CAPE TOWN F[R]ICTIONS

Landscape as an ally of urban growth

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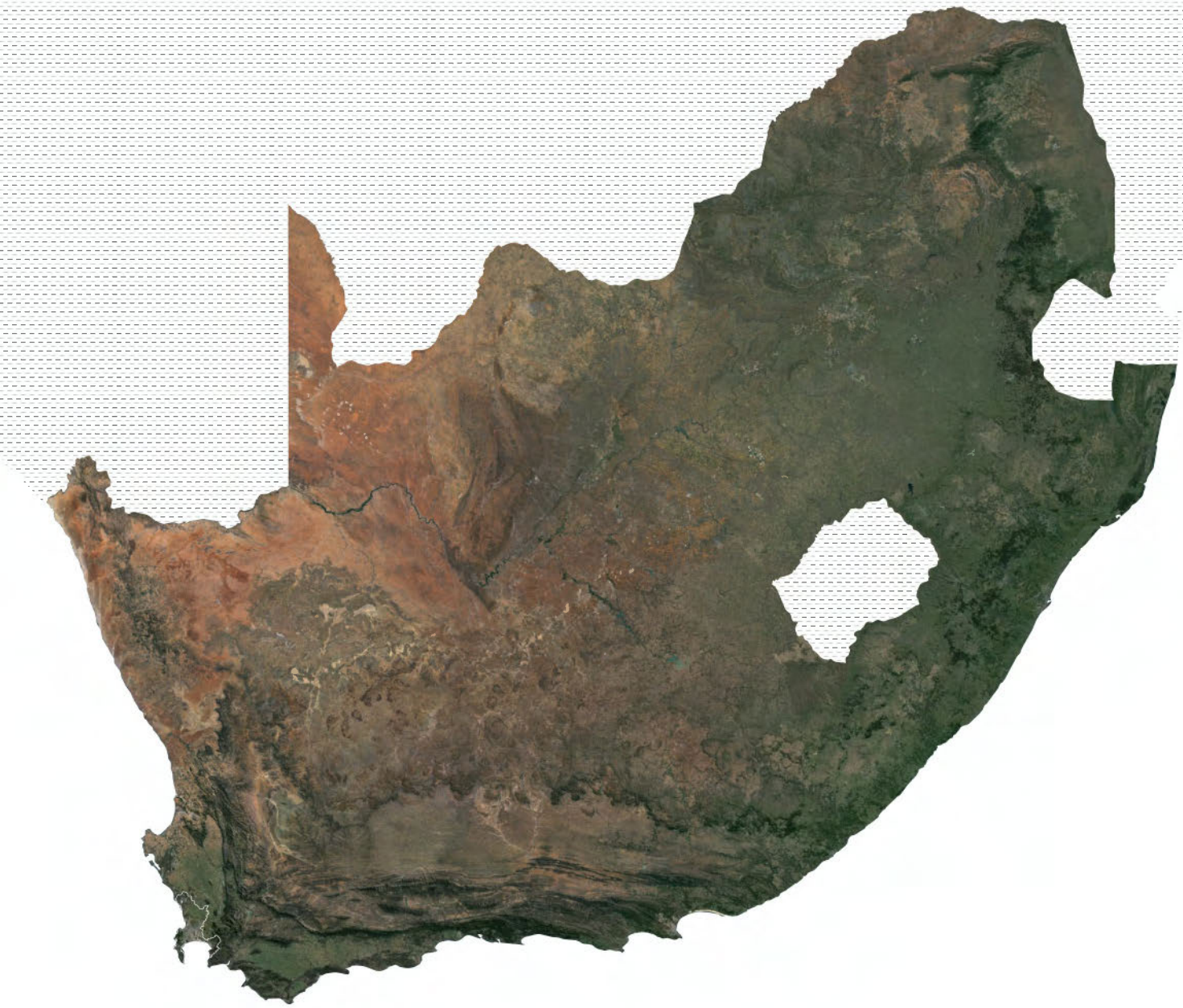
Africa

Area: 30.370.000 km²
Population: 1.1 billion ppl
Population density: 36.4 ppl/km²



South Africa

Area: 1.221.037 km²
Population: 54.956.900 ppl
Population density: 42.4 ppl/km²

Cape Town Metropolitan Area

Area: 2.445 km²
Population: 3.740.062 ppl
Population density: 1530 ppl/km²


FOR SALE


NISSAN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01
01


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Faculty of Engineering Science

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abstract

Cape Town, struggling with its current and future demographic growth has been characterized by its history, which has been one of separation, inequity and uncontrolled occupation of uninhabited land. A lot of effort has been put into trying to solve Cape Town's problems, often in the perspective of post-Apartheid. Most attention was given to providing adequate housing, occupying and forgetting the landscape. There is an ongoing fight between the landscape and urbanity. Most of the time urbanity wins, but often also the landscape shows its presence by striking back.

The occupation of this land happens in a very contained cellular way. Isolated settlements, what we call archipelagos or enclaves, are developed further and further away, instead of densifying the existing tissue. There are no hybrid islands, everything is one thing or the other. We acknowledge that Cape Town is dealing with frictions between fast and slow, small and big, natural and organized.

By using the landscape as a protagonist for urban growth, we will embrace these frictions by allying them. In our designs the border between landscape and urbanity will be broken open. Our story is not about one thing or the other, but about how these coexist together and that is the point when they become interesting. Small scale initiatives take over the metropolitan space. This goes hand in hand with the bigger scale. Big and small, slow and fast, nature and city benefit from each other.

The title of the book can also be read as Cape Town Fictions. It is not the intention to propose master plans, but ideas. We offer a new way to look at these frictions and make room for thought by fictions.

acknowledgements

Before we start our work, we would like to express our gratitude to those who helped us during the process, whether through collaboration, guidance or mental support. The realisation of this work was made possible mainly thanks to them.

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The Ark City of Refuge in Cape Town. We would like to thank the staff and the inhabitants of the organisation for giving us the opportunity to show us their incredible work. Besides providing physical needs for those who have no alternative options, the organisation uses Christian-based counseling and life-skills to bring about spiritual, mental and physical healing and to facilitate re-introduction to the community.

DAG, Development Action Group in Cape Town. Thank you for letting us participate in the instructive workshops and for the lectures and guided tours, which made it possible to come in contact with locals.

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Last but not least, we want to thank our **family and friends** for their continuous support, their much appreciated advice and great interest in our work.

preface

This book is the thesis project concluding the master's program in Architectural Engineering at KULeuven. It forms a reference document on the urban growth of African cities, more specifically in the case of Cape Town. The work seeks to explore and demonstrate the role of urban design and architecture in one of the most rapidly growing cities in sub Saharan Africa.

The work is based on two months of intensive fieldwork, which is a crucial ingredient to foster a better understanding of the city's challenges. During the fieldwork several specific sites were chosen with the aim to achieve a bottom-up research by design with interpretative mapping as a fundamental tool. Although the research took place in smaller groups of two to three students, different findings and insights were reviewed with the whole studio on a regular basis.

The ambition of the work is to investigate how the challenges of Cape Town's urbanisation process can be approached from a different perspective in a context where a great amount of research by several local specialists exists. The main goal is not to solve existing or future problems, but rather to present new ways of thinking in the ongoing debate for the future of the city so that it also can be useful as a reference for other rapidly growing cities that deal with similar situations.

structure

After a short introduction to Cape Town, we divide the book into two chapters: 'frictions' and 'figures'.

In the chapter 'frictions', we tell the story of Cape Town through two lenses: the one of the landscape (in black) and the one of urbanity (in grey). Each chapter shows the duality that is present between these two elements and the frictions occuring between both.

In the chapter 'figures', we describe three important figures we distilled from our analysis of the city. These figures will be elaborated on in case studies, where design proposals are used as tools to present alternative ideas.

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frictions

figures

Studio Cape Town

introduction

The way a city functions or takes form, tends to deviate from our traditional conceptions of urban centres. A new dialectic is necessary to reinforce current practices. An essential feature of current cities is, that a city is a place where a wide variety of aspects come together and intermingle. This heterogeneity obviously leads to dissension between people, systems, etc., because of differing needs, wishes, ideas and logics. The word friction embodies these conflicts between things that are considered to be different. As places of diversity and interaction, cities are natural incubators of friction. One could argue that friction is even an integral part of what constitutes a city.

However, since the 1980's focus was put on the challenges friction raises, instead of on the opportunities it involves. The whole concept of friction got a strictly negative connotation. This reputation together with a dominating vision of safety and efficiency further pushed friction out of the urban scene. Many urban problems were thus handled in a more secular and sterile way, that actively tried to eliminate all forms of frictions. This evolution went hand in hand with the development of a new culture of mono-cultural spaces known as enclaves. Several other spatial components of the zero-friction society also started popping up in cities around the world: the cul-de-sac, privatopias, commuter villages, office and science parks, regional shopping malls and theme parks. This capsularisation of our society divided urban space in clearly defined portions, each strictly allocated to a single idea or need. However the interaction between entities was not fully erased. A few remaining shared spaces were allowed, but subjected to conditions that assured all actors behaved in a single-minded and uniform way to prevent friction to occur. The latter has resulted in carefully monitored behaviour and spaces governed by strong disciplinary systems. Cape Town is a clear example of a city where this secular way of thinking altered the city's appearance. Most striking is how throughout history, its unique diversity got contained in scattered mono-cultural zero-friction enclaves.

It is primarily the local topography that started defining the make-up of this most South-Western part of South Africa. In combination with the temperate climate, it graced the region with a rich range of unique fauna and flora. This richness has been the prime reason people have been drawn to some of its fertile slopes and valleys. Original human activity in the Cape region was more nomadic, with probably a minimal impact on the natural plant and animal life. Some communities took on pastoral lifestyles, making their settlements more permanent and changing their interaction with the environment. Thriving thanks to the natural resources provided by the natural landscape, some settlements started to expand and further develop themselves. With them, their impact on the natural landscape grew, changing its systems and adding new foreign elements. Where before human settlement

patterns were mostly determined by natural landscape elements (slopes, rivers, forests...), human activity itself slowly started actively shaping the landscape. Further growth of these settlements has led to the city region of Cape Town that we know today. Through history, urban expansion often disregarded the workings of natural systems, resulting in a landscape that strongly differs from what it originally looked like. The infamous apartheid regime expanded the city wielding urban and natural elements as tools to enforce governmental ideals. This abuse left the urban fabric polarized and its landscape dismembered, subjecting the city to the negative sides of social friction. As a place of cross cultural interaction, Cape Town was already prone to be challenged by racism, violence and xenophobia. However these tensions were hugely enhanced when the diverse entities of the city were torn apart and placed opposite to one another, creating a vast urban archipelago.

Some foster the vision of Cape Town as a future world city. Africa is however different from the rest of the World when it comes to urbanisation conditions. As people and nature were originally highly intertwined, resources are now often badly managed, migration rates are high, the impact of climate change is rising and economic situations shift quickly. While they perhaps hold the largest challenges, the opportunities are enormous. These complex challenges of urbanization, development, poverty and climate can only be met with close cooperation between different sectors. From the perspective of the natural landscape, a new urban agenda is needed that moves past the 19th century agenda of recreational parks, streets and squares. The predicted urban growth can thus be seen as an opportunity to actively bring the friction between urbanity and natural landscape to the foreground.

Sociologist Louis Wirth wrote in his work 'urbanism as a way of life' about cities: " Nowhere has mankind been farther removed from organic nature than under the conditions of life characteristic of great cities." (Wirth, 1938). In Cape Town too, new drivers of urbanisation are expanding the city, frequently forcing its natural landscape in a mute subordinate role. Rising migration figures forecast that this growth will soon approach a new acceleration, that will again greatly change the entire region. City officials are already facing several challenges that precede the predicted growth. All while they are trying to overcome the challenges caused by the remnants of apartheid. The already difficult interaction between the urban fabric and the natural landscape is tested to the extreme. New development has shown that it holds the danger of becoming generic and too unconscious of natural ecosystems.

What Cape Town needs is a strategy that stimulates cross-fertilisation, instead of a secular approach that keeps everything strictly apart. The different enclaves need to come together and strive to meet the challenges as one. This does not signify that everything should become the same, but rather that all different parts try to coexist and find a way to work together to reach common goals. Learning from current places of friction could be a first step. These are often the places of real interaction between the disconnected city parts. As ideas change and needs

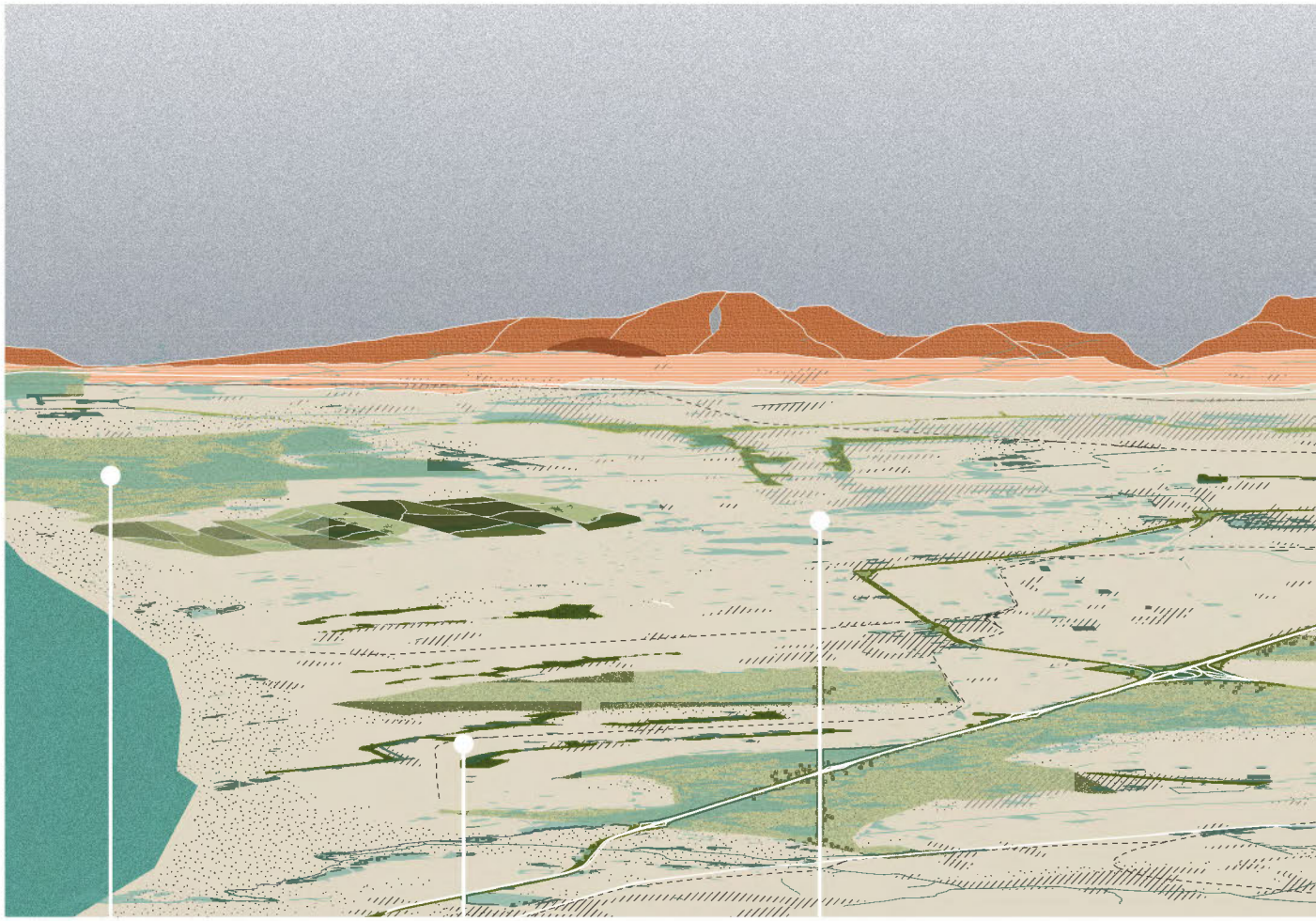
evolve, the friction between entities evolves simultanuously. This makes the investigation of friction a continuous learning process. As mentioned before, friction is not exclusively a source of conflict between arrangements of power, it provides movement, action, change,... Design can be an interesting tool to tackle or accentuate friction. Provoking contestation and debate about use that is embedded in the everyday life of citizens is just one example. People are not only stimulated to take up more active roles in their communities, but also to question conventional norms and values.

Cape Town's open spaces that threaten to be consumed by development, are interesting places of friction. Both to address different kinds of contestation in city, and the tension between the urban fabric and the natural landscape. A study of places where capsularised city parts meet, collide and blend is needed, as this could reveal inspiring opportunities. Frictions allow experiments and provoke creativity, which makes one envision unprecedented fictions of a future city. However, if the paradox of a city without friction remains unresolved, the result will be the development of a city without history, without identity and unfit to be called a city.

Base map

Unbuilt environment
Rivers
Railway lines
Main infrastructure lines

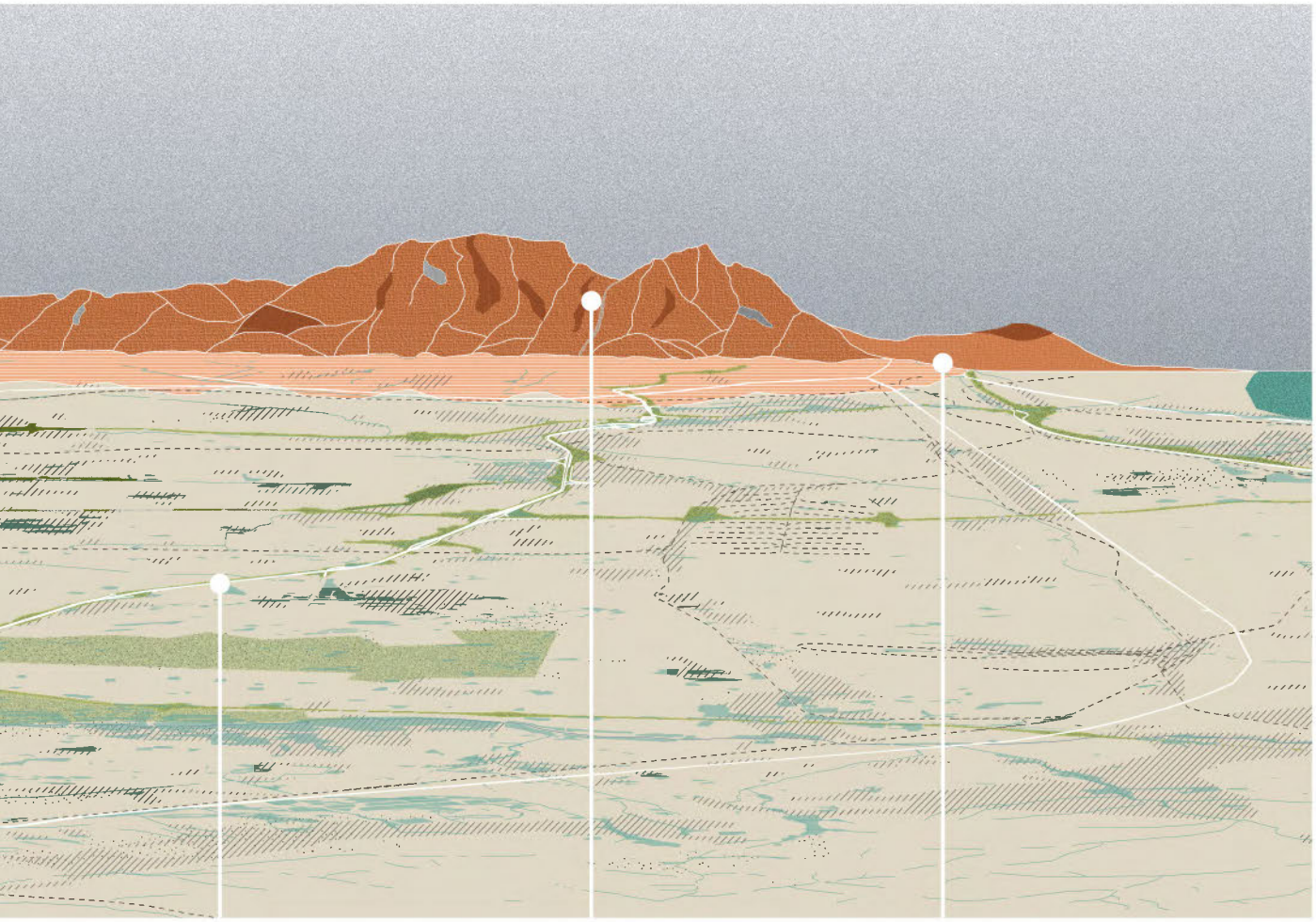

5km
10km
15km



Domestic sewage in Cape Town is cleaned by several wastewater treatment plants that are spread out across the city. Most of the purified water is diverted in the river to eventually reach the sea. Unfortunately, only a very small fraction is reused. Moreover, the same story applies to non-separated solid waste which is collected by the government or private contractors and brought to landfills and, thus, not actively recycled.

The Cape Flats, is an expansive, low-lying, flat area situated to the southeast of the central CBD. Previously, it was home to people that were designated as non-white by the Apartheid government.

Currently, the area is characterized by development on a large scale. Although formal housing is provided by the government, a large backlog of housing is still existent due to an increasing population growth, mainly as a result of both national and transnational migration. Consequently, this leads to an unregulated
informal development with often poor facilities.



The car is the most common form of urban transportation in Cape Town. Numerous inhabitants travel to the CBD and back via large main roads on a daily basis. Consequently, this leads to daily traffic jams at peak hours. An alternative to the busy highways is the railway network which connects the CBD to the rest of the city. Furthermore, new plants for public transport plans are being implemented by the government. Nevertheless, it remains a great challenge.

The Table Mountain is the city's best known landmark. Moreover, it is responsible for the CBD's microclimate due to its geographical shape and location in combination with its specific fauna and flora.

The Central Business District, considered as the heart of the city, is the historical and current economic centre of Cape Town.

Doomscape: the future of Cape Town?

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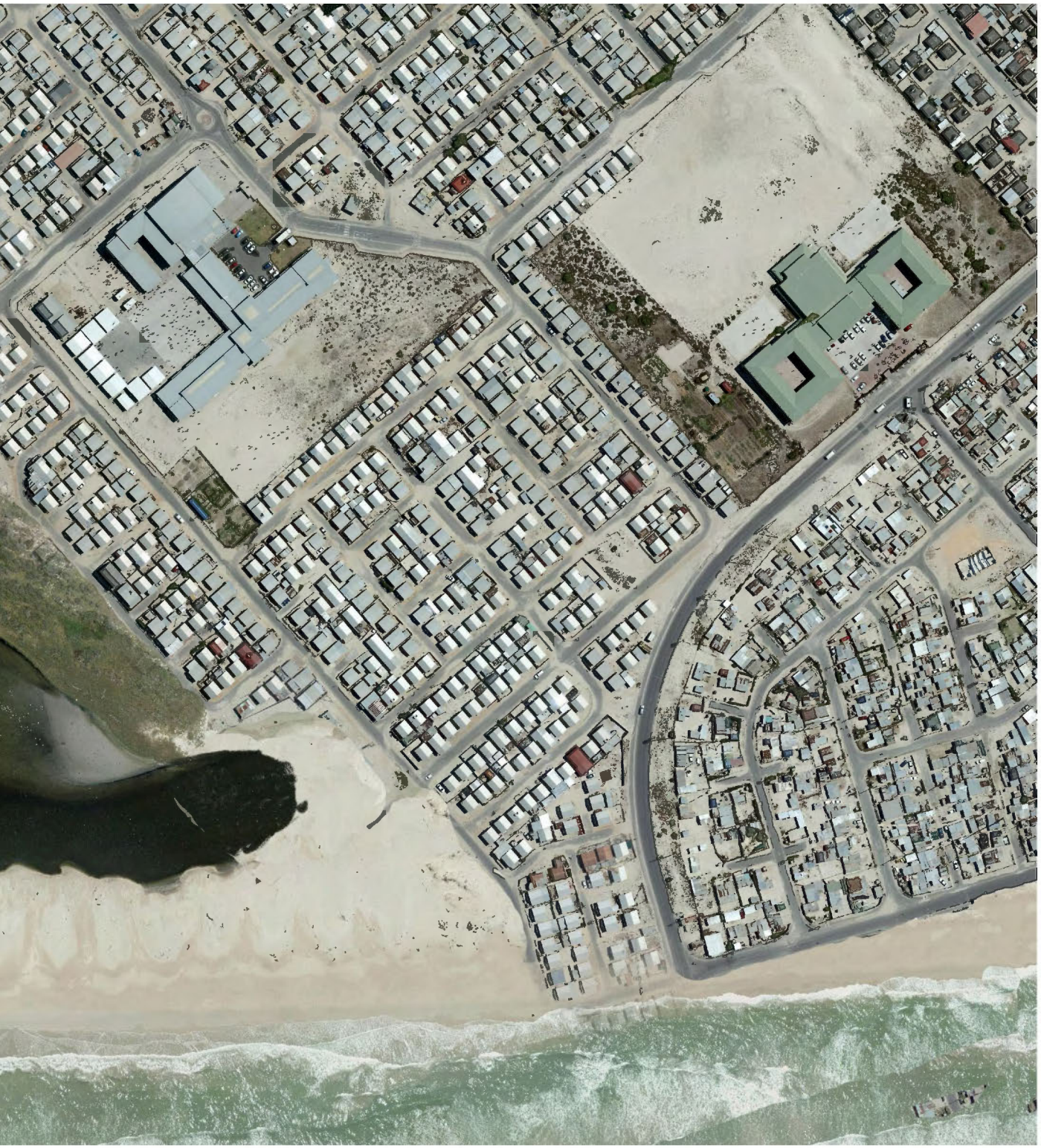


Doomscape: the future of Cape Town?

frictions

introduction

The city of Cape Town is characterised by a strong friction between its natural landscape and its urban fabric. In this chapter we want to give them both the opportunity to speak up. These systems are often seen as disconnected entities. Both landscape and urbanity lead to different outlooks on the problems the city is dealing with today. Their perspectives are however inseparable as they constantly influence each other. In this chapter we want to accentuate this by telling both stories side by side with an alternating point of view.

ant aspects of the existing city are investigated. It is noticeable how a strong focus on urbanity results in a forgotten and neglected landscape. Main topics are the origin of the city of Cape Town, its evolution over time and the challenges it faces today. In this storyline the urban logic often supersedes the logic of the natural landscape.

The second part discusses the more direct relation between urbanity and landscape. People have always been dependent on natural landscape and have adapted it to better meet their needs and wishes. This domestication of nature by urbanity, leads to a change in ecological systems. In Cape town this mostly refers to adaptations to the water systems and the influence of agriculture.

The last chapter explains how even urbanity is sometimes forgotten, when it is subjected to the systems of the natural landscape. Cape Town's climate, topography and geology are still very present in the city today and have partly influenced how the city is structured. Its rich and exceptional biodiversity however is under rising pressure and risks to disappear.

Landscape

The term 'landscape' etymologically originates from the Dutch word 'landschap', given to rural areas in 1240. In 1617 a new meaning of the term emerged, to name paintings of the countryside. In these paintings, people were almost never pictured, the land itself was the protagonist. Today, multiple definitions of the term exist. In English there are two main meanings, the aforementioned genre of paintings and the visible features of an area of land.

In its original language the term is specified as our observation of the exterior environment, being a complex system of relationships between different natural elements reciprocally and humans.

"Onze waarneming van de buitenomgeving (aardoppervlak), met inbegrip van de talrijke functies en hun samenhang, en ontstaan door de werking van gesteente, water, lucht, planten, dieren en de mens. Een landschap wordt wel omschreven als een complex van relatiesystemen, dat gemaakt is en in stand gehouden wordt door de wisselwerking tussen de verschillende elementen." [www.encyclo.nl]

In the remainder of the book, we will only use the term landscape to refer to the combination of all the natural elements: topography including mountains and hills, water bodies such rivers, wetlands and the sea, fauna and flora, geology, climate... Human elements like buildings, different forms of land use, infrastructure... are not incorporated in this definition and are seen as parts of the urban system.

Urbanity

Etymologically, the terms 'urban' and 'city' originate from different words, but now share a similar meaning. Urbanity directly originated from the Middle French word 'urbanité', meaning 'refinement, elegance and courtesy' or 'wit, raillery and trickery'. It referred to the manners of townspeople, who were assumed to be refined.[Ethymonline, 2006] Urbanité itself comes from the latin word 'urbanus' that also means 'refined, courteous, witty, bold, impudent' or literally 'of a city'. It comes from the Latin word 'urbs', used to describe a larger settlement. A resident of such a settlement was called a 'civis'. This word was linked to 'civitatem' which means 'community of citizens, state, commonwealth'. The meaning of his word evolved through history ultimately referring to the place instead of its inhabitants. During medieval times the word 'city' meant a cathedral town, but originally it referred to any settlement regardless of its size.

The sociologist Louis Wirth defined cities in his paper "Urbanism as a way of life" in 1938 by four characteristics: permanence, a large population size, high population density and finally social heterogeneity. Cities are thus specific places where a lot of people with different social backgrounds gather for a long time. All human interventions that facilitate these interactions are part of the urban system.

Wirth further explains that cities have expanded their impact and have taken on roles that outgrow the specific place of settlement.

The influences which cities exert upon the social life of man are greater than the ratio of the urban population would indicate, for the city is not only in ever larger degrees the dwelling-place and the workshop of modern man, but it is the initiating and controlling center of economic, political, and cultural life that has drawn the most remote parts of the world into its orbit and woven diverse areas, peoples, and activities into a cosmos." [Wirth, 1938]

forgotten landscape

urbanity at full power

"You forgot and neglected me. We used to work together to survive, but now you only think about yourself. You keep occupying land, leaving me no space to thrive. You keep expanding, without thinking about the consequences of your actions. You introduced new elements that make it difficult for me to be who I am. I am struggling to survive."

"I am constantly changing and growing and therefore I just need more space. I have always been vibrant and only recently closed a darker chapter of my existence. I am full of hope of becoming more and more important as I grow."

Contrast between structured TRA in Blikkiesdorp and the natural landscape

Central Business District

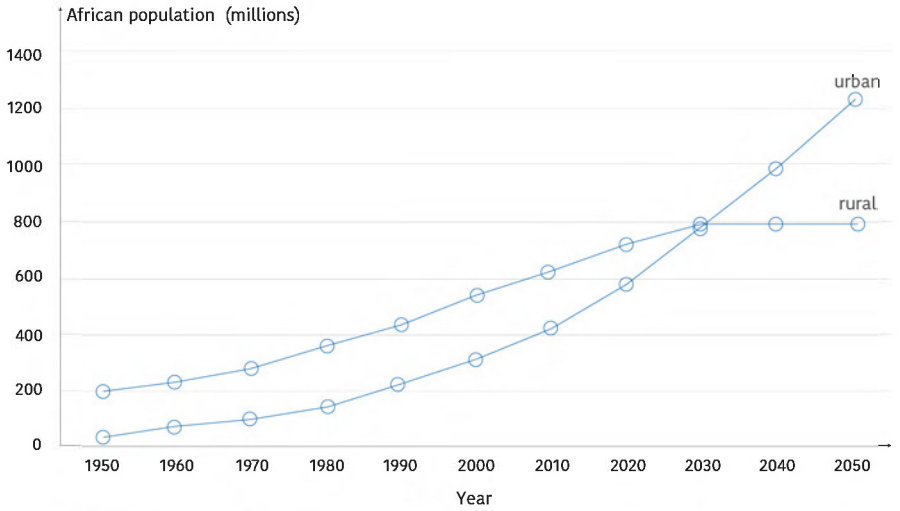
Street with informal shops in Khayelitsha

Informal shacks in one of the townships

Developing a world city?

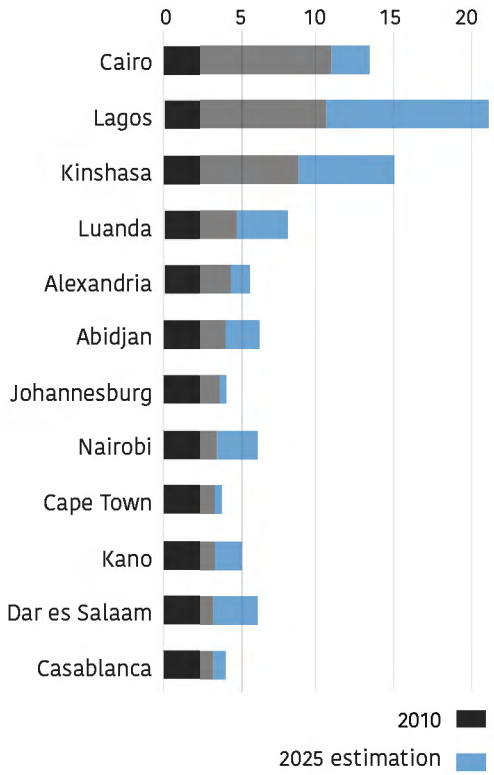
The rate at which cities all around the world are currently growing is unprecedented. It is the first time in history that more than 50 percent of the world's population is living in towns and cities. In some countries, 80 percent of the national production and income is provided by cities. This number steadily grows as the amount of city dwellers increases with nearly 60 million each year. Urban economic importance grows accordingly. Global estimations expect that by 2025 more than 4 billion consumers will live in cities and more than half will come from emerging market cities.

Over the next decades, global urbanization will almost entirely occur in Africa and Asia. These two regions will thus account for about 86 percent of the world's urban population. Africa's economic transition will lead the way, comparable to how China's economic transition has influenced global markets since the 80's. By 2040 Africa will have the largest work force on the planet and in cities the consumer spending is expected to triple by 2030. Lastly, by 2050 more than 50 percent of Africans will live in the continent's cities. The urbanization of Africa creates great opportunity for wealth creation, creativity, innovation and invention. With its 54 countries and over 1000 spoken dialects it is perhaps also one of the most diverse regions of all, which makes it a very complex destination for investments. Businesses will need more city-centric orientations towards investment decisions and day-to-day business practices. Cities are essential to economic prosperity as they highly influences the fundamentals for sustainable economic progress: urbanization and a rich demographic dividend combined



Prediction of the population in Africa.

with modernization and increased connectivity across the continent. The rise of African cities coincides with the continent's growth and rejuvenation of the past decade. Cities represent growth and a new era of economic modernization with new market opportunities. They will be the primary focus during the continent's economic reconfiguration and will be essential to unlocking its underlying potential.



Most populated African cities

Predictions based on global forecasting and quantitative analysis point to Cape Town, Dar es Salaam, Johannesburg and Luanda as Africa's possible major future economic giants.

The current growth rate of Cape Town's economy is the highest of South Africa. By 2022 the total metropolitan population is expected to surpass 4,2 million inhabitants. A study conducted by city officials assured that there enough land within the perimeter of the edge, to accommodate urban growth until 2021.

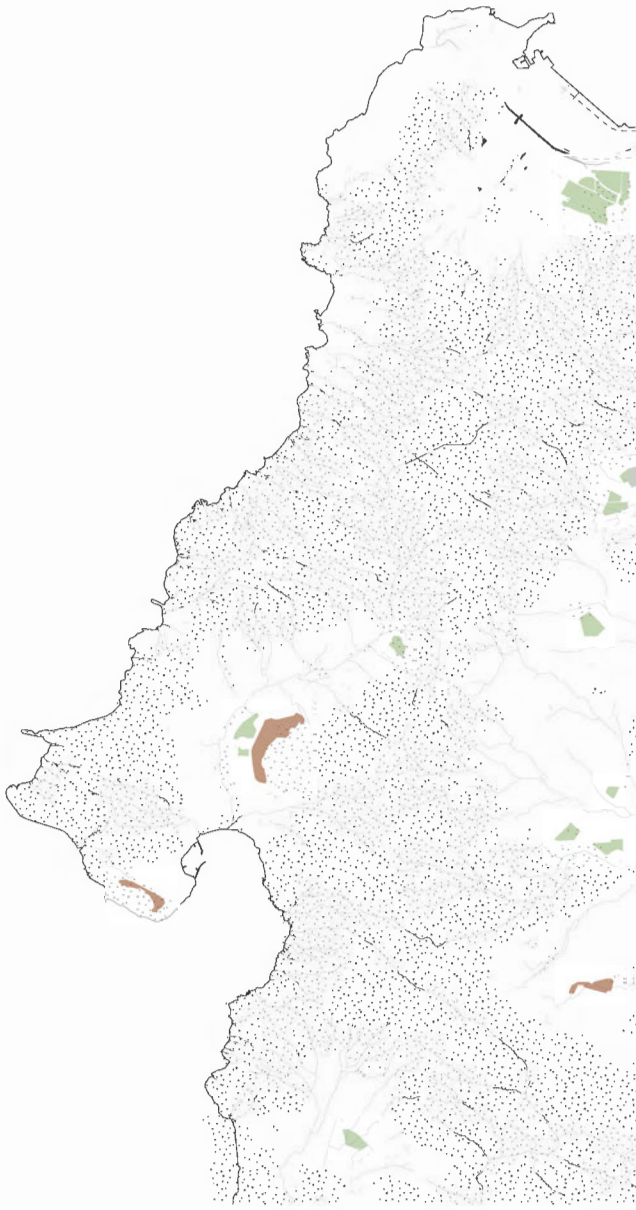
Cape Town has entered a new period of urban expansion, after the downfall of the Apartheid government, everyone is allowed again to live where they want. As the Cape region is seen as a booming employment hub, it now attracts migrants from across the South-Africa and even other African countries. [Bafana, 2016; Leidreiter, 2016; Post-Apartheid developments and challenges, n.d.; Thunstrom et al., 2012; Owen Gaffney, 2016; WPR, 2015]

A growing population means new development challenges, mostly in the organization of people and resources. If badly handled growth takes form in inefficient land-use patterns, that can lead to overcrowding, resource constraints, pollution... Cities often also lack the needed infrastructure and services to accommodate the influx of new people.

In addition this growth is happening as Africa has to deal with extreme poverty and a climate that is becoming warmer and drier.

Although Cape Town's developed area increased by 40%, the rapid urbanization lead to ageing infrastructure, a large housing backlog and degradation of natural systems.

The unique biodiversity in Cape Town's lowlands is threatened as crucial habitats have been destroyed. However the natural landscape of the Cape Flats isn't the only one that risks to disappear. Older areas closer to Table mountain underwent a lot of construction on the slopes and have changed the traditional image of the once in a valley city. There are two main reasons for the loss of natural open spaces: land occupation by new buildings and people who invade the remaining natural landscape and leave traces such as waste. New urban expansion means increase in both formal and informal development encroaching on natural assets and larger impact by human traces polluting the landscape. Even natural open spaces with clear programs like beaches, agriculture and watercourses are being menaced. Cape Town lost 30 percent of its original natural landscape last century and this trend only seems to be accelerating with predictions of more urban expansion. The city needs to prepare for the future by setting clearer limits and strengthening the connection with its natural settings. [Cape Town History and Heritage, n.d., IOL, 2014; Purves et al., n.d.]



Occupation map

Map showing the friction between expected formal and informal growth

- Proposed formal development zones
- Estimated informal development zones
- Expected friction


2.5km
5km

Historical development

Map showing the evolution of urban development.

- 1940
- 1960
- 1980
- 1990
- 2000
- 2010


2.5km
5km

Urban growth in Kosovo (top) from 2013-2014-2015 and in Muizenberg (bottom) from 2002-2009-2015

From various migrations to new identities

Cape Town is one of the most multicultural cities in the world and it keeps attracting people from all around. The oldest city in South-Africa, immigrants and expatriates still see it as a major destination. However this has very often been the case throughout history. The city is a historic melt pot fueled by multiple migration waves.

Categorization of the population is difficult and is never fully able to cover the complexity of real life human demography. During the Apartheid period a compartmentalized vision has nestled itself in the mindset of people.

Consequently its social composition has never been homogeneous, different ethnic groups interacted and influenced one another and created new population groups. Current Capetonians thus have a heritage that varies highly in cultural background.

The Apartheid system designated the African population based on tribe, allocating every person to one of nine tribes. However a large part of the population was lumped together in categories because they didn't fit well in one of the designated categories.

Cape Town is unique as it is the only city in South Africa where the largest part of its population has a mixed ethnic heritage. They are all put in the same category even though the genealogy of individuals and families greatly vary. They descend from different combinations of interactions between the indigenous Khoisan, Bantu people from southern Africa, Western European people and South- and Southeast Asian people. Multiple genetic studies suggest that they have the highest levels of mixed ancestry in

Cape Town attracts people from all around the world.

the entire world. There exist several subgroups that people identify with, an example are the Cape Malays people who originate partly from regions of current Indonesia and Malaysia. About 42 percent of Cape Town's inhabitants are considered to be part of the 'Coloured' population group.

The second largest demographic group are the people that attribute their descent entirely to native African ethnic groups. Among this wide range in South Africa are the Zulu, Xhosa, Ndebele, Tsonga, Venda, Pedi, Sotho, Tswana and Swazi. They descend both from the aboriginal Khoisan group of the Cape and/or the Bantur groups that migrated from the North. This group grows each year as a lot of new migrants from other African countries are moving to the Cape. They are all categorized into the 'Black Africans'-group and make up 38 percent of Cape Town's population.
Other people in Cape Town trace their ancestry exclusively to European ethnic groups. Some connect to Dutch, French, British, Irish, and German settlers who began arriving at the Cape from the late 17th century while other have ancestors that were immigrants from Europe who arrived in the twentieth century other link themselves to the Portuguese people who left the former Portuguese colonies in southern Africa after their independence in the mid-1970s. One subgroup are the Afrikaners who predominantly descend from the first Dutch settlers. Approximately 15 percent falls under the category 'White African'.

The remaining people have mainly Asian and/or South Asian ancestors. Some are descendants of Indian sugar estate workers or traders who arrived in the mid-19th century or are part of a group of Chinese people who migrated to South Africa. This 'Indian/ Asian' population group is around 2 percent. [Immigration South Africa, n.d.; South African History Online, 2011; Statistics South Africa, 2014; Wilkinson, 2015]

The Khoisan

The indigenous Khoisan nomads lived around Table Mountain 27000 years ago.

25000BC | 1450 | 1500 | 1550 | 1600

1488

1488 Portuguese explorers

They discover Cape Town on their way back after searching for an alternative route to India.

1650 The Dutch
They are the first ones to establish a permanent settlement, mostly as a re-supply and layover port for vessels of the Dutch East India Company.

1679 The fort
The construction of the Castle of Good Hope is finished and used as a fort.

1792-1815 Coalition wars
Cape Town grows more slowly in this period because of the war with Napoleon in the Netherlands. Cape Town is also being threatened to take over by the French as a puppet regime is installed in the Netherlands

1795 British in Muizenberg
The British occupy Muizenberg to protect Cape Town from being occupied by the French.

1650 1679 1795

1650 1700 1750 1800

1654 1663 1815

1663 Dutch city planning
The Dutch introduce a grid pattern with Company gardens.

1654 Harbour construction
Commander Jan Van Riebeeck establishes the first harbour construction.

1815 Waterloo Peace
With the end of the Napoleon wars, the Cape is given to the British. The Cape becomes a colonial Capital.

1834 Great Trek

In 1834 the British abolish slavery. Dutch-Afrikaner farmers and emancipated slaves react by emigration from the British Cape Colony to the interior of South Africa through Voortrekker Road.

1867 Diamond boom

The discovery of diamonds results in more immigrants and a true swelling of Cape Town, although racially mixed.

1834 1850 1863 1867 1900 1901

1863 Railways and roads

The first railway lines are constructed in 1863 and roads towards the rest of the Cape continent.

1901 Plague

A plague results in the first townships and racial segregation. Ndabeni is regarded as the first township of Cape Town, established in 1902.

1910 SA Union
Cape Town is no longer a colony but part of the South-African union.

1923 Urban Areas Act
The act states that Africans have to live in designated areas.

1927 Langa
The first planned and controlled township is established.

1948 Apartheid
The National Party is elected and the Apartheid policy is introduced, where different racial groups have different rights.

1960 Gugulethu
A new township is established.

1960 Mitchells Plain and Crossroads
New townships are established.

1980 Khayelitsha
A new township is established.

1989 Delft
A new township is established.

1994 End of apartheid
The first democratic elections are held open to all races where Nelson Mandela is elected as the first Black president.

1910 1923 1927 1948 1950 1960 1970 1980 1989 1994 2000

Local landscape culture knows a long history of changing and enduring relationships between people and the physical place they live in. The move of diverse ethnic groups has had a great influence on many aspects of the city, including landscape culture. Each new migration had a different impact, as people brought other things with them from their native landscapes : land uses, habits, traditions, new techniques, foreign species...
Some influences mixed with local practices while others were more dominant and gradually replaced the existing. The different cultural practices also vary highly in their attitude towards nature. Historically there is an evolution from being heavily rooted in the ecological systems of the landscape to a more isolated stance that seems to forget the local landscape.

From harbor town to business districts

During the British colonial period a large part of the middle class drove the establishment strong business institutions. Even after the departure of the British, these companies kept on trading. They pushed urban programs that started the creation of modern Cape Town and its infrastructure. Railway lines running north-south were added and a new harbor was finished in 1860. People also continued building roads, which included the construction of several mountain passes.
The development of the Cape's infrastructure came just in time to capitalize on the great diamond boom that started in 1867, and the economy of the Cape grew fivefold in five years more precisely from 1870 to 1875.

Early twentieth century Cape Town was mostly characterized by the new pier built in 1925. The pier was however already demolished in 1940 because of demands for improved infrastructure and new docks. An extensive land reclamation scheme extended the city and thus created space for wharfs, freeways and a modern port. The following years Cape Town underwent further expansion together with the arrival of electricity, motor cars and cinema which turned it into an industrial city. People's homes were equipped with electricity during the 30's. An example is how in 1936 the Table Bay power station brought an increased revenue to the city.

Even though Cape Town grew into a modern industrial city during the interbellum, it couldn't follow the growth of Johannesburg. Cape Town's production kept a focus on its drink, food, tobacco, printing and clothing industries. Large increase in population inspired ambitious urban planning that led to the development of 'Garden cities', townships and a massive land reclamation scheme on the city's foreshore.

During the apartheid period all global connections with South-Africa were annexed. Later in the 1990's after the abolishment of apartheid the country re-entered on the international markets. In the Cape Town the structure of the city was adapted to better meet global demands. This included the development of central business districts. The manufacturing industry further declined although it once held an important position in the city's production. It couldn't compete with mounting competition from lower waged markets. Similar to post-fordist changes

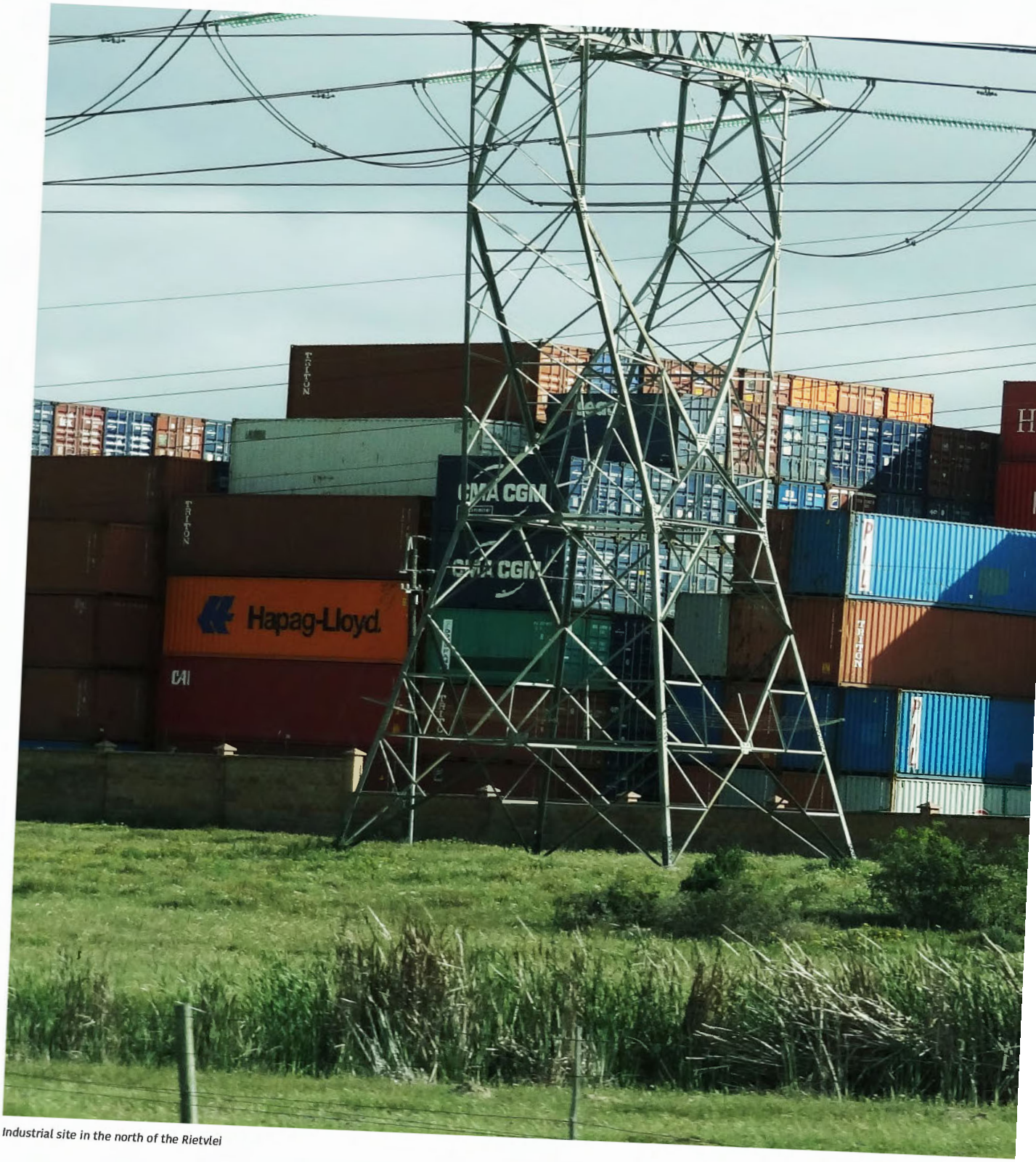
Industrial site in the north of the Rietvlei

in the North Cape Town has experienced an expansion in service-provider and financial based firms such as ICT, the film industry and investment corporations. Its contemporary economic growth is mainly driven by the commercial, financial and service sectors, which greatly resembles to other global cities elsewhere. Cape Town History and Heritage, n.d.; Lemanski, 2007]

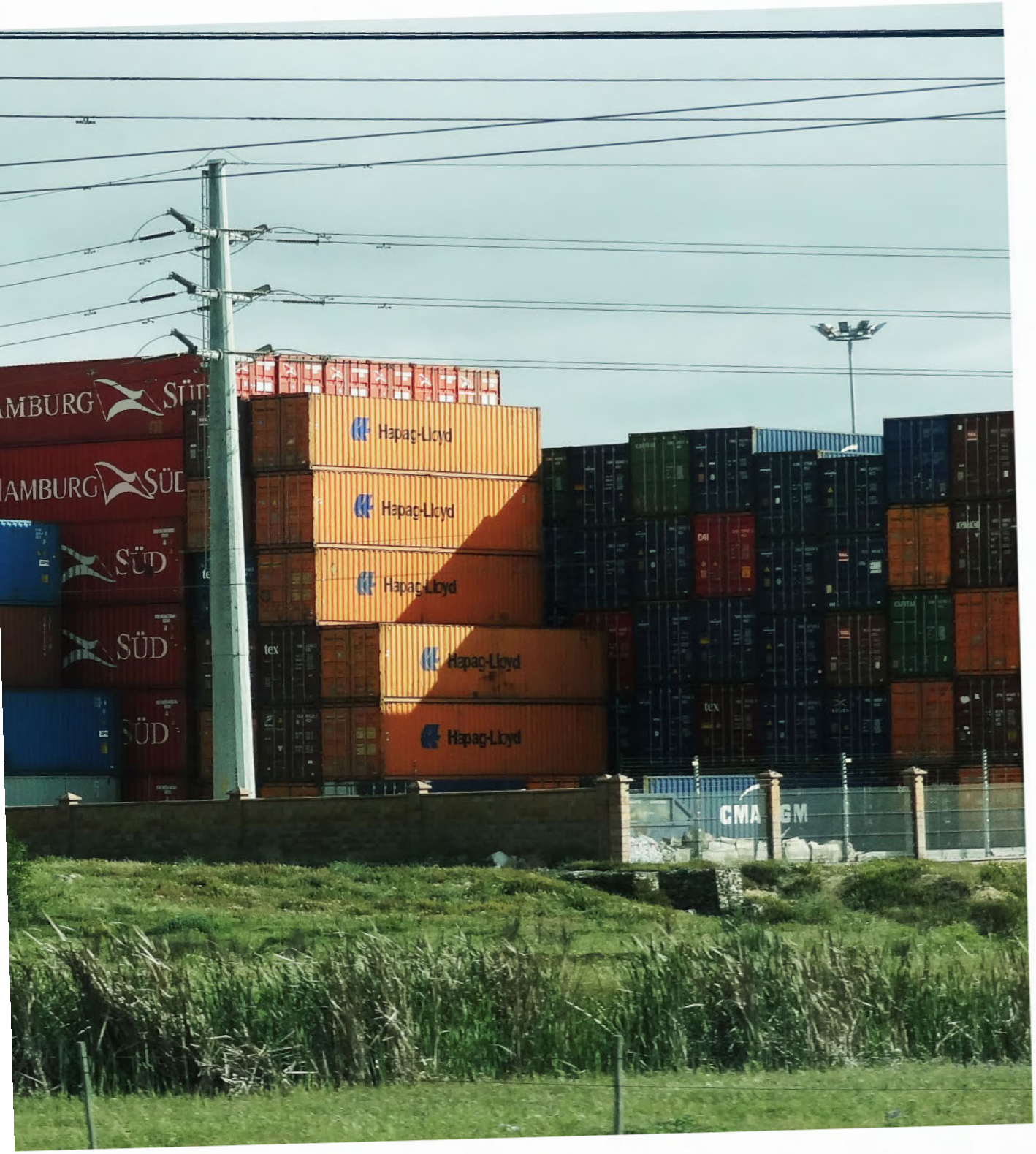
The Industrial revolution is a clear example of a period when nature is overthrown as the main logic behind urban transformation and expansion.

Production starts to drive urban development as new infrastructure, factories, land exploitation sites, and labour force accommodations are constructed. Most of these developments have directly or indirectly changed the landscape as natural elements are subjected to production rationale. Moreover this change in urbanisation has greatly contributed to climate change, the loss of natural fertility of farmland, soil carbon and biodiversity all over the world.

Cape Town has developed consumption and waste disposal habits that show no concern for environmental consequences. As the city grows larger and richer, its impact on nature's bounty grows accordingly. Like many other cities it greatly depends on resources outside of the own local hinterland. [Leidreiter, 2013]



Industrial site in the north of the Rietvlei


Hapag-Lloyd
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SÜD
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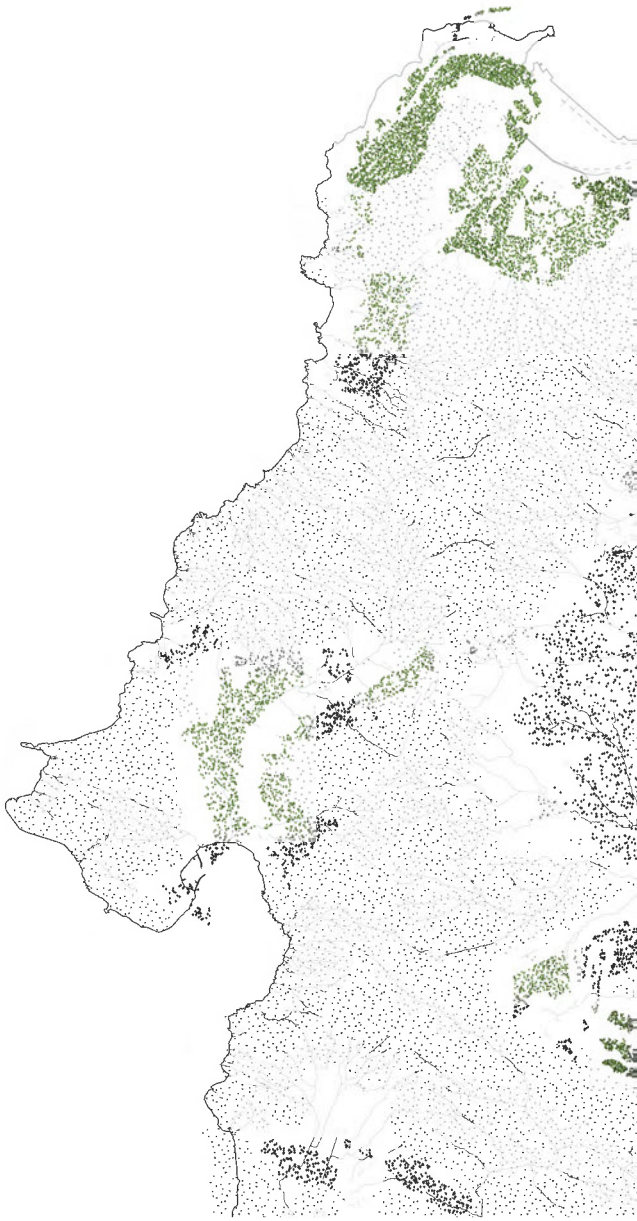
SÜD
CMA CGM

Railway infrastructure in the CBD.

Becoming a segregated city

Starting the late eighteenth century right up to the middle of the twentieth century legislation played a crucial role in shaping Cape Town as a segregated city. Apartheid included a policy driven form of spatial engineering that severely deformed entire South-African cities. However patterns of exclusion already emerged with the arrival of the Dutch. After they constructed a fort and established the early settlement, they built both imagined and physical boundaries between themselves and the Khoisan. They began to invent and implement techniques to regulate and limit the access of the Khoikhoi to the castle and its surrounding areas.

Prejudice and government policy further frustrated and separated the migrants that arrived at the Cape during the following centuries. Through discriminatory employment practices people's wealth became slowly tied to race. Moreover the ruling elite continuously started to differ groups. Growing economic differences further separated races in facilities, churches and suburbs.

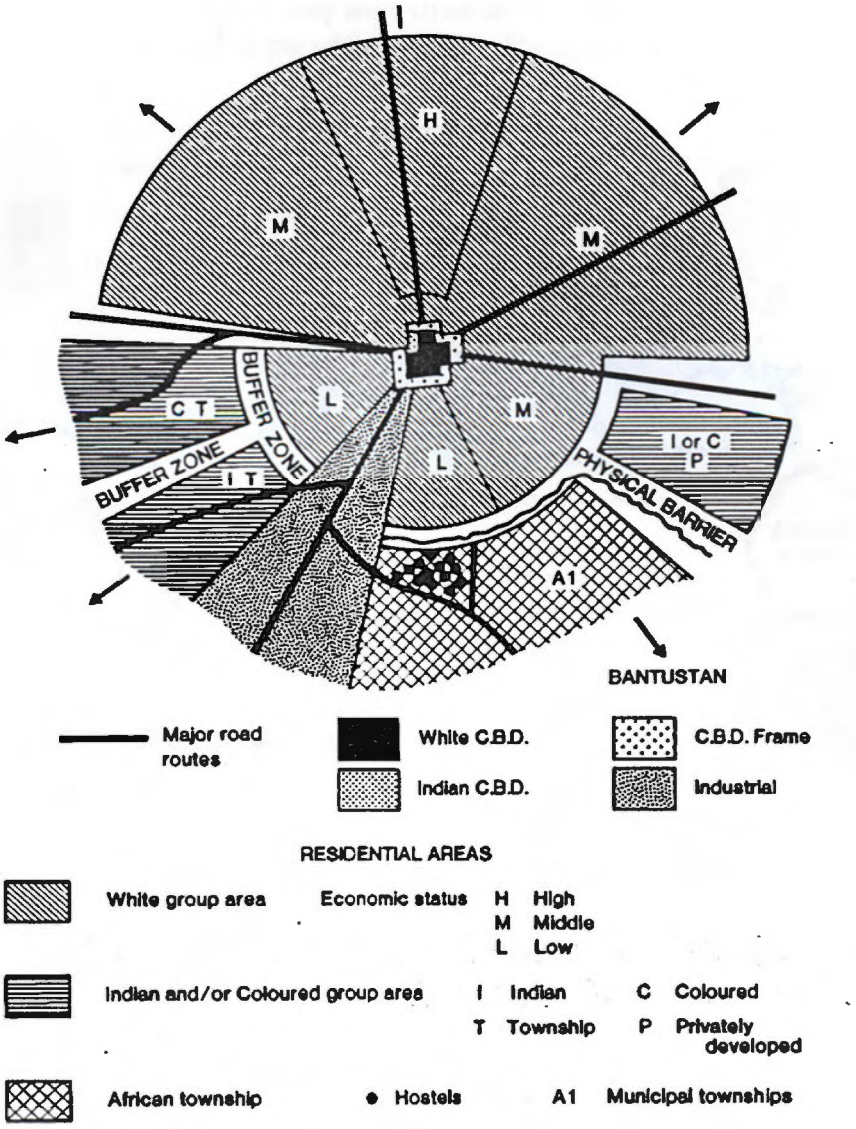


Racial dot map

Map showing the presence of different ethnic groups in Cape Town. (Note: 1 dot represents 10 persons)

- Other
- Asian
- White
- Colored
- Black


2.5km
5km



Apartheid city planning

The end of the British period was haunted by racial attitudes and prejudices. An Afrikaans-dominated government in Pretoria created policies that only further extended and reinforced these problems. Many discriminatory policies benefited white citizens, while others struggled were impoverished by the effects of the Depression. Cape Town became further divided along racial borders. Eventually in 1948, a government was elected committed to a policy of apartheid, a policy of universal segregation, that would ruthlessly categorise and divide the population. All residents soon had to register their race. This particular registration law had destructive effects considering the very mixed heritage of many Capetonians. There were two levels of discrimination, the first called the 'Grand Apartheid' established separate areas and homelands on national, regional and urban levels. The second 'the Petty Apartheid' established the segregation of everyday spaces. The Separate Amenities Act of 1953, included a clause stating that separate

Informal houses in Lotus Park

facilities no longer had to be 'substantially equal', so allowing the government to provide better facilities to whites.

During the Apartheid, further development of Cape Town was conducted with the typical urban apartheid model in mind with a white-only centre, surrounded by contained settlements for the labour forces to the east. Separate townships were established for each of the three designated non-white race groups (black people, coloureds and Indians). Minimal entry points (two or three) to the settlements and a fence enabled the police to control entire neighbourhoods in little time and minimal effort.

"Apartheid may have ended 20 years ago, but here in Cape Town the sense of apartness remains as strong as ever. After decades of enforced segregation, the feeling of division is permanently carved into the city's urban form, the physical legacy of a plan that was calculatedly designed to separate poor blacks from rich whites."[Wainwright, 2014]

Moreover black Africans were prohibited from owning either land or property in the city. They perpetually paid rent for government-built housing, lived in single-sex hostels or illegally built shelters with materials they could find. For a time, Coloureds were allowed to own land and a house, although this was later changed. Indians were allowed to own a house but not the land under it, until this loophole in racial segregation also was closed. Very little housing was built for Africans by the apartheid regime. Only basic shelter was provided in the townships. Typically there were no modern services such as piped water, electricity, mains sewage etc. After the downfall of the Apartheid government everyone is allowed again to live where they want and own property again, but the races of Apartheid are still part of the city.

Gated community in the city

City bowl

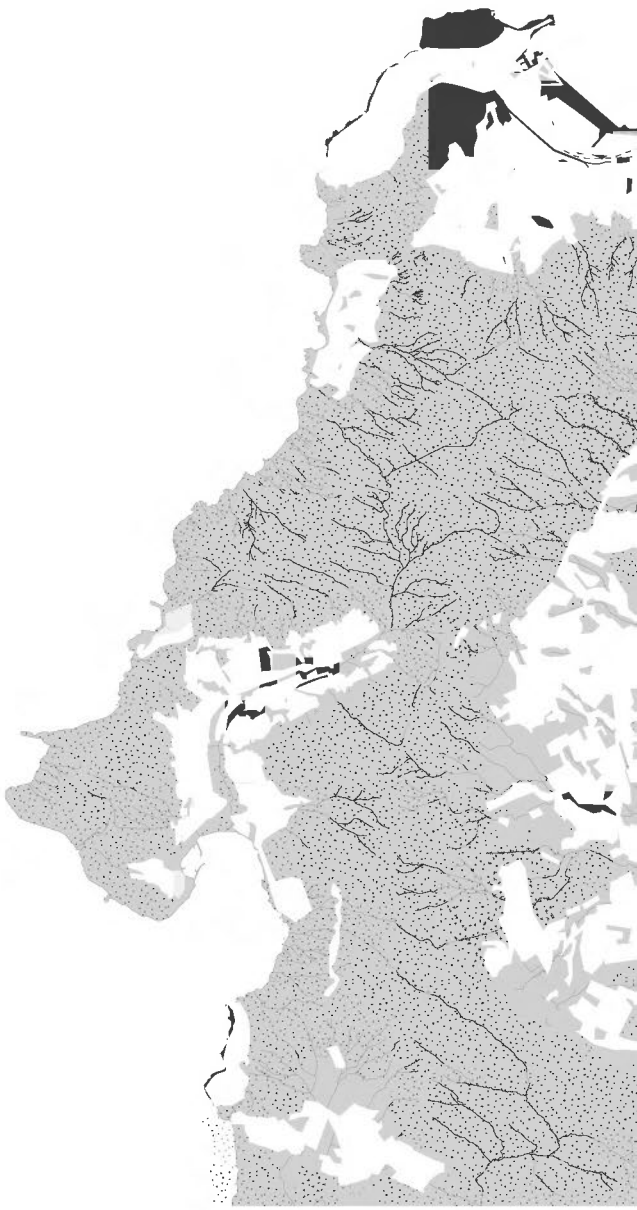
Fenced informal settlement in Khayelitsha

Concrete public toilets in an informal settlement in Khayelitsha

After apartheid, landscape was left with a negative connotation as it was at the same time used as a separating element and was also separated itself.

The planned townships were each not only hemmed in by highways and rail lines but also by rivers and valleys. At the same time protective buffer zones of scrubland separated them from the affluent white suburbs. Both manmade infrastructure and natural landscape features were thus used to create new physical and imaginary barriers, aimed to keep different racial communities isolated. On the other hand each amenity was subjected to racial categorisation. Both public and leisure institutions faced segregation, this included hospitals, law courts, swimming pools and even some cinemas, cafes, hotels and beaches. The finest natural locations were often allocated to the richer white population. Beaches for example were strictly segregated with those offering more facilities, bathing and interest designated 'White only'. Other open spaces in the city were created when people were forced to move to the planned township areas. Entire neighborhoods were destroyed and were replaced by barren wastelands.

Some remain painful scars that remind people of what once was. The clearest example is the empty land of district six close to the historic centre, were a vibrant and diverse community used to live.



Landscape remnants

Map showing the remnants of the landscape in Cape Town.

- Landscape at full power
- Domesticated landscape


2.5km
5km

Finally the once stronger connected natural network was cut into fragmented open spaces across the city. These range from abandoned non-spaces to synthetic parks and hermetically sealed reserves. [Cape Town History and Heritage, n.d.]

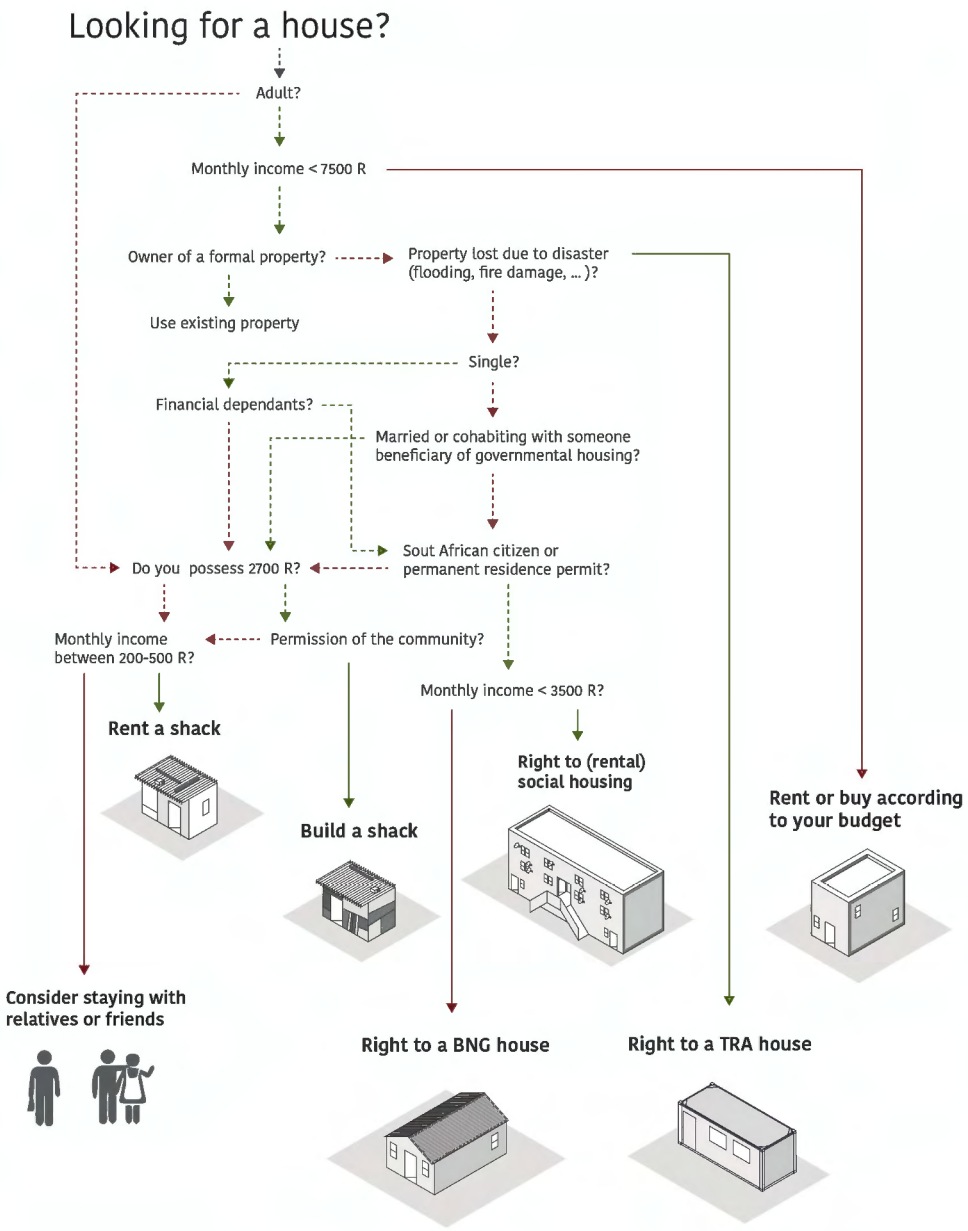
Housing a growing population

South Africa has several national laws that outline the nation's stance on housing provision. Firstly, there is stated in the constitution that "everyone has the right to have access to adequate housing" and it is up to the state to provide this right, within its available resources. The national housing act of 1997 further defines governmental roles, responsibilities and functions for sustainable housing development. Since 2007, a new regulation on minimum physical requirements for standalone dwellings was written down in the National Norms and Standards. Each house must have 40m² of floor space, two bedrooms, a separate bathroom with a toilet, a shower and hand basin, and a combined living area and kitchen. Therefore, the state provides free housing, but also supports different kinds of rental or purchasable housing. This creates several options for people looking to live in South-African cities. The type of house someone can acquire mostly depends on budget and social status.

There are several types of free housing established by the state. The RDP housing project was established by the African National Congress (ANC) government of Nelson Mandela in 1994. Every South African has the right to clean water, electricity, health care, sanitation and access to education. The main goal of RDP housing is to provide such necessities to previously disadvantaged South Africans. It is used to replace shacks for families whose sole provider is unemployed or families who collectively earn less than R3500 per month. Originally these houses were two room brick work structures with corrugated iron roof sheeting of only 16m². Over the years the design of the house improved a lot. Regulations were put into place and the houses had to be extended. The floor area was increased to 40m² with an extra room.

RDP housing is mainly built on the outskirts of cities where large portions of land are available at a lower cost. This can create problems regarding travelling to work and schools or even medical facilities and shops. People are facing many other problems other than obtaining a house. They are not only far from good medical facilities and schools, but they also have to travel great distances to get to work and transport is not cheap. Many citizens are inscribed on waiting lists to receive RDP housing for a long period, some even more than 10 years. Although most of them meet the requirements, the process to receive housing is a very a slow process. A new policy called Breaking New Ground (BNG) was established in 2004 and introduced refinements to the previous RDP model.

While the rental units are being upgraded, residents who are unable to move in with family or friends during the refurbishment will be accommodated in Temporary Accommodation Villages (TAVs) built specifically for this purpose.



Housing scheme based on the laws and principles of the government

New housing development in Langa

The containers used for this purpose are typically 2,4m by 12 m long (=28.8m²), and have insulation, partitions, power, running water, ablution facilities as well as internal and external lighting. The program also supplies temporary assistance to victims of housing related disasters (such as fire and flood damage), and includes the provision of Temporary Resettlement Areas (TRA). Minimum services are provided, along with basic shelters.

Data from various sources indicates that the rental sector is significant, as it accounts for roughly 20% of households in South Africa, with a majority of poor or low-income households. Social housing is rental housing provided by the City for people who earn between R2500 and R7500 per month. These projects are not entirely run by the government but only assisted by the government. These homes, which usually take the form of apartments, are built on City owned land in partnership with the municipality's accredited social housing institutions. As a general rule the rent attaching to various unit types will be based on assumptions about the target market and, more specifically in relation to a proportion of income that can be afforded. Social housing is an initiative that was introduced to focus on low to middle income individuals.

Affordable rental housing is aimed at households earning less than R7,500 per month. At most, households are regarded as being able to allocate a maximum of between a quarter and a third of their incomes to rent, although in reality few pay as much as this. As one would expect, rent paid by households living in informal structures is far lower with the vast majority of shack dwellers paying less than R200 per month.

Backyard structures generally consist of one or two rooms, crudely constructed from wood and corrugated iron. These rooms are used by residents to cook, eat, sleep, wash and live in. The inadequate size and quality of backyard dwellings, paired with the unhealthy living environments associated with these structures, make backyard dwellings comparable to living in informal structures in informal settlements. Yet the Social Housing Foundation (2008:3) states that in general, backyard settlers enjoy better access to services than those in informal settlements, due to their location within formally serviced townships.
For the middle class and upper class. Large price range dependable on the location and type of housing: flats, hostel, house, student housing, simplex/duplex/semi-detached/ cluster house, old age home/retirement village/units…

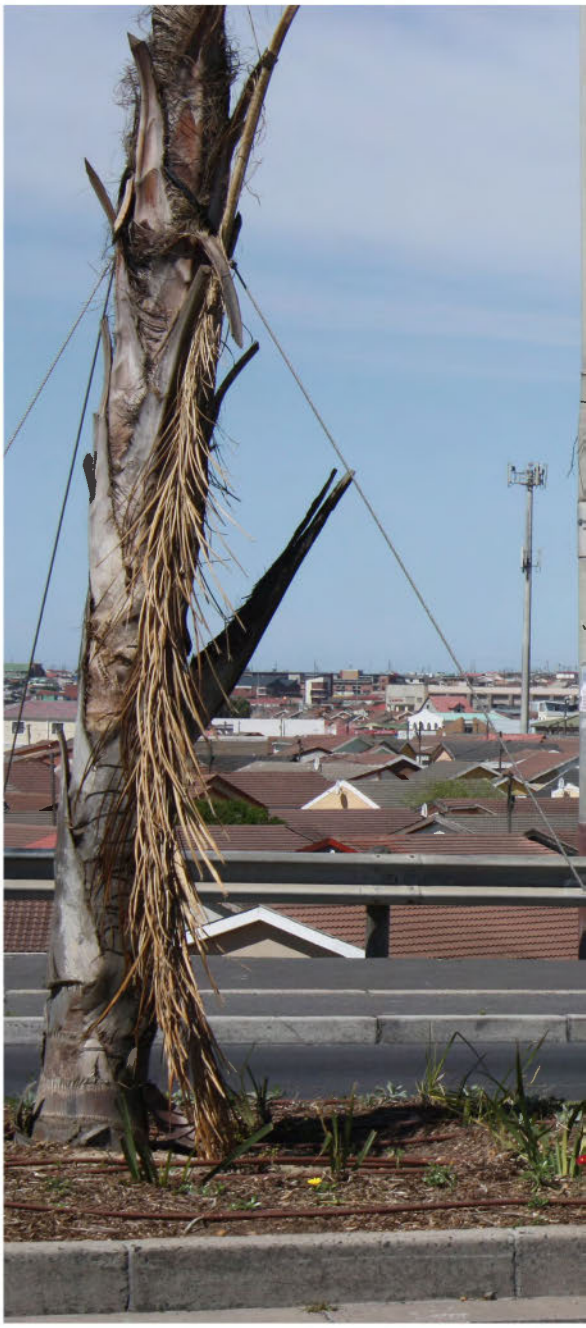
The affordable housing market in South Africa is defined as households earning between R3 500 and R25 000. This market accounts for about 32% of the entire home loan market, requiring cost effective, good quality housing up to R600 000. GAP houses are implemented by private developers, and cater for families earning between R 3 500 and R 10 000 per month. Young couples who don't qualify for RDP housing can qualify for hundreds of 'gap housing' units being developed by the City of Cape Town and Nedbank. Approval from the authorities must be obtained before construction on site can begin.

Once an agreement is in place, a strong informal housing market starts to develop, with community members selling stands and shacks to each other, using the security of informal documentation supplied by the community committee. Land values for owned but unoccupied stands rise significantly, even for shack areas lacking infrastructure delivery or formal tenure security.

Urban sprawl in Cape Town is a major problem.
They often reduce urban efficiency, increase costs of services and result in the loss of agricultural, conservation and recreation worthy land. Moreover most housing projects result in low density urban tissue.

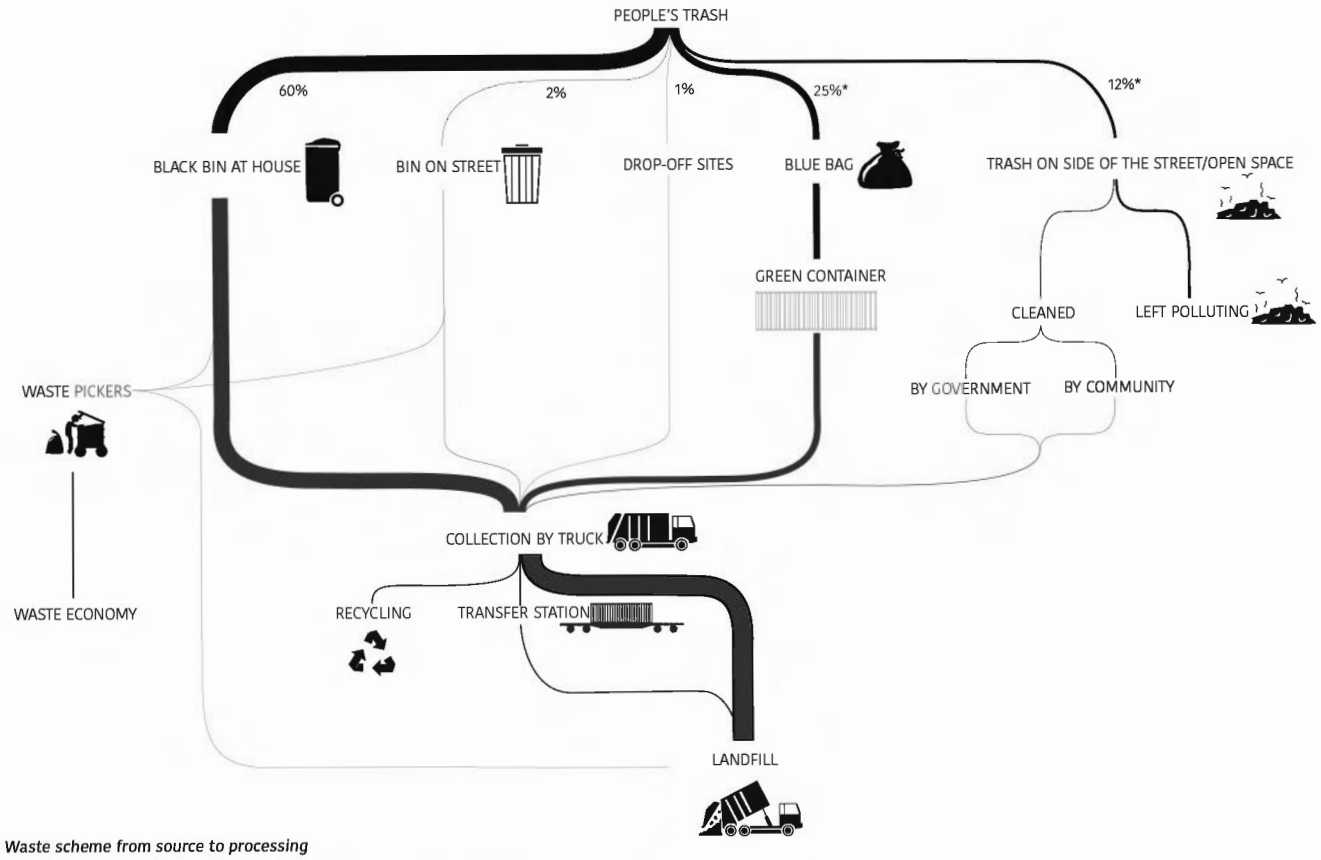
Formal housing developments and informal settlements have spread out across the city. Both are threatening the last open spaces in the city.

The density of housing in the City is now actually even lower today than it was in the 1930s. This makes Cape Town the second-least dense city of 15 major African cities, according to the African Green Cities index. It has approximately a density of 1,500 people per square kilometer, compared to the average of 4,600. Like other cities growing horizontally, it too is struggling to deal with increasing urban populations and will probably not be sustainable on the long term. Horizontal densification leads to new challenges linked to congestion, infrastructure, pollution and social disaggregation. [Doig, 2013]



Homogenous tissue of single-story housing in Khayelitsha

Homogenous tissue of single-story housing in Khayelitsha



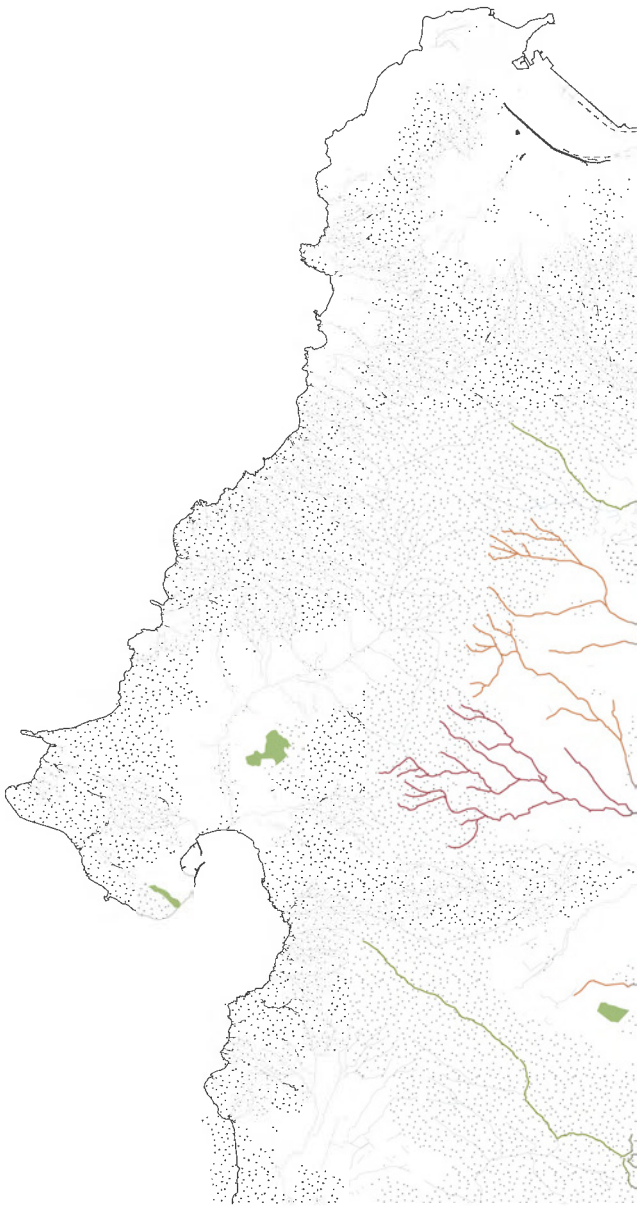
Waste scheme from source to processing

Dealing with diverse waste flows

The huge differences in living conditions in the city result in a diversified waste collection system that differs from municipality to municipality. Developing area-specific solutions to municipal solid waste management is thus crucial. Formal settlements are equipped with a black bin system to collect household waste. Informal settlements on the other hand make use of different colored plastic bags, that are brought together in green containers. Very often household waste is partially picked up by informal waste pickers who search it for valuable items to resell. Privately owned organizations bring their waste to waste drop off points. All the collected waste is then crushed and compacted in waste refusal points before it is brought to landfills within the city borders. [Henry et al., 2006; Wilson et al., 2006]

As Cape Town's population grows so does the size of its landfills and this forces the city to look out for new landfill locations or better alternatives. Most of the waste eventually ends up here, but there is also a significant amount of solid waste that litters the city's open spaces. This is typically caused by flaws in the waste collection systems: lack of garbage bags or bins, infrequent waste collection, impractical positions of green containers... Another big problem is that the different types of waste are not sorted out and that only a very small amount of garbage gets recycled. Very often in low and middle-income countries informal solid waste collection systems are better in valorizing waste. This garbage heavily pollutes the water and soil quality of the city's natural landscape.

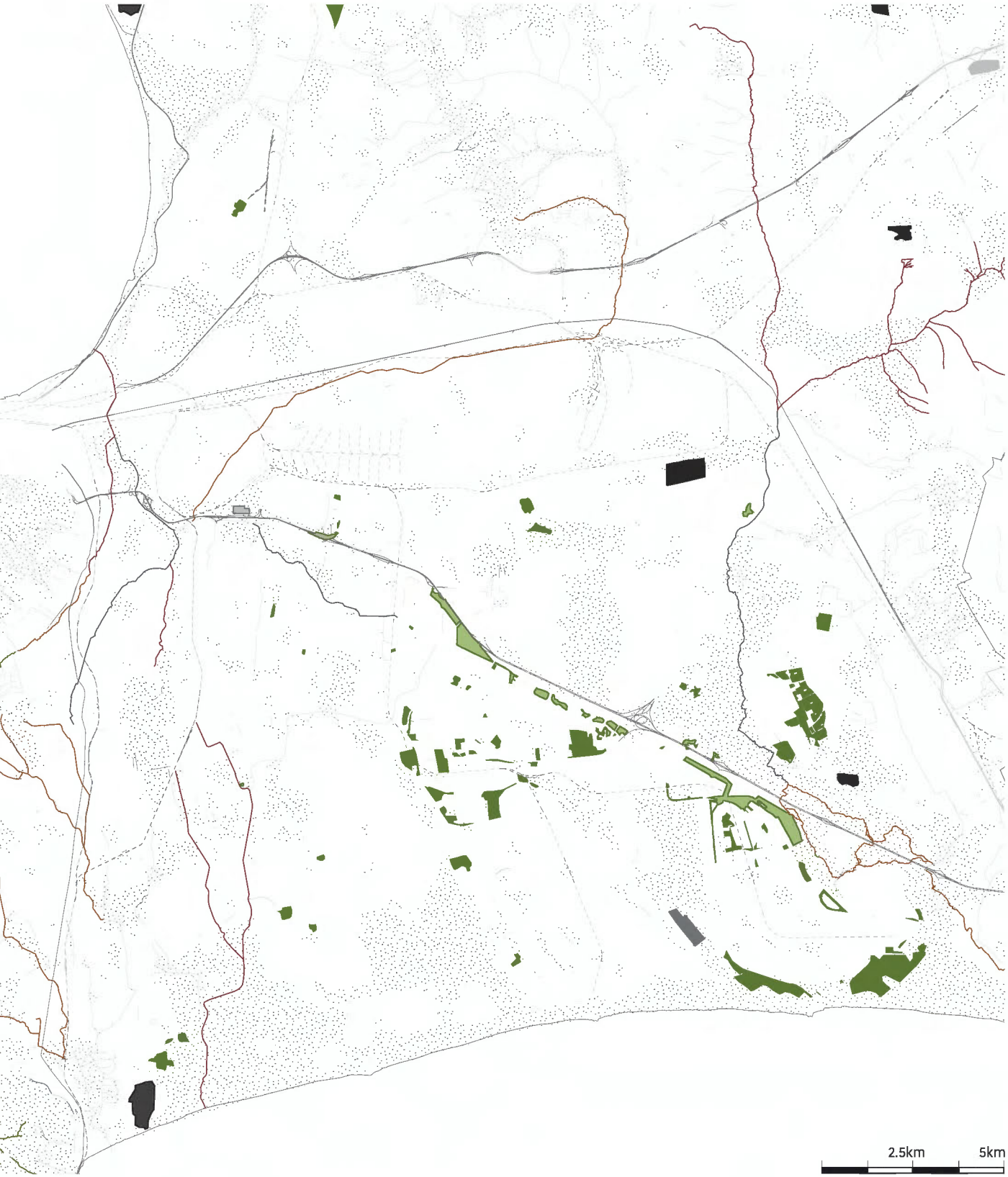
Waste picker in Lotus Park



Wastemap

Map showing the river water quality related to landfill sites and informal waste containers

- Good water quality
- Fair water quality
- Bad water quality
- Very bad water quality
- Current landfill
- Historic landfill
- Informal waste containers


2.5km
5km

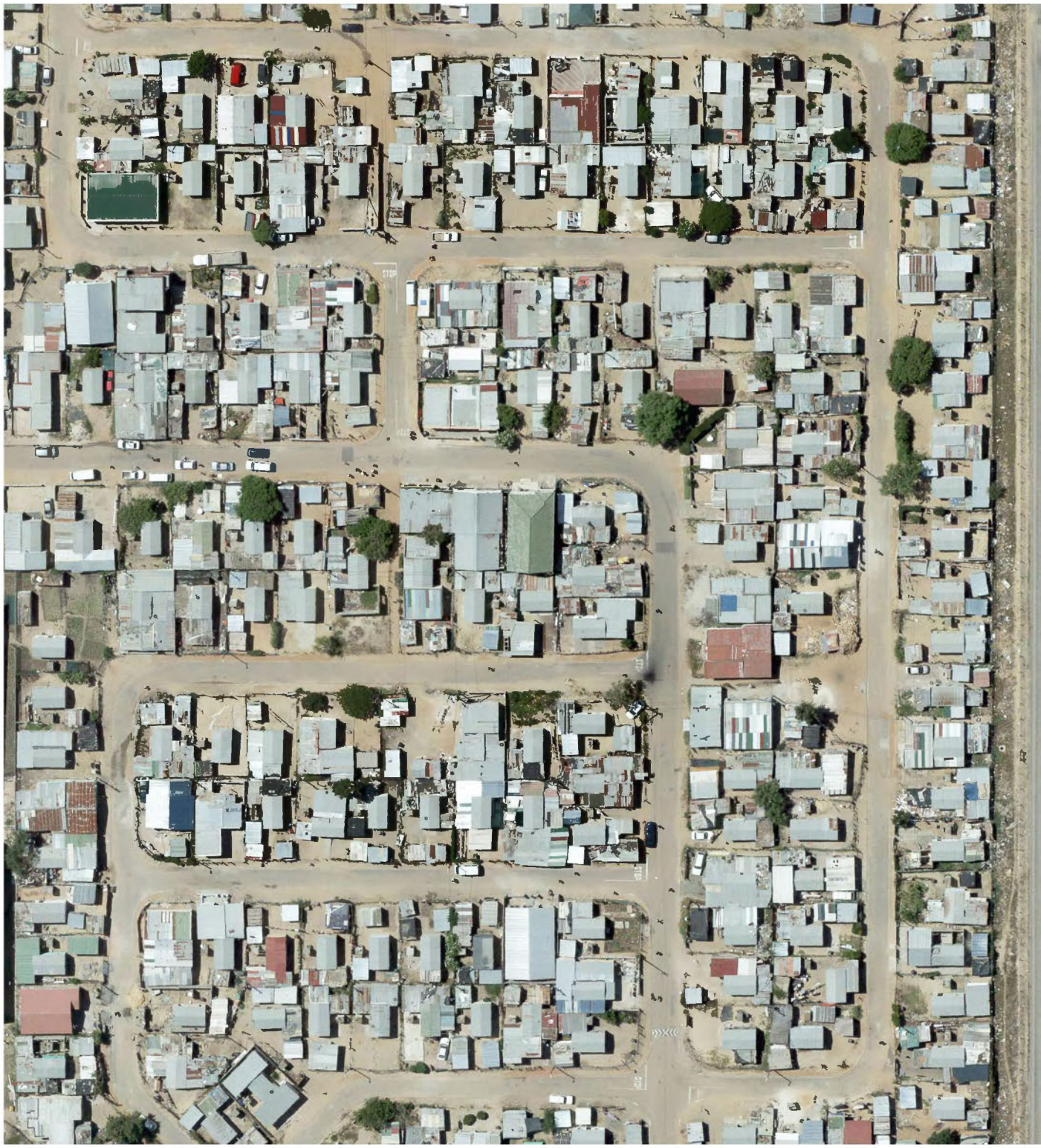
Trucks queuing at the Coastal Park landfill

domesticated landscape

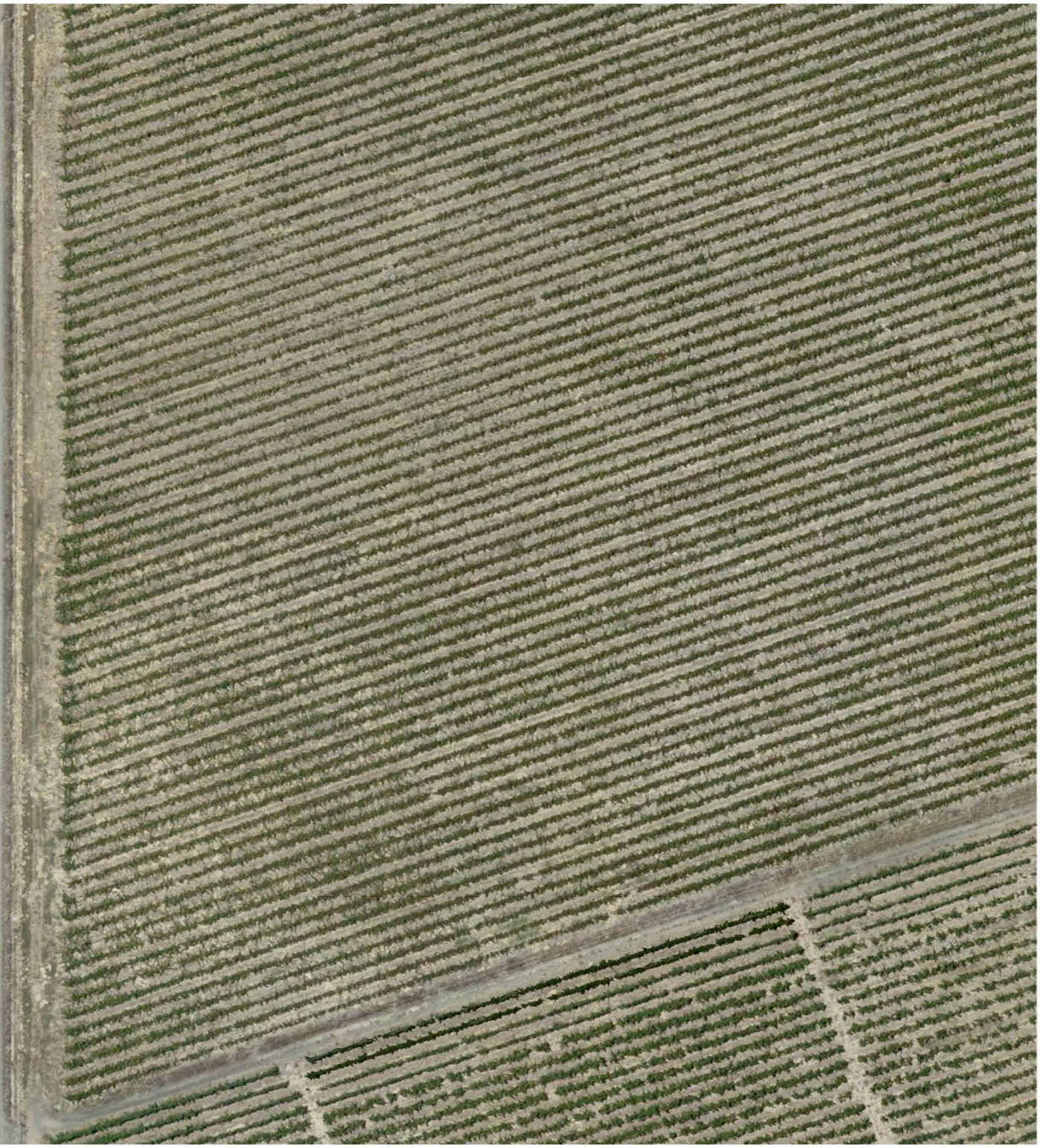
urbanity domesticating

"I feel like you don't accept me the way I am. I am imprisoned and tamed, for you adapt me to your needs and wishes. By changing my template, you alter the fluxes and streams that are essential to my existence. I feed you, but you never have enough. "

" I need you, but sometimes there is too much of you and other times there is not enough. You never are at the right place, at the right time. Yes, I adjust and change you, but this is the only way I see to survive."



Contrast between tissue and domesticated landscape



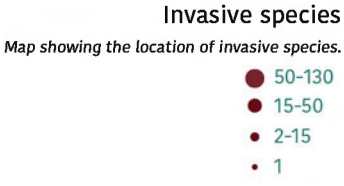
Mouth of the Rietvlei estuary

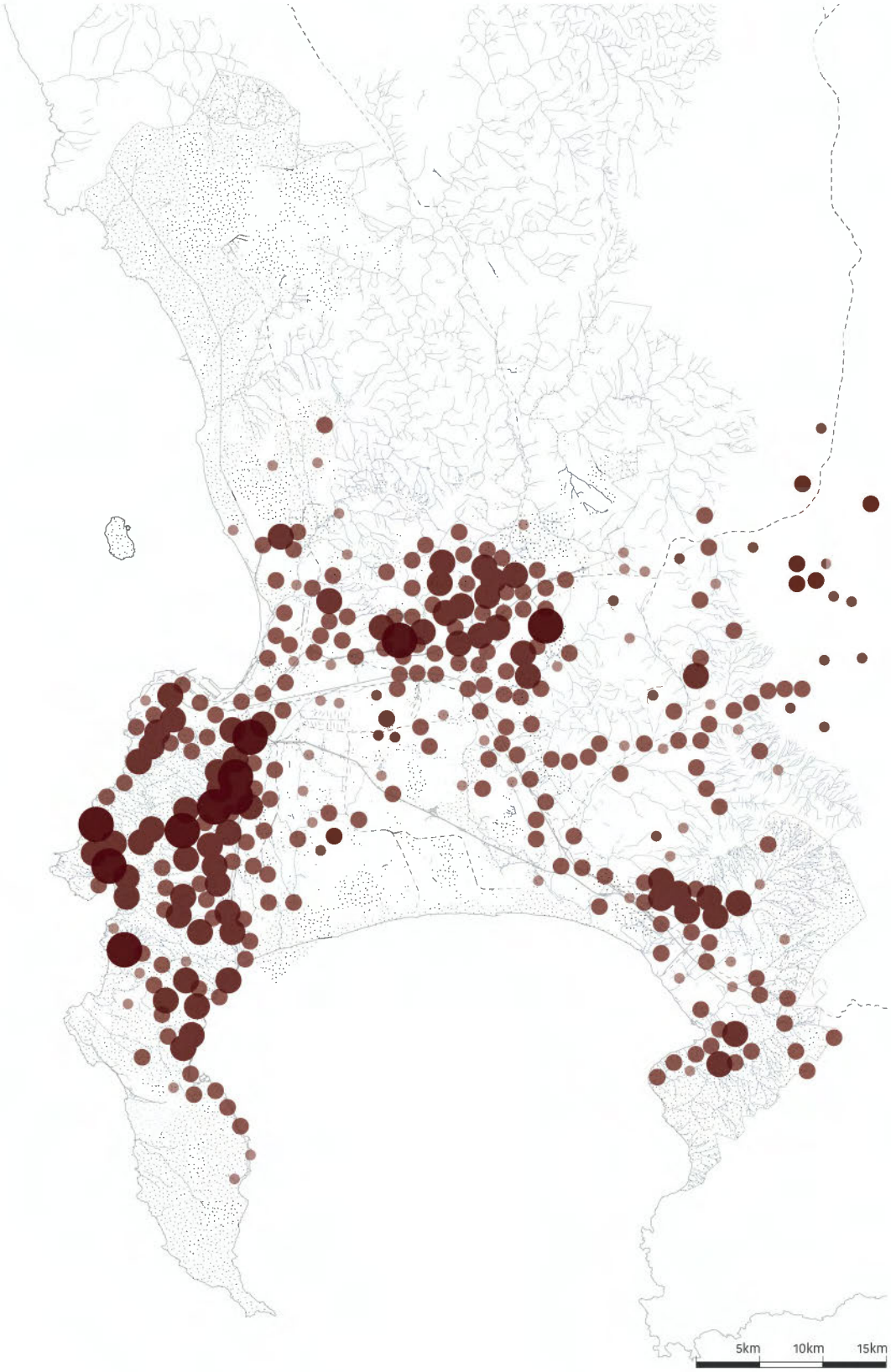
Foreign species replacing traditional practices

Throughout history, people have introduced many plant and animal species to the Cape from everywhere in the world to use for food crops, timber, hedge plants, dune stabilisation and horticulture. Thousands of alien plants have been imported through trade, transport, travel and tourism, often this happened consciously, but sometimes travellers imported species without realising it.

These invasive species often had a negative impact on the local ecosystems. They are called invasive because they tend to become problematic in areas where they would never have occurred naturally. As they have no natural enemies, they are able to reproduce rapidly and degrade the local ecosystem by out-competing the indigenous fauna and flora.

Invasive plants have a negative impact on the water system; they block up rivers, stop the flow of water and can even entirely dry up a water system. Weeds threaten the health and functioning of the rivers and vleis of Cape Town. [Dunn, 2010; Enviroworks, 2012]




5km
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15km

When they are allowed to multiply, alien plants can cause more frequent water shortages and higher water costs. The water supply in the mountain catchments is threatened by woody invasive plants such as the pine and black wattle. In 2011, the water loss due to alien plants was estimated at R6.5 billion each year. Without interventions this loss would have been R41.7 billion. Alien trees result in a water loss in the mountain catchment areas of 4%, which in the future would rise to 16% if there is nothing done about it.

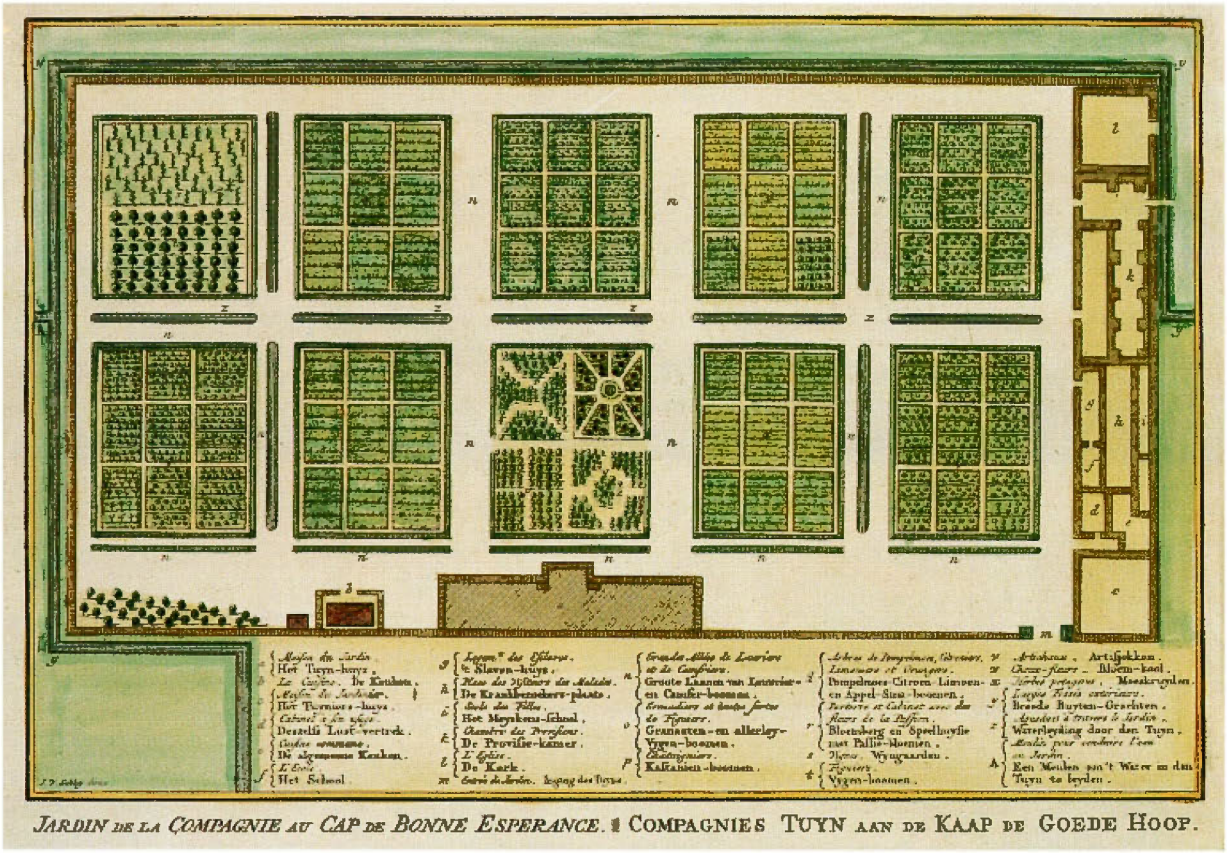
The rise of invasive plants and animals affect the existing species. The invasive Lantana Camara for example destroys understory species and poisons cattle. The Indian house cow carries diseases and transmits them to humans. The water hyacinth creates an ideal breeding habitat for mosquitos and snails that spread parasites. A large share of the unique fynbos species have become extinct due to invasive species. The forests of invasive plants that have started to replace them burn more intensely and hotter than the traditional fynbos vegetation and therefore pose a huge risk.

The city started to manage invasive species with various strategies, including the prevention, early detection and rapid response, containment, control and eradication of invasive species, as well as restoration of affected areas. Mostly to stop the threat invasive species pose to food availability and production costs. For prevention public awareness and education are very important. The city has turned the threat of invasive species into an opportunity by creating local jobs through invasive species management. [Enviroworks, 2012]

The aboriginal people of the Cape region are collectively known as the Khoisan, which denotes the combination of the Khoikhoi-people with the San-people. Khoekhoen, Kwena or simply Khoi – can be translated as "the real people" or "men of men", meaning "we people with domestic animals". The Khoikhoi are also responsible for the name we use to refer to the San people and this term signifies "the other people" or "those who are different from us". The two groups are often named together as they have similar physical and putative linguistic characteristics that distinct them from the Bantu majority, a clear example is their click language. [South African History Online, 2011]

The Khoisan were the original inhabitants of the Cape region. Thanks to the abundance of natural resources the San originally sustained a hunter-gatherer lifestyle on the rhythm of the local ecological systems. Safe for their rock paintings, they left little traces in the landscape. During the late stone age the Khoikhoi herders migrated southward into the western half of South Africa, settled on the land formerly occupied by the San and brought sheep and cattle into the region. "Although they appear to have developed a symbiotic relationship with the hunter-gatherers, they converted individuals to herding, and therefore weakened hunter-gatherer social cohesion." [South African History Online, 2011] Hereby, not only the cultural activities of the San declined, but also their population size.

According to archaeological evidence, eventually larger Bantu-speaking groups migrated from the Great Lakes in the east to South Africa as early as the 11th century.



The original plan of the British East India Company Garden in Cape Town.

Slowly, they moved westwards in groups and they destroyed, incorporated or drove off the Khoisan people. The language of a certain group of Bantu farmers got influenced by the Khoisan vocabulary and adopted their distinctive 'click' sounds. By the mid-17th century, the Bantu-speaking groups were well established in South Africa. They gradually occupied much of the east South African territory. [South African History Online, 2011]

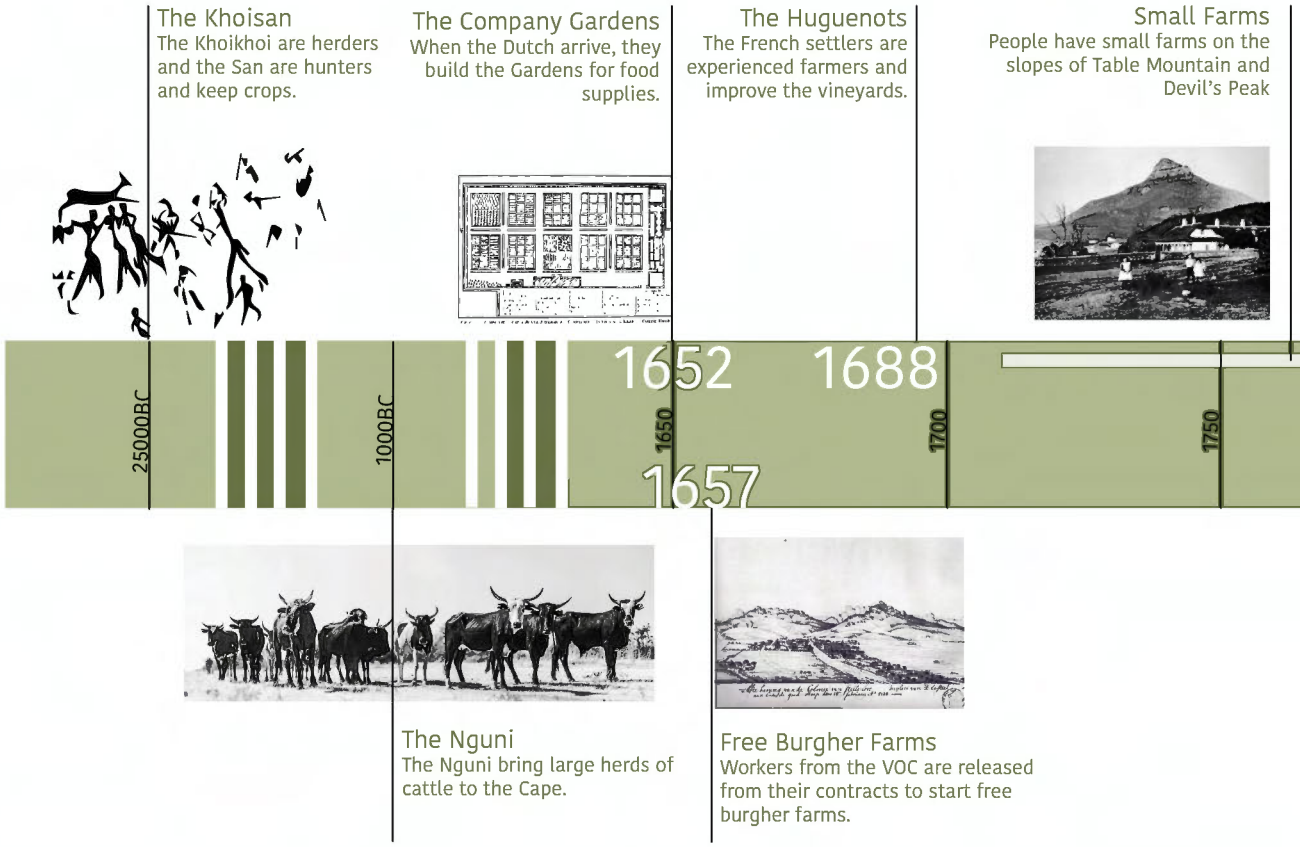
One of these groups of farmers were the Nguni, who are the ancestors of the current Xhosa speaking population. "The Cape Nguni of long ago were cattle farmers. They took great care of their cattle because they were a symbol of wealth, status, and respect. Cattle were used to determine the price of a bride, or lobola, and they were the most acceptable offerings to the ancestral spirits. They also kept dogs, goats and later, horses, sheep, pigs and poultry. Their chief crops were millet, maize, kidney beans, pumpkins, and watermelons. By the eighteenth century they were also growing tobacco and hemp." (Xhosa, Article at everyculture.com)

Its reputation for the fierceness of the seas, Cape's Khoe inhabitants and the ebb and flow of European politics, kept the Cape isolated for long. When European settlers did arrive, this meant the beginning of the end for the San culture.

Eventually the Dutch - from the "Verenigde Oost-Indische Companie" build the first permanent settlement in Table bay. They choose this location because it was more easy to find fresh water here, compared to other local areas. [Dunn, 2010]

The Dutch settlers were permitted to own land, build farms and improve food supply. What started as a friendly cohabitation became a struggle between the different races.

Informal cattle farm in Kuils River: cows are being bred to sell for the lobola ritual of the Xhosa people.



Agriculture timeline

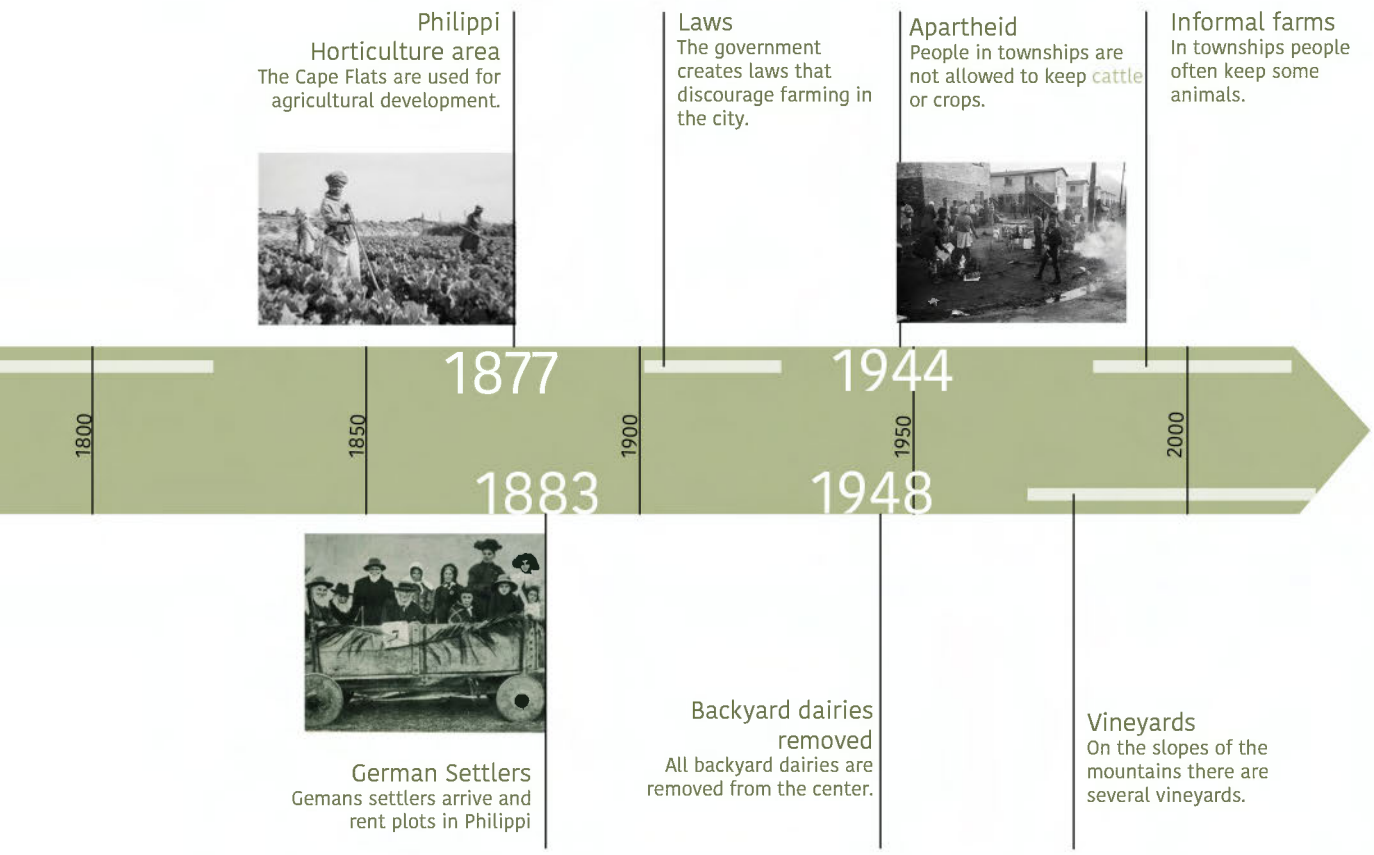
The Dutch settlers conquered the land of the Khoisan and later also the land of the Xhosa. In 1652 Jan van Riebeeck, a Dutch colonial administrator created the company Gardens to grow vegetables and fruits for passing ships.

The friction between the new settlers and the more indigenous groups was not based on race, but on the struggle for drinking water, grazing and living space.

There was an increasing need for supplies, unfavourable climate conditions and an uneasy relation with the Khoisan in 1657. Therefore workers from the VOC were released from their contracts to start free burgher farms. They were provided with tools, seeds and loans to start farming and only them were allowed to farm privately. The farmers were permitted to keep livestock in addition to vegetables, but were ordered to sell everything to the VOC.

When French protestants (the Huguenots) fled to South Africa, they immigrated to the Cape as they were encouraged by the VOC, because they were experienced farmers. "They were particularly experienced in viticulture and oenology (the growing of grapes and making of wine, brandy and vinegar)."[SA history] They were given farmlands among the Dutch farmers. The settlers wanted cheap labour for the provision of livestock and therefore used African slaves. (Dunn, 2010)

During the period of jan Van Riebeeck, a lot of vegetables and herbs were imported (carrots, corn, wheat, cabbage, peas, cauliflower, lettuce, asparagus, barley, beans, radishes, spinach, turnips, herbs) and even a vineyard



and orchard were planted. At that time the invasion of alien species began. When the free burghers started to clear vegetation for fields, burned it for grazing and harvested trees and bushes for firewood and thatching, changes in the landscape started to become more apparent.

The arrival of the French Huguenots was an extra drive for the transformation of the natural landscape into domesticated agricultural land.

Small vegetable and livestock farms were concentrated on the slopes of Devil's peak and Table mountain. People had homes with vegetable gardens, stables and a few cows. In the late 1800s the government decided the Cape Flats were to be used for Agricultural development. The Philippi Horticulture Area then emerged, because it was the most fertile land in the area. When later the German sailors arrived, they could rent plots in Philippi with vegetable farms. The area started to consist of farming communities.

In the early 1900's, authorities no longer supported agriculture for health reasons. They made laws for keeping livestock that discouraged the farmers, with strict controls and standards for hygiene and the number of animals that were allowed to be kept.

All backyard dairies were removed from the areas near the centre and a licence became obligated. Black, coloured and white households practiced small scale urban farming in the southern parts of the Cape Flats outside of the city centre. When black, Indian and coloured people were forced to

move into townships during apartheid, they were no longer allowed to keep animals and vegetables. A lot of them used to be self-sufficient farmers.

The government had a vision of the city that excluded agriculture.

Today a lot of people keep chickens, cows, goats, sheep and pigs in their backyards on the Cape Flats. Although it originated there, agriculture has almost entirely disappeared from the city centre. The only remnants are some vineyards on the slopes of the mountains. Philippi is still the main agricultural area in Cape Town, but the farms are slowly disappearing. Vandalism is a big issue; crops get stolen from the field. As more profitable ways of land use arise, a lot of the farmers have given up on agriculture.

Food insecurity is a big issue in Cape Town, but is mainly caused by uneven access and not inadequate production.

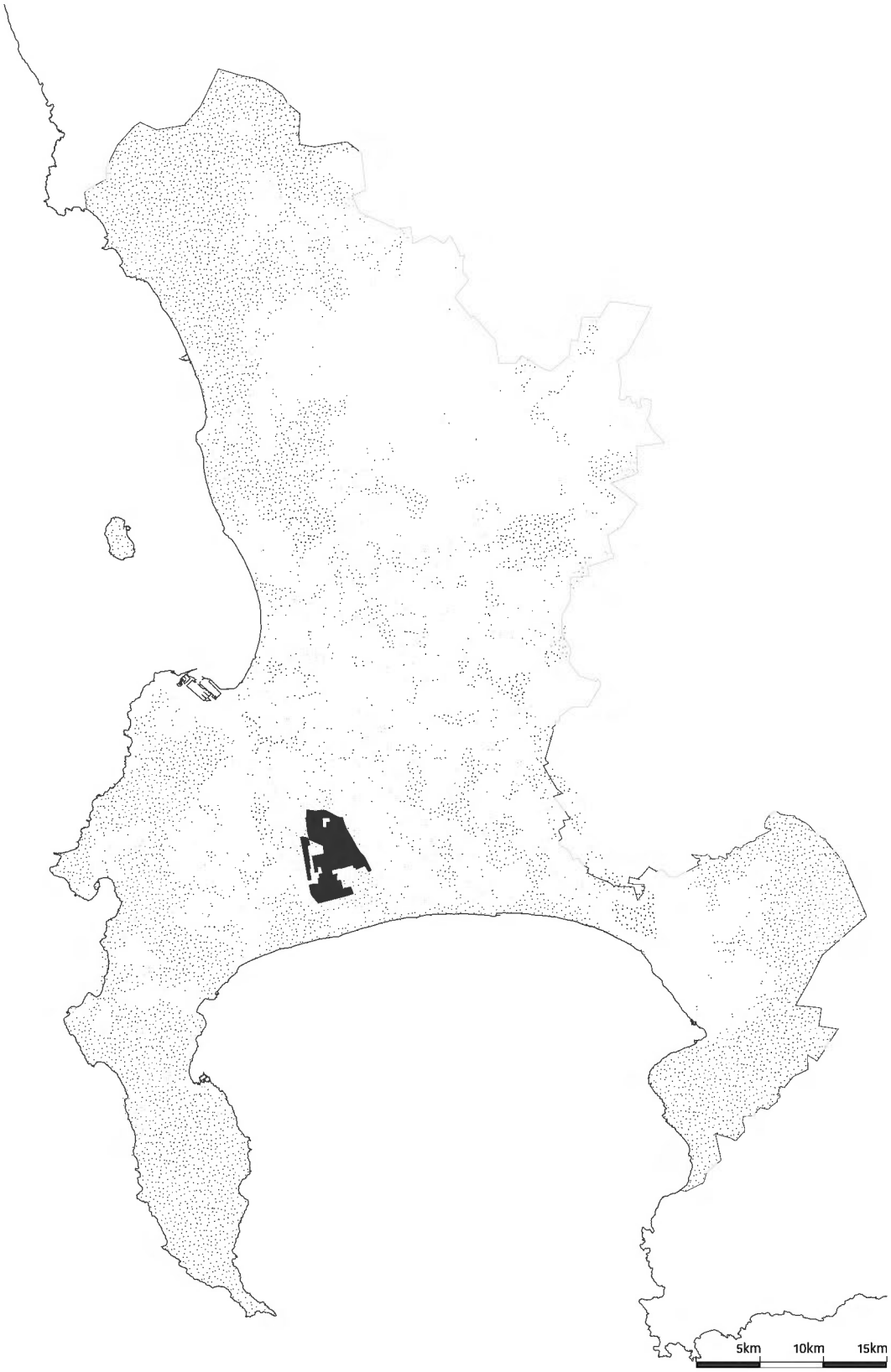
The problem lies in the low income of a lot of people in the Cape Flats. They cannot afford to buy food on the formal market, and therefore they are dependent on the informal market. Not many citizens grow their own vegetables in Cape Town. This has several reasons of which the local mentality and the unfertile sandy soil of the Cape Flats are important aspects. (Dunn, 2010)

From Fresh River to Foul Sewer

Table Mountain is the source of countless streams and springs. Some small seasonal streams and four perennial streams flow into Table Valley, namely the Zwaartrivier, Third stream, Molenwater and the Platteklip Stream. The Platteklip Stream was a dominant feature when the first Europeans reached the Table Valley and it was the ideal source of fresh water for passing sailers. It was named the Varsche (Fresh) River by the Dutch settlers and became the centre of Cape Town's existence for almost 200 years. [Brown et al., 2009]

A system of irrigation furrows was created from the Varsche River and other streams to establish the Company Gardens. Later the furrows were widened and deepened and got the status of canals (locally also called grachts). The main one was called the Heerengracht and was the source of drinking water for passing ships, the 'Caabse Vlek' village and the new settlements. The former Varsche river became a canal lined with stonework and bridges. Channels were used for both water supply and drainage, and typically flanked the streets.

Philippi horticultural area


5km
10km
15km

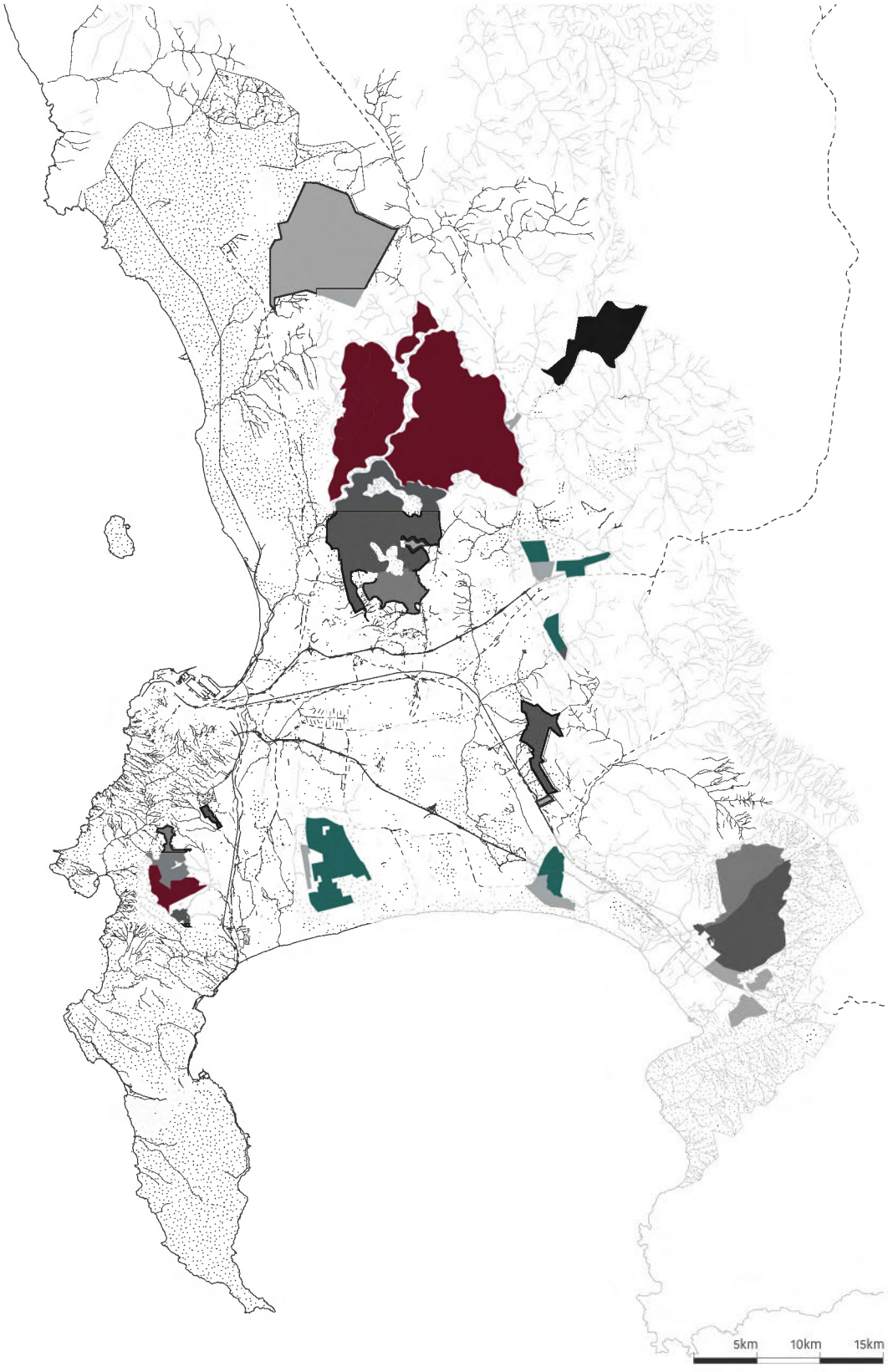
In townships community garden projects start to arise.

In townships community garden projects start to arise.

Agriculture

Map showing the value and potential of agricultural land in Cape Town.

- Significant value and used
- Significant value and potential use
- High potential, unique, long term protection worthy
- High potential, unique, statutory protection worthy


5km
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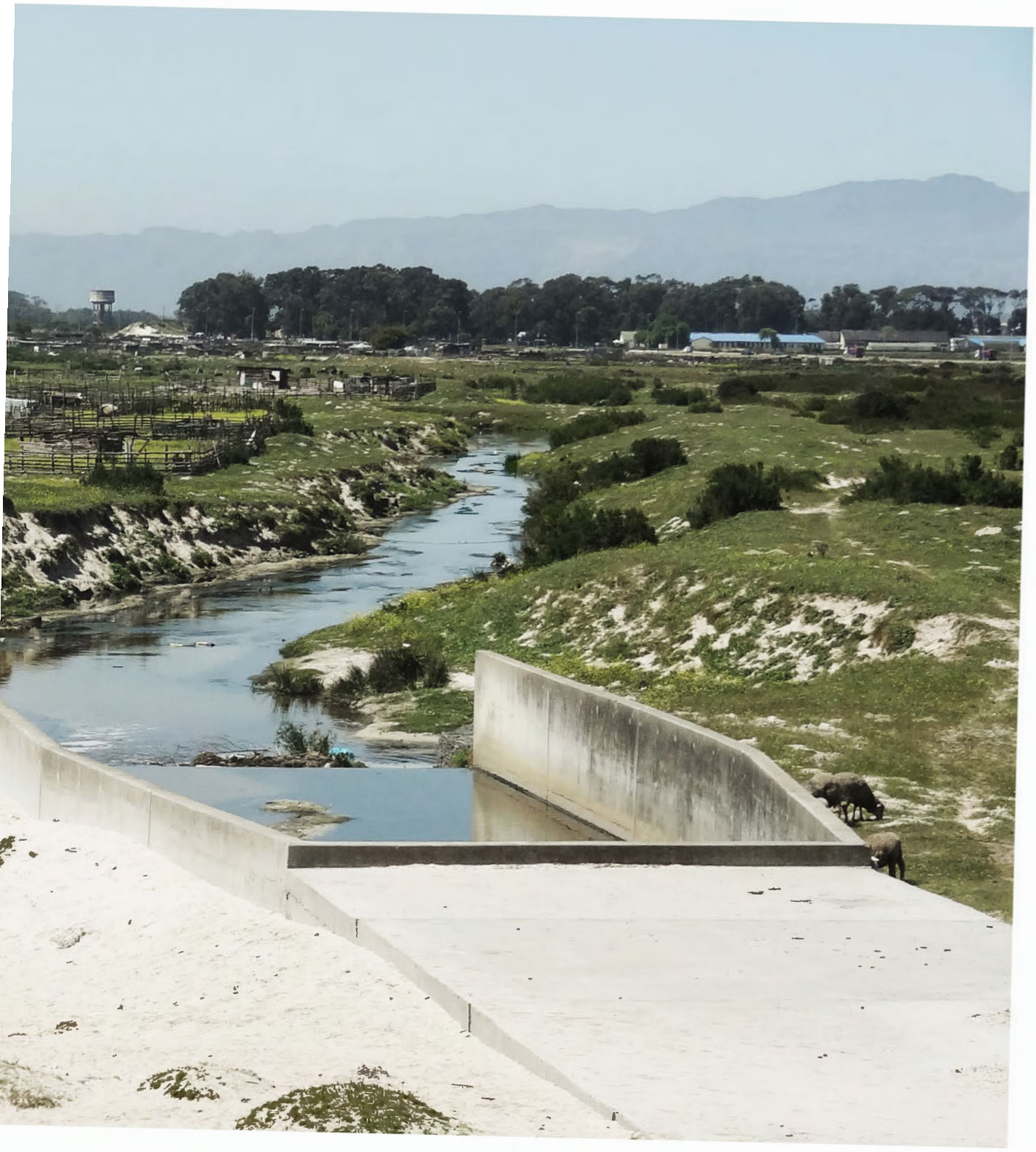
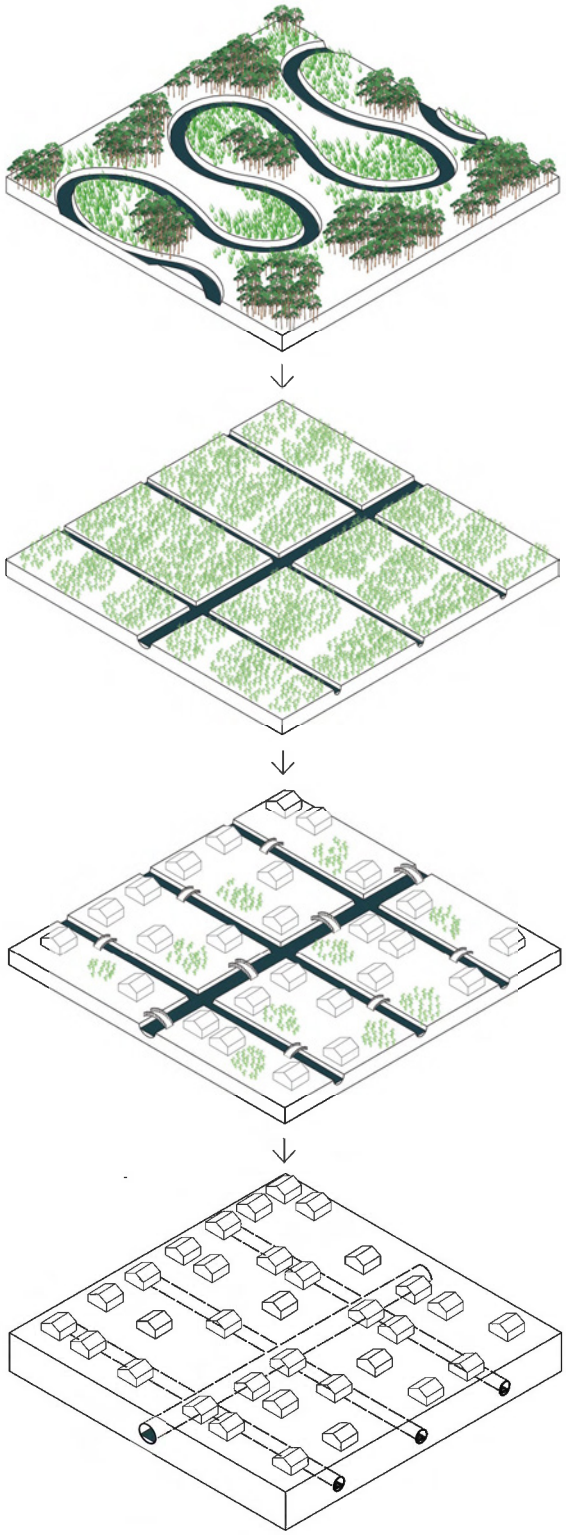
Informal cattle farm in Kuils River: cows are being bred to sell for the lobola ritual of the Xhosa people.





Axonometric evolution of the Varsche River

With time the water of the canals became unfit for consumption because polluted stormwater and untreated waste water from the buildings entered the system. The watercourses of the city had become foul sewers, Cape Town was in a shocking state. In 1863 the entire canal system was covered over with stone or brick barrel arches because of the pollution (night soils were disposed into them) and people fell into them at night. The covered grachts released stinking gases because they accumulated waste.
Through the Heerengracht drain, Cape Town discharged sewage into the sea for many years. In the late 1800s, the authorities finally installed water-borne sewage throughout the city.

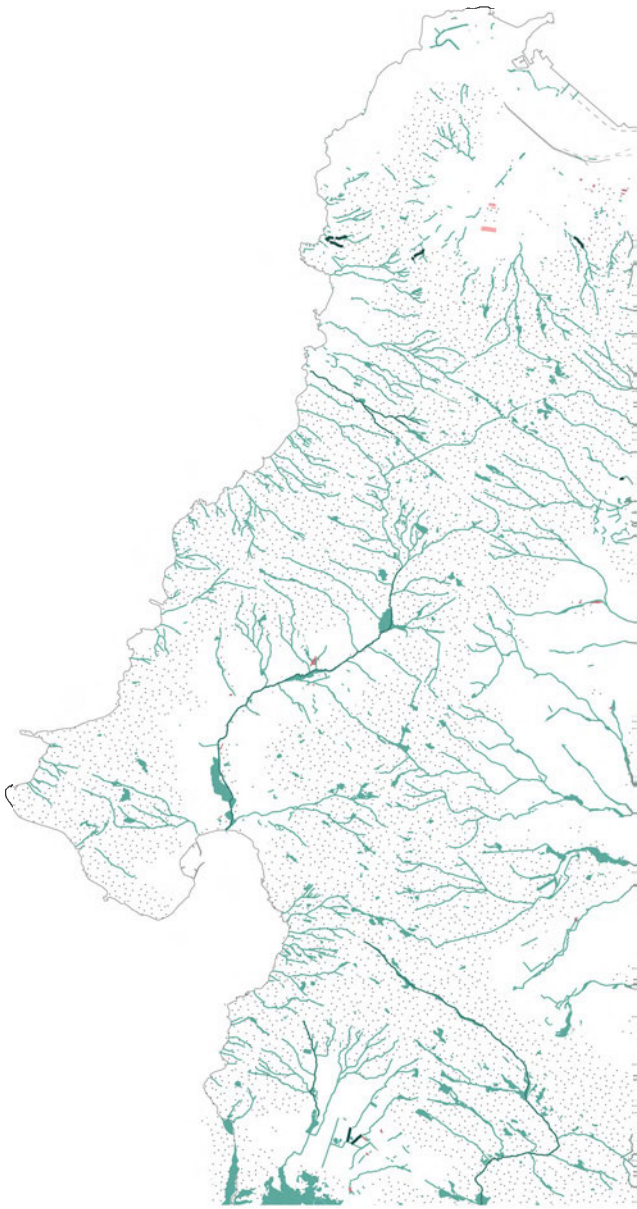
The beautiful rivers coming off the Table mountain became underground stormwater drains that until now discharge the fresh water from Table Mountain into the sea. In the urban areas of Cape Town, stormwater drainage still flanks the streets.
The domestication of the water system has had an impact on the water quality and chemistry.

Many rivers and vleis have become contaminated by stormwater, sewage and waste from (in)formal settlements. Stormwater runoff from agricultural and (sub)urban land contains all kinds of chemicals: nutrients, heavy metals, bacteria, herbicides, antibiotics, viruses and other toxins. When this water enters the natural system it alters the nature of the water and changes the natural assemblage of fauna and flora. Therefore detention ponds should be used that hold stormwater for a longer period so sedimental particles and pollutants can settle out.

"When urbanisation arrives, pollution follows." [Brown et al., 2009; p58]

Today the sewerage of Cape Town consists of several waste water treatment works, sea outfalls and major interceptor sewers. Not much of the treated waste water is re-used, only the water from the Potsdam waste water treatment works is used for agricultural purposes and industry. Some golf and sport facilities are also irrigated with treated effluent. [Brown et al., 2009]

Rivers are contaminated by effluent from the waste water treatment works. Leakages from pipelines or sceptic tanks and runoff from informal latrines also affect many rivers in Cape Town. For example, the Zeekoe Outlet Canal is polluted by the Cape Flats Waste water Treatment Plant.

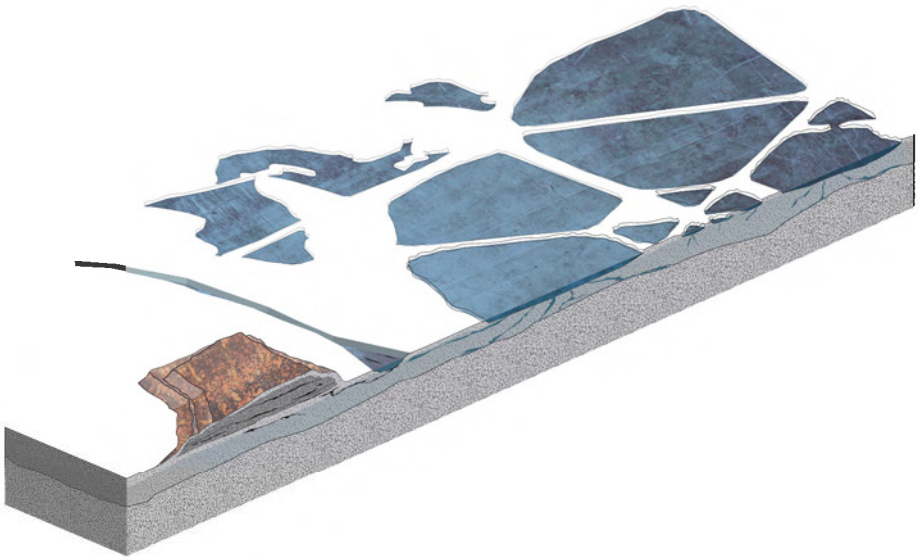


Watercourses and -bodies

Map showing the wide variety of watercourses and -bodies found in Cape Town.

- Canals
- Rivers
- Tributaries
- Open water reservoir
- WWT pond
- Stormwater depression
- Natural wetlands


2.5km
5km



Pollution of the Zeekoe outlet by the Coastal Park landfill on the left and the (still polluted) water of the waste water treatment on the right.

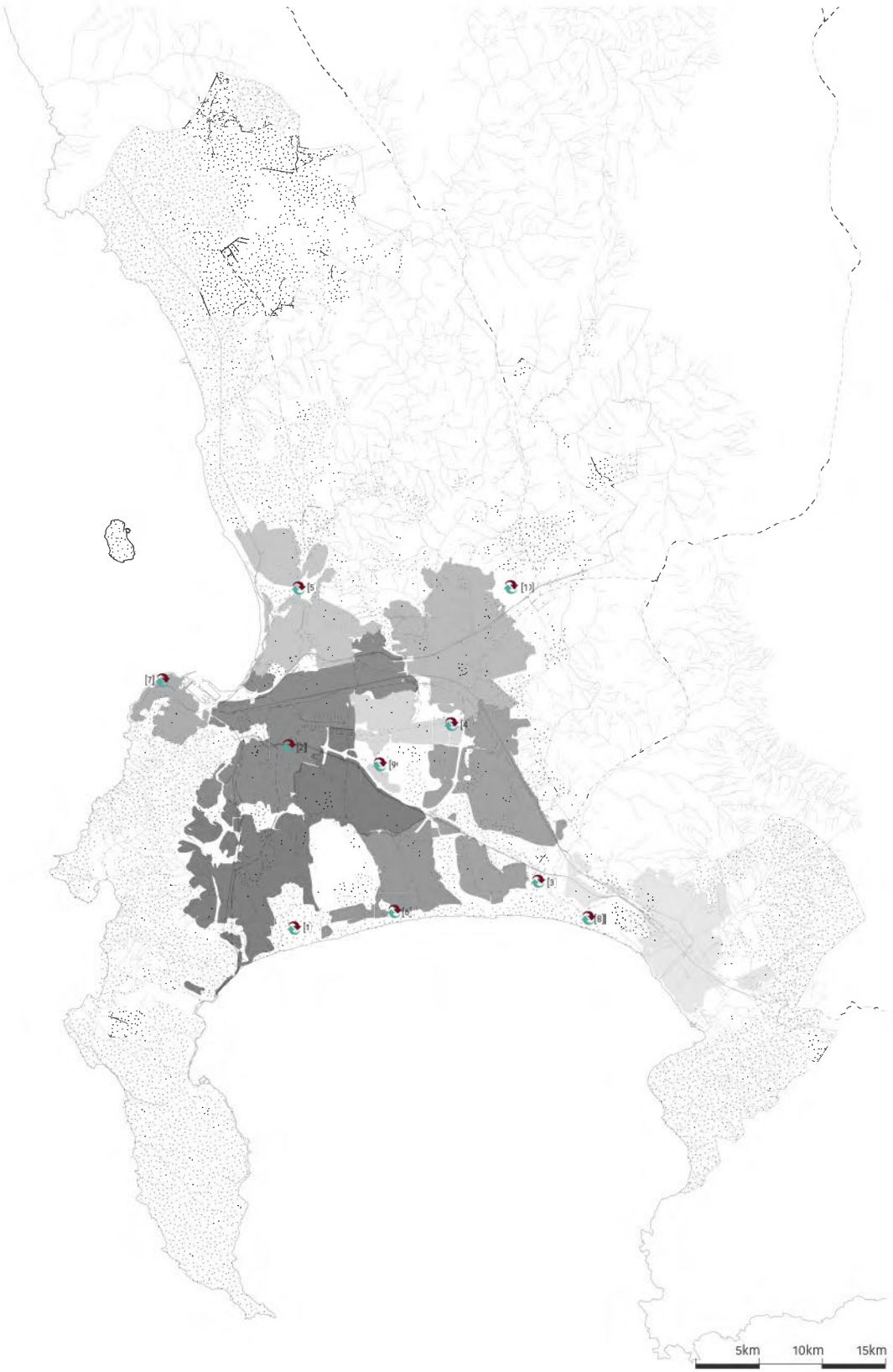
Draining water to expand the city

Cape Town is richly blessed with rivers, small shallow lakes and wetlands (locally also called vleis). People changed the natural water flow by drainage, filling depressions with sand, and thereby isolating the remaining water bodies. Because sand dunes shift quickly, the size and location of the vleis change continuously. Many of the vleis in Cape Town are originally seasonal. When in winter the water table rises above the soil surface, they become flooded. They have become extremely rare over the last few decades because of the urban development. Building Khayelitsha and the film studios has eliminated or altered many vleis on the Cape Flats.

Sewer Catchment Areas

In each area, the water is collected and cleaned by the same waste water treatment plant as shown in the legend.

- Macassar
- Borcherds Quarry
- Potsdam
- Bellville
- Green Point
- Zandvliet
- Mitchells Plain
- Athlone
- Cape Flats
- Waste water treatment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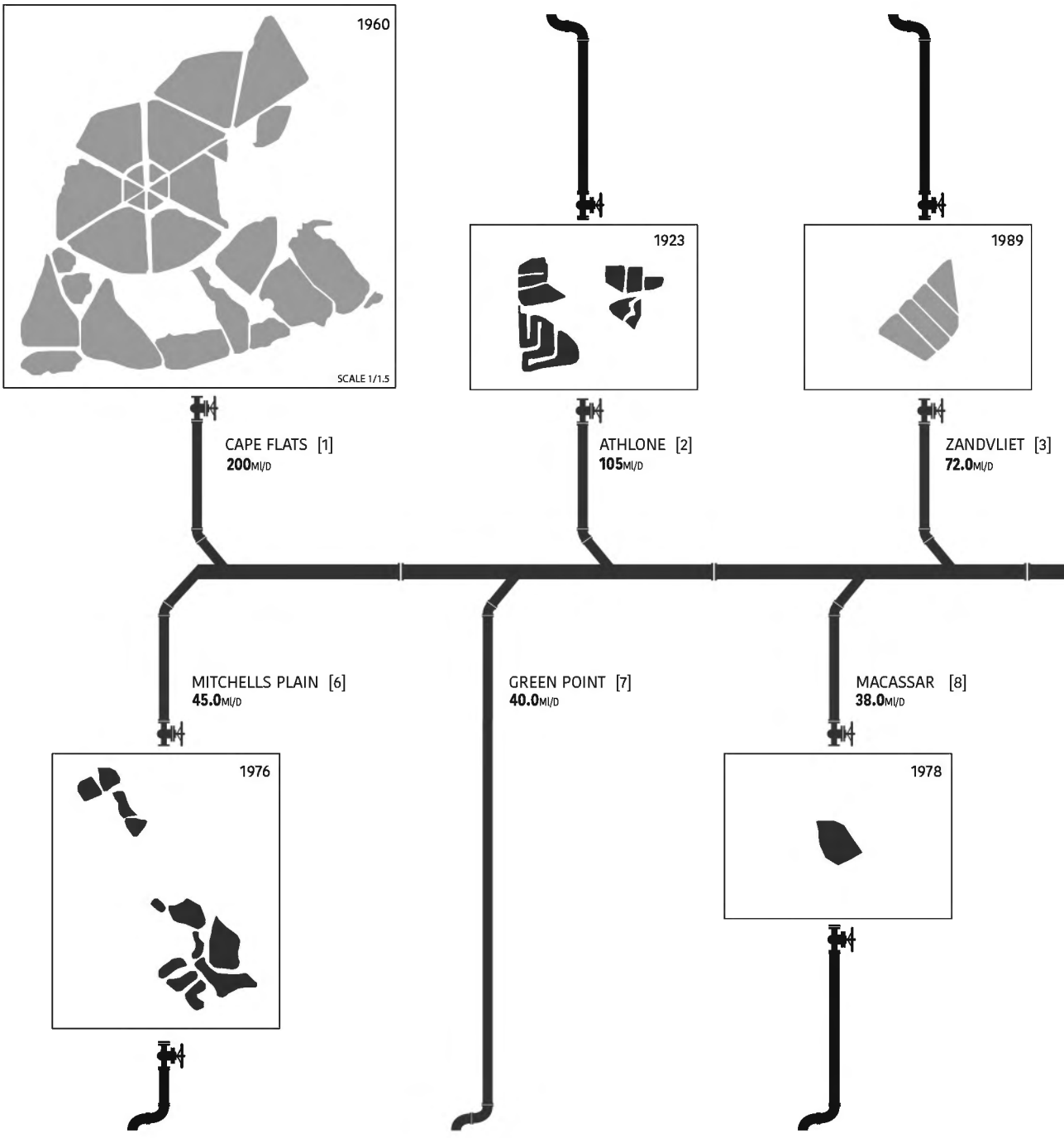
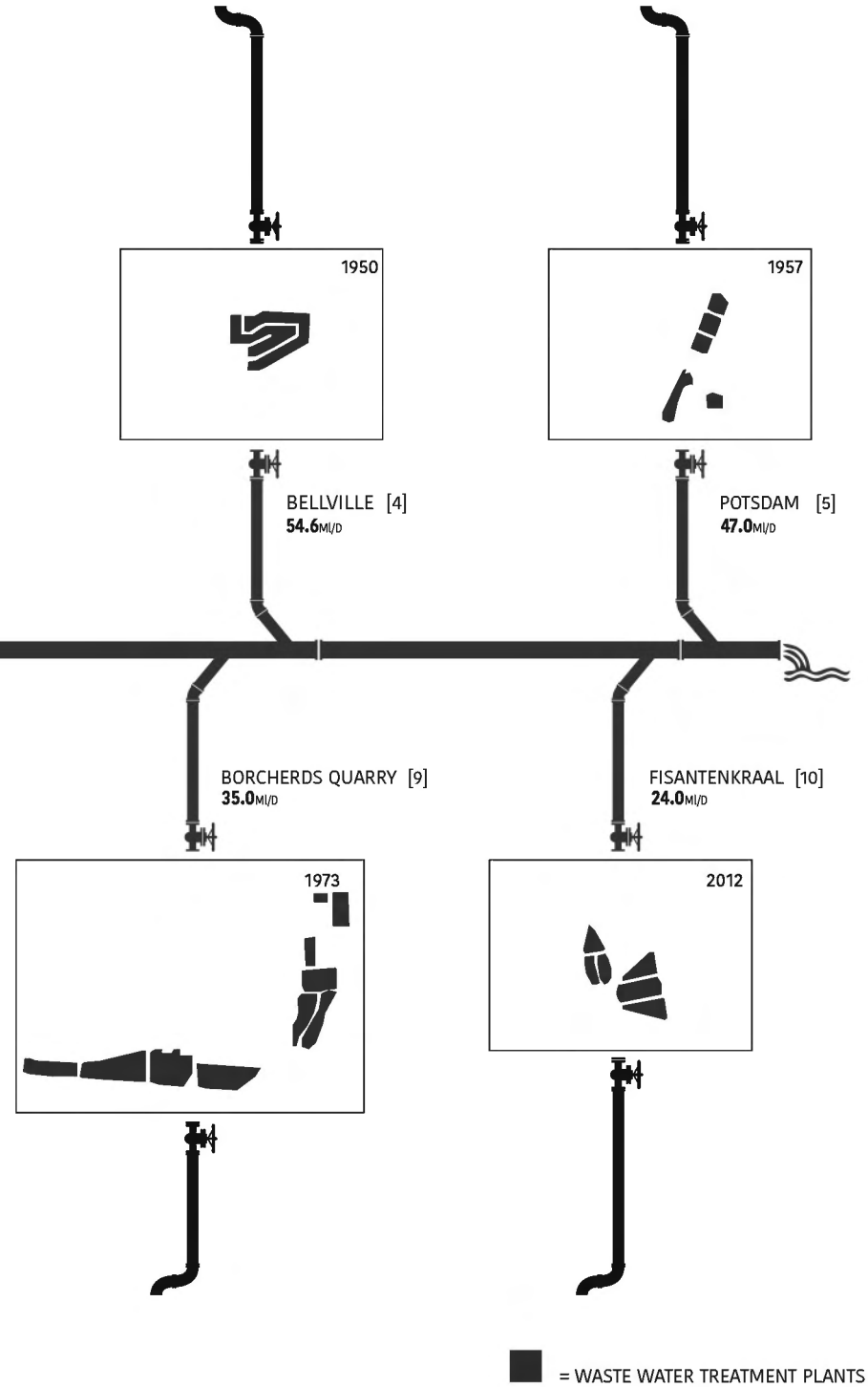


Schematic representation of the waste water treatment works in Cape Town


1950
1957
BELLVILLE [4]
54.6Ml/D
POTSDAM [5]
47.0Ml/D
BORCHERDS QUARRY [9]
35.0Ml/D
FISANTENKRAAL [10]
24.0Ml/D
1973
2012
= WASTE WATER TREATMENT PLANTS

In the last century, many of the wetlands that used to characterize the Cape Flats have disappeared due to urban expansion. Only the largest systems and some isolated water bodies remain, but these also have been modified and regulated. Numerous wetlands have been drained, filled in and lost entirely to make space for urban development. Because of catchment hardening, more water would have collected in the wetlands, therefore canals have been constructed to drain the seasonal wetlands. The wetlands and vleis would have naturally absorbed and detained floodwaters, but with their destruction, flood peaks have become considerably higher. Many of the present canals were never rivers but longitudinal wetlands. The big Lotus 'River' is for example completely artificial. The removal of the wetlands created a need for extensive drainage and flood alleviation works.

The position of rivers and wetlands follows the geological template and is therefore very dependent on human topographical interventions. The manipulation of the flow of rivers disturbs the natural system.

Rivers have become canalised or disappeared and replaced by underground stormwater drains. The rivers that are not canalised are often channelized (which consists of only a topographical intervention and no lining with concrete as is the case with canals).

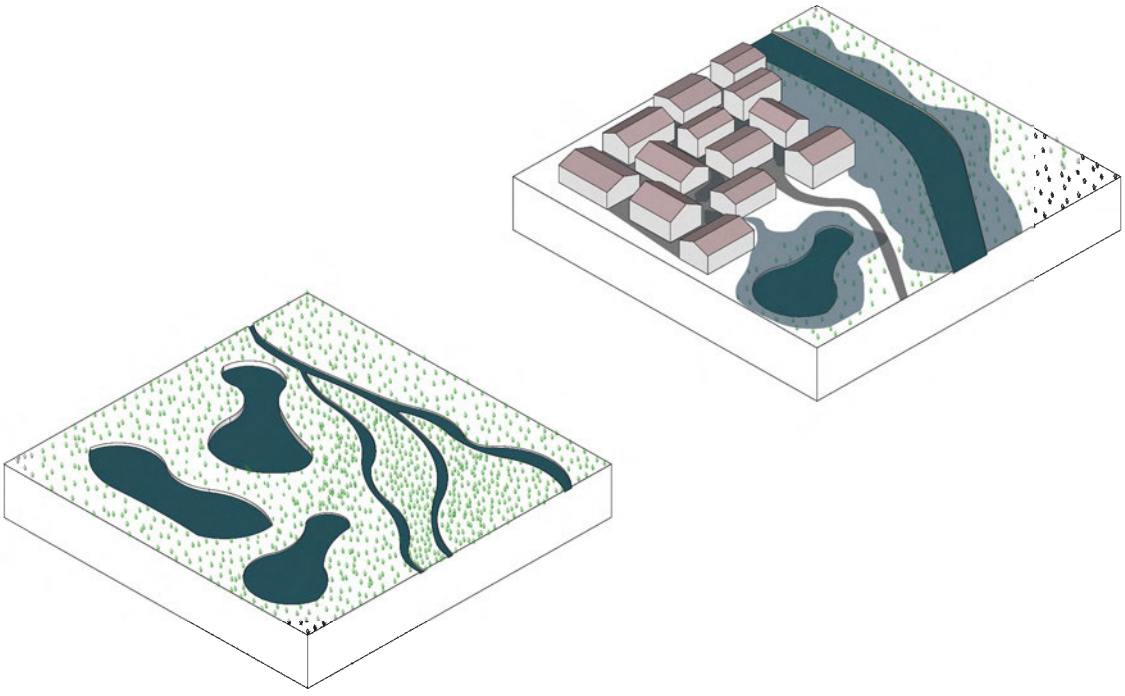
The rivers of Cape Town now carry much more water than before the urbanisation because of catchment hardening.

The area of the soil that absorbs water is reduced by the construction of roofs, paths, roads, freeways, pavements and parking lots. More and faster water has resulted in bed erosion of some rivers, which is why they are now canalised with concrete.

Canalisation not only affected the natural water system but also the aesthetic quality and recreational opportunities of rivers. They usually improve the quality of life and attractiveness of a city and provide benefits for public health, recreation and economic growth. It also makes conveying water through urban areas more efficient.

Table Bay used to consist of a vast system of estuarine lakes. In the natural system, the duration and frequency an estuary is open depends on the tide, degree of mouth protection, size, shape and river flows. The opening or closing affects the types and number of plants that live in the estuary.

Runoff from hardened catchments has increased the freshwater inflow which changed the time of open mouth conditions and altered the salinity levels. Therefore the connectivity with the marine environment changed and thereby the plant and animal species that live there. The available habitats are reduced and the overall productivity has declined dramatically. Most of the estuaries in Cape Town have been modified, a good example is the Zandvlei. The mouth is artificially closed and opened with a sand bar and a lot of topographical adaptations were made for urban development. [Brown et al., 2009]



Kuils River
More water flows into the river through catchment hardening, resulting in flooding.

Molteno water reservoir in the CBD

Canalised river running to Zwartriver

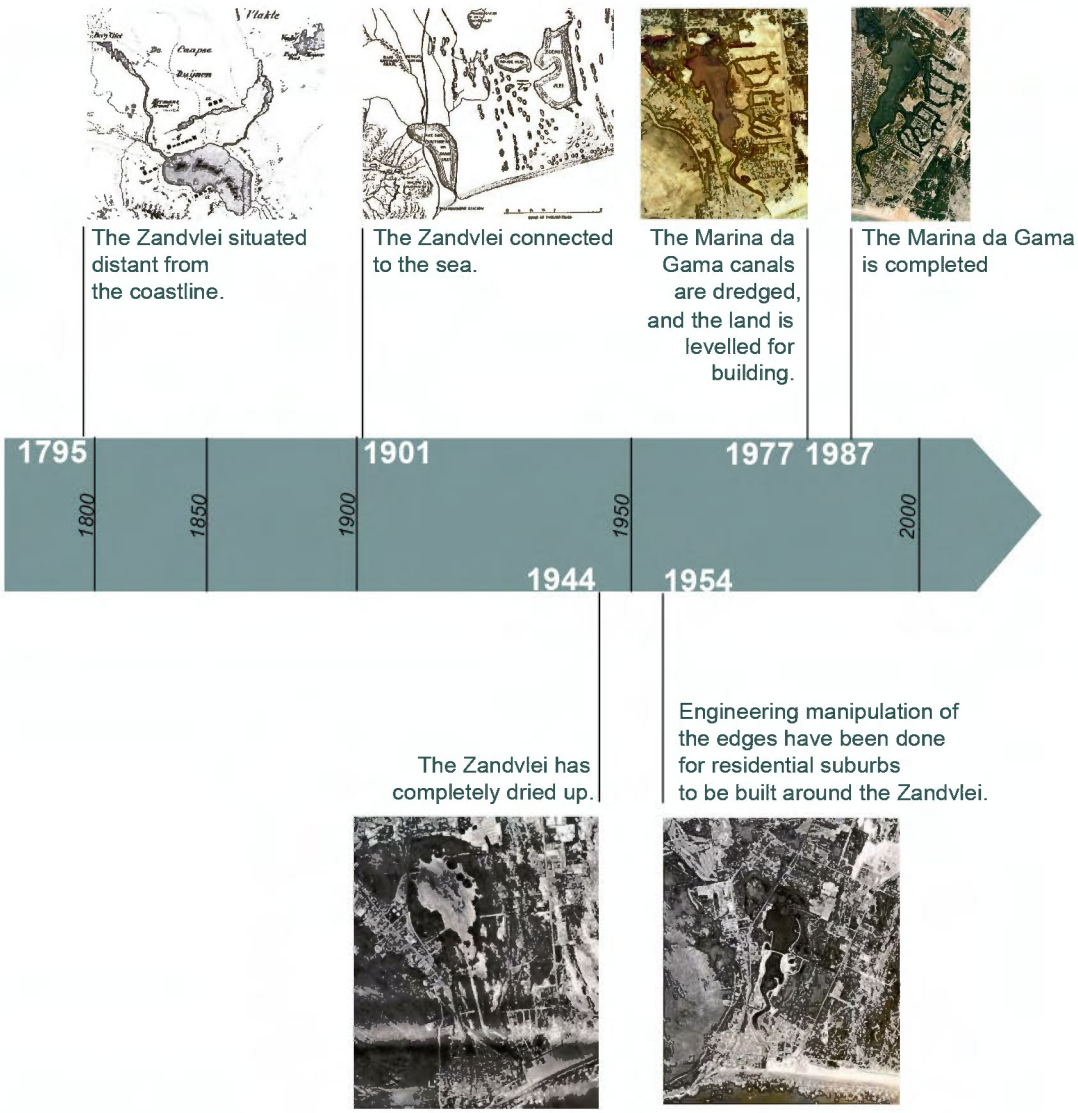
Retrieving water to expand the city

Cape Town has always been attractive for several groups of people for the amount of fresh water it supplies. People though tend to modify the amount of water they receive because they never have enough.

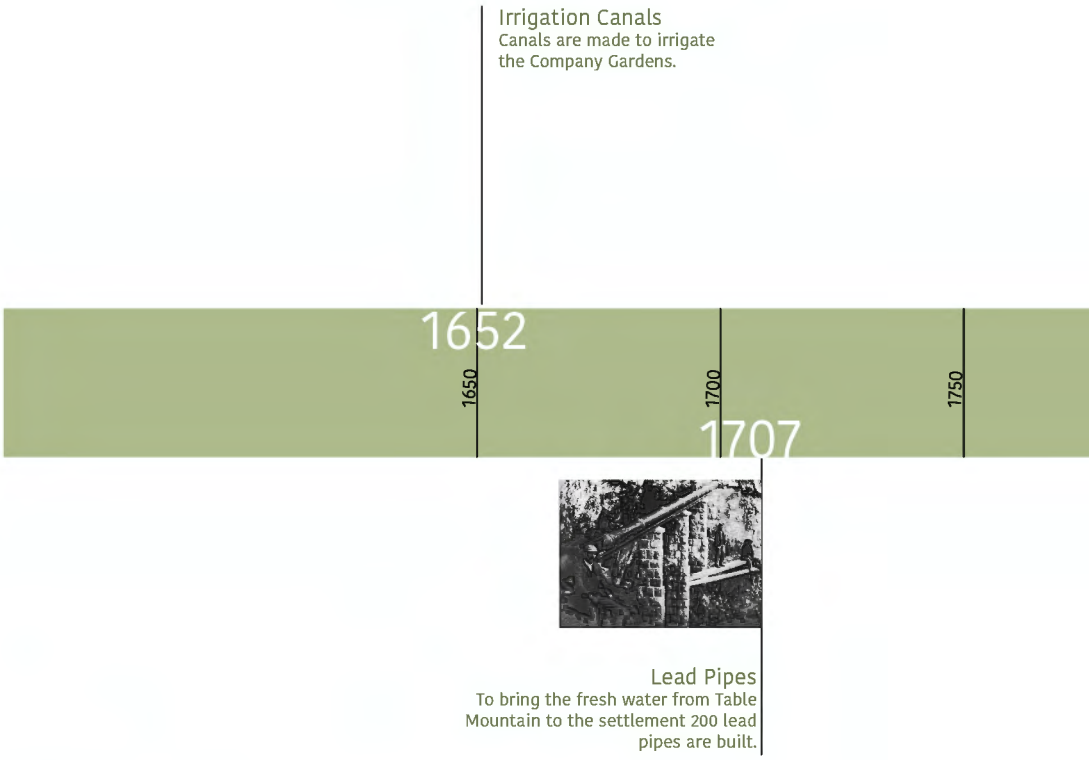
The role of the natural rivers has changed; instead of being the main suppliers of water, they now remove unwanted water or waste water..

As the city grew, demand exceeded the local supply and water was imported from further from the city centre.
They carry a much larger amount of water than would naturally belong in their catchments.
At the early stage of the settlement, households used water from the canals running along the streets and when they were dry they used a public well with a pump. At the end of the 19th century people started to build reservoirs to store water during the rainy season. They built more and more reservoirs because the supply never stayed sufficient. These reservoirs also became bigger and bigger and some are still in use. To transport the water from the reservoirs, water pipes were built. The first ones were made from bored tree trunks, subsequently from lead and eventually from cast-iron. In 1707 the VOC produced 200 lead pipes to bring fresh water from the foot of Table Mountain to the settlement with fountains to supply local needs.

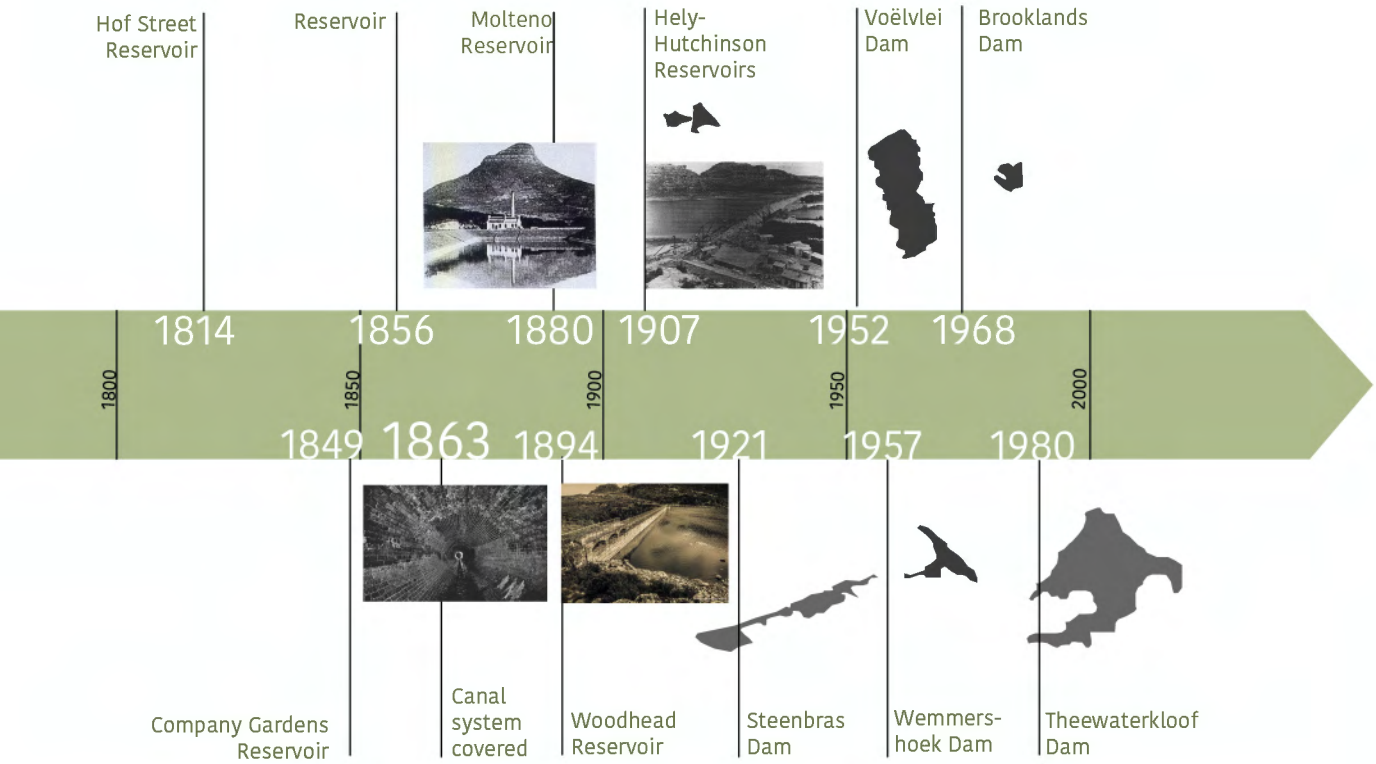
The Western Cape Water Supply System now supplies Cape Town of water. It is a large, technologically sophisticated network of reservoirs, dams, tunnels and interlinking pipelines. Much of the water consumed in Cape Town is imported from outside its catchments. Since 1897 several dams were built, linked to water treatment plants that make the water potable. The dams have often been raised through history and sometimes also serve as hydro-electric pump storage. Today there are no more sites suitable for large dams, therefore other options for water supply need to be investigated.



Zandvlei waterbodies evolution

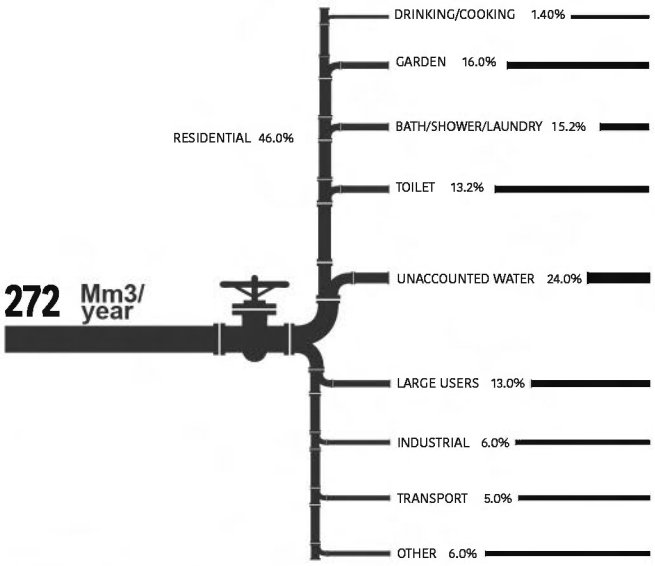


Water timeline



Today all the water that flows through the pipes is potable water. It is used for everything including watering gardens and operating carwashes. Considering the coming water crisis, a more sustainable use of water would be needed. One of the remnants of apartheid is the uneven distribution of water. Rich, often white people living in the CBD have very easy access while black and coloured people living in the townships can barely afford it. [Brown et al., 2009]

The insufficient supply is not the only difficulty in the water management of Cape Town. There are large pressing issues of unequal access and inefficient use of potable water.



Water usage in Cape Town

The domestication of water in Cape Town has had large economic and environmental costs. A fundamental change in the water management and planning is needed to radically twist the inefficient use and inequitable distribution between different socio-economic groups. Today studies are being undertaken to find options for future water requirements. The mentality is that water demand management should be implemented before additional supply would be accomplished. The reuse of effluent on a larger scale should be considered. At a viable cost, 40% of the 180 million cubic metres of waste water could be re-used. Other options that are being investigated are pumping groundwater from the Cape Flats and Table Mountain aquifers and the desalination of seawater.

Water source map

Map showing where Cape Town gets its water from. Most of the sources orignate from dams in the east.

- Wemmershoek & Voëlvlei & Hely Hutchinson
- Wemmershoek & Voëlvlei
- Theewaterkloof
- Wemmershoek
- Voëlvlei
- Theewater & Steenbras
- CmcDams
- Dwaf Dams
- Water reservoir
- Water treatment raw-potable
- DWAF waterpipeline
- CMC potable water pipeline
- CMC Raw water pipeline


[D]
[F]
[F]
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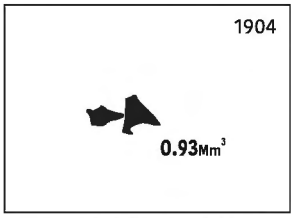
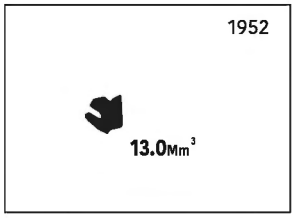
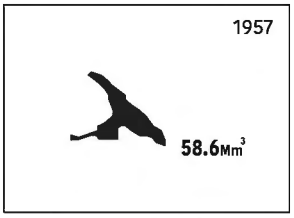
[C]
[B]
5km
10km
15km



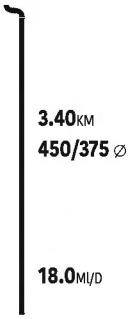
HELY HUTCHINSON DAMS [A]



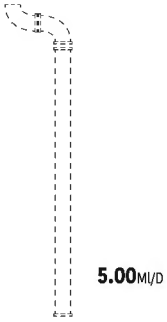
BROOKLANDS [B]



WEMMERSHOEK [C]



KLOOFNEK



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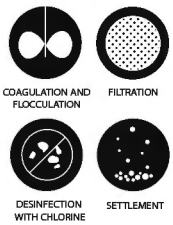
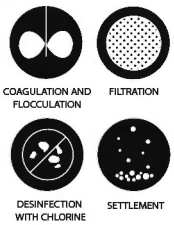
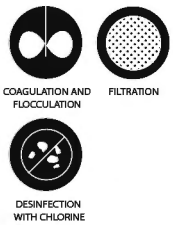
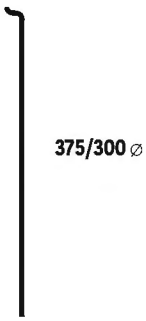
WEMMERSHOEK







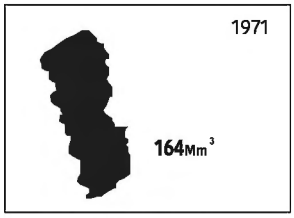


KLOOFNEK RES. [6]

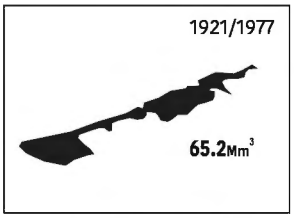
KLEINPLAAS DAM [/]

TYGERBERG RES. [1]

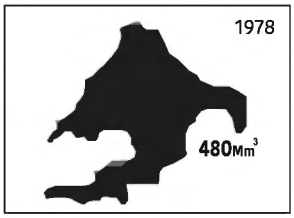
Water process from source to consumer



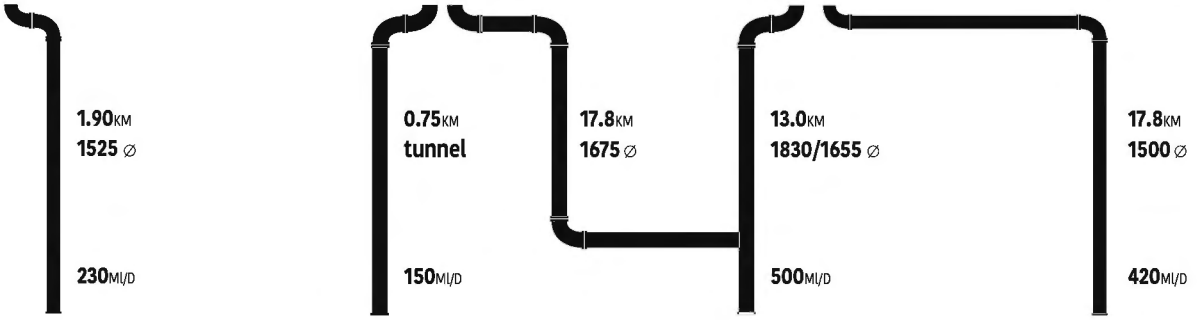
VOELVLEI [D]



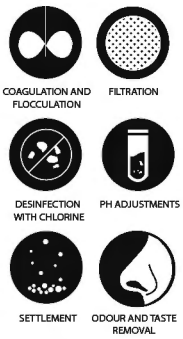
STEENBRASDAM [E]



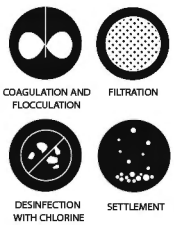
THEEWATERKLOOF [F]



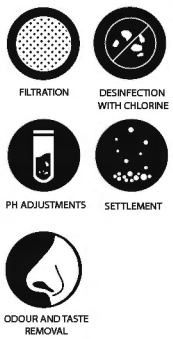
VOELVLEI



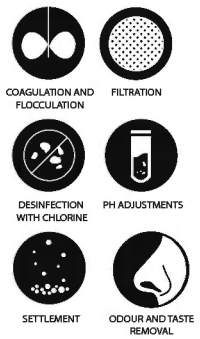
STEENBRAS

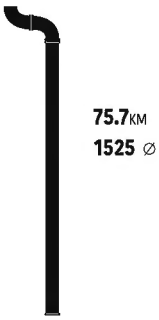


FAURE

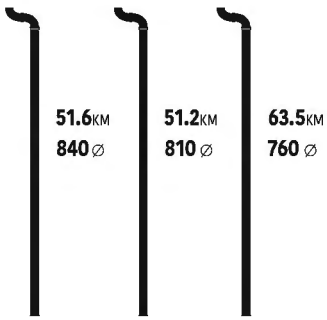


BLACKHEAT





PLATTEKLOOF RES. [2]



NEWLANDS STATION [3]

NEWLANDS RES. [4]

MOLTENO RES. [5]

CITY BULK SYSTEM [/]

CITY BULK SYSTEM [/]

■ = DWAF/CMC OWNED DAMS

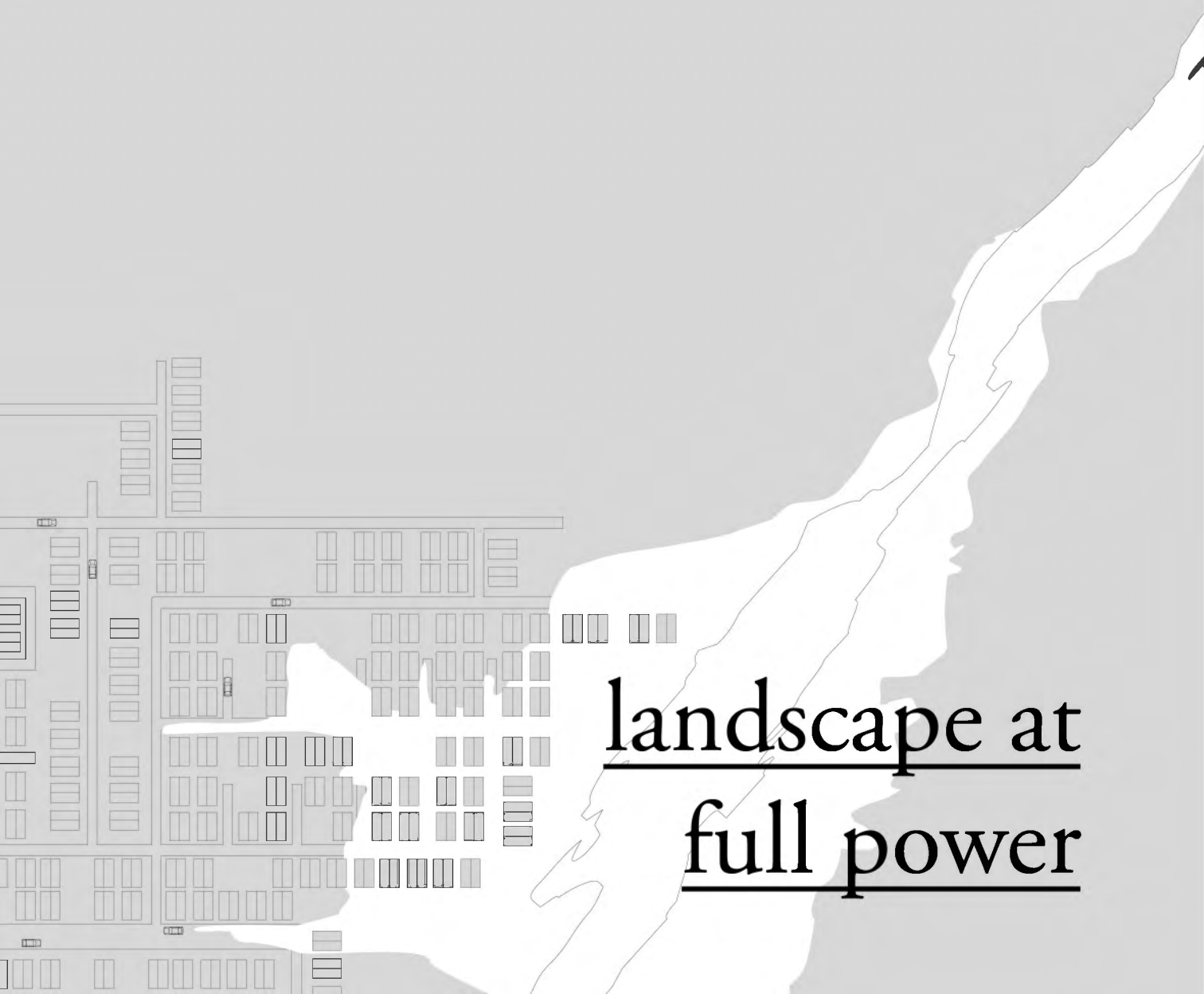
Faure reservoir

Canalised Lotus River

frictions | domesticated landscape

Mfuleni border

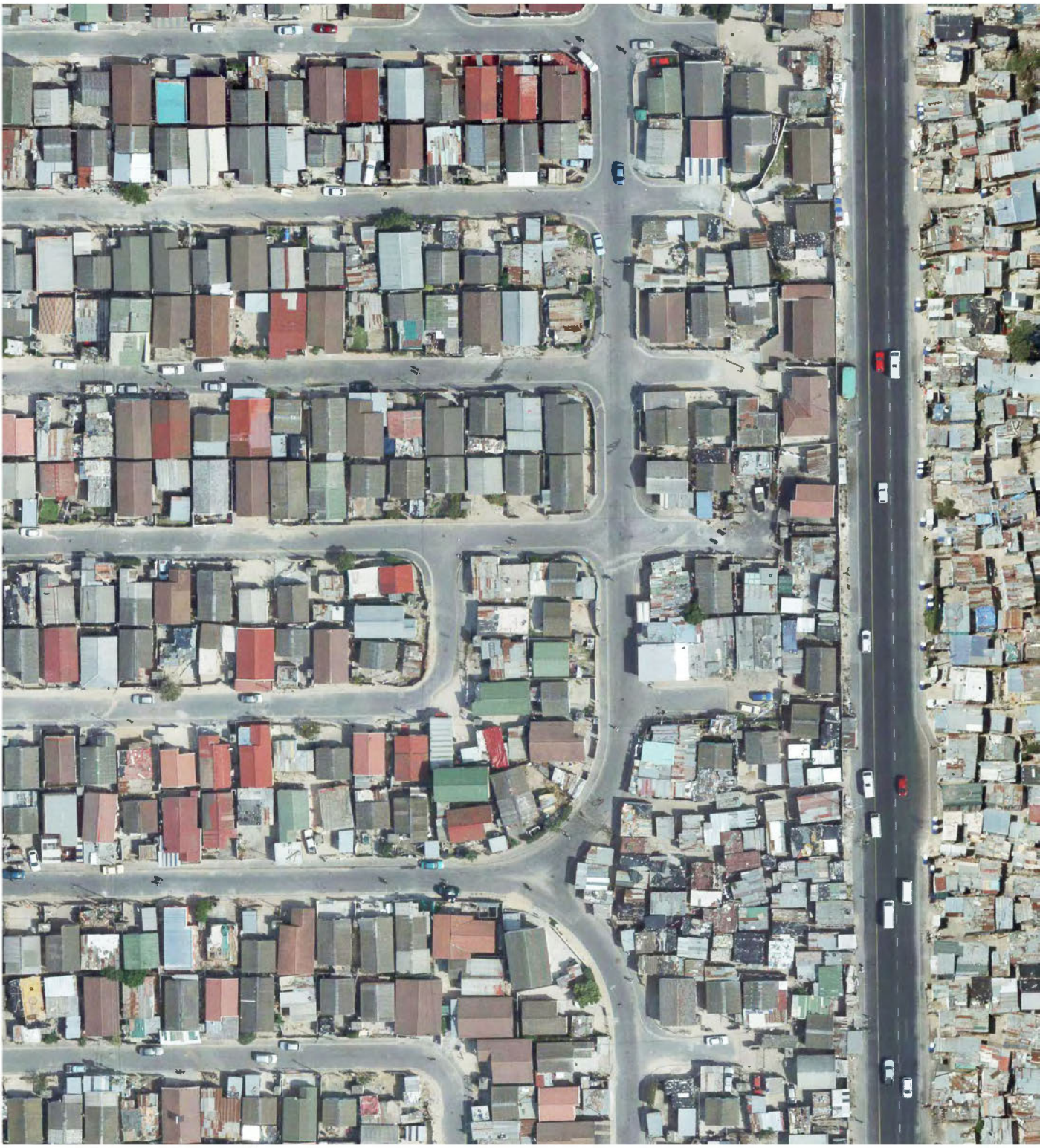
forgotten urbanity



landscape at full power

"You are unpredictable and dangerous. I feel like you don't want me here and you want to chase me away. You are always too hot or too cold, too dry or too wet. With your character and your flows, you limit my chances to fully develop."

"I have always been myself, following my own rules and principles. But because you never take me into consideration, I have no other option than to react. All I have, I give to you. Everything you have and are is due to me. I create great opportunities, but you often choose to close your eyes to them. If you would let me be myself, you too would benefit."



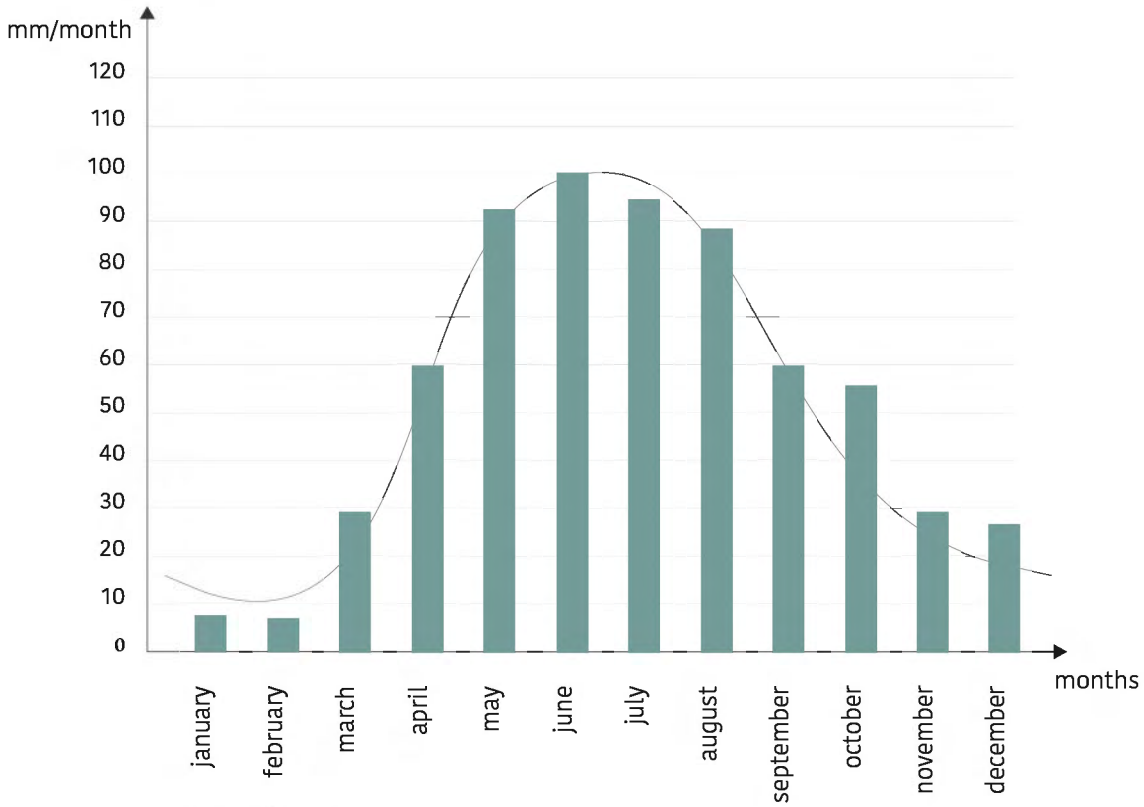
Contrast between tissue and landscape at full power

Zandvlei Nature Reserve

A climate with dynamic flows

Cape Town has a Mediterranean climate, this primarily means it only knows two distinct seasons: hot and dry summers in opposition to mild and rainy winters. November, December, January, February and March are the summer months with average temperatures between 13 to 26 degrees Celsius. The dry period ranges from December till January. In summer, temperatures reach extreme numbers. The highest recorded temperature annually is 39 degrees Celsius. During other parts of the year averages vary from 7 to 22 degrees. In July temperatures are coldest with the a record low of -2 degrees.

Cape Town normally receives about 788mm of rain per year and this rain falls mostly during winter. The summer months experience little rain as they have only about

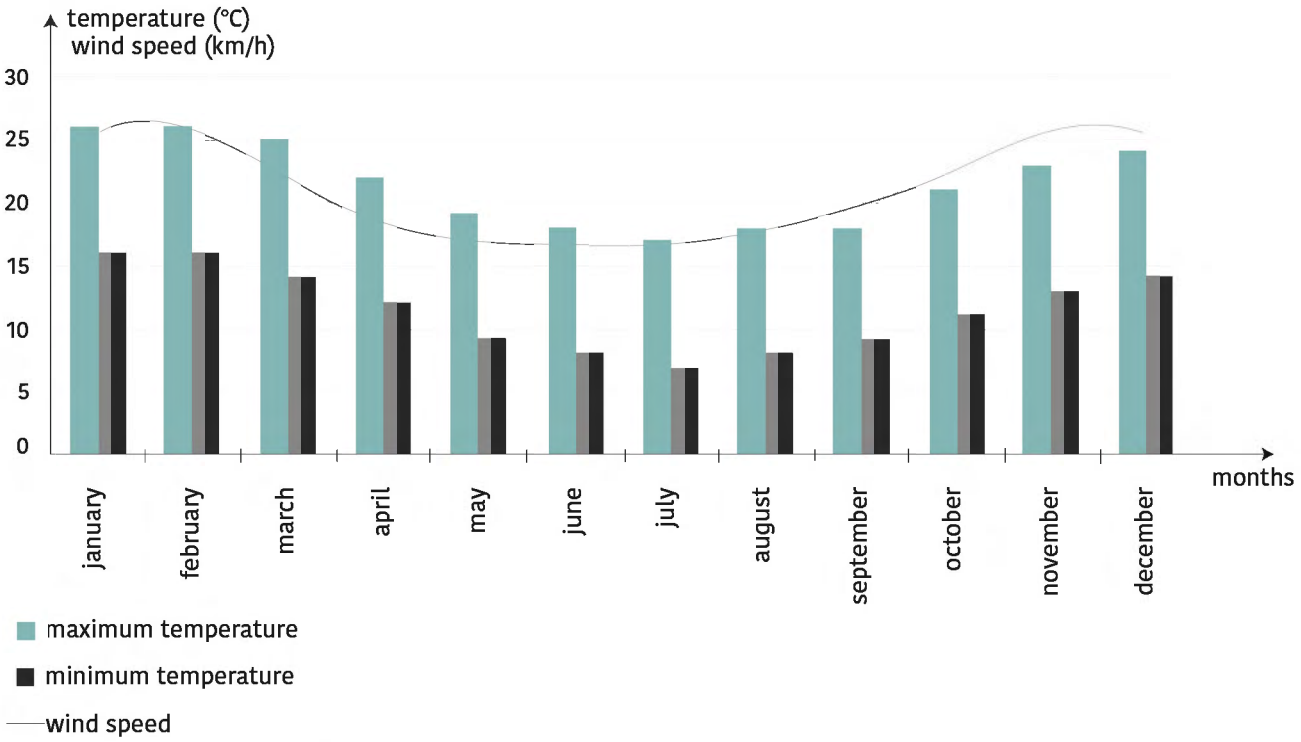


Precipitation in Cape Town

three wet days per month. The lowest amount of rainfall (15mm) is measured in February and the highest (140mm) in June.

Another name for the Cape of Good Hope is the Cape of Storms. This does not signify that it gets plagued by hurricanes or tropical storms, but rather refers to the strong winds that frequently occur. There is a consistent breeze with an average speed of 20.4 km/h. Most of the year winds come from the oceanside which makes them rather cool. However at the end of February and March warm winds come from the interior of the country and then they only add to the heat.

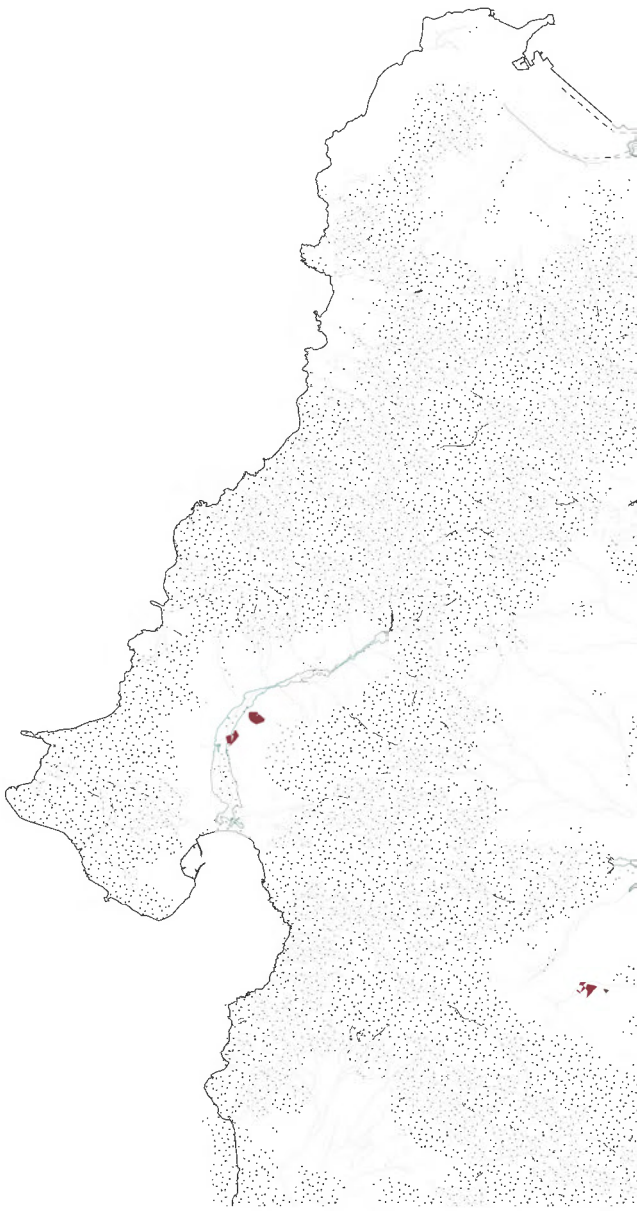
Ocean storms are usually accompanied by winter rains and made the Cape famous among sailors and explorers throughout history. The natural fluxes of storms, waves and winds eroded the dunes and transform them into a dynamic moving landscape. The coastline has natural sculpting processes that constantly redraw beaches, reshape river mouths and inundate the flats with water. The frequencies of these processes vary greatly. Some take a single season, some a decade and others even take thousands of years. The changing climate however alters the fluxes of the oceans and strengthens the forces of winds and oceans. [African centre for cities, 2013]



Temperatures and wind speeds in Cape Town

Every year in winter, Cape Town has to cope with heavy rainfall. This leads to serious problems in townships like Philippi and Khayelitsha that are located on the Cape Flats. They have a lack of stormwater infrastructure, in contrast to the neighbourhoods built near table mountain that are fully equipped with operational flood-resistant stormwater infrastructure.

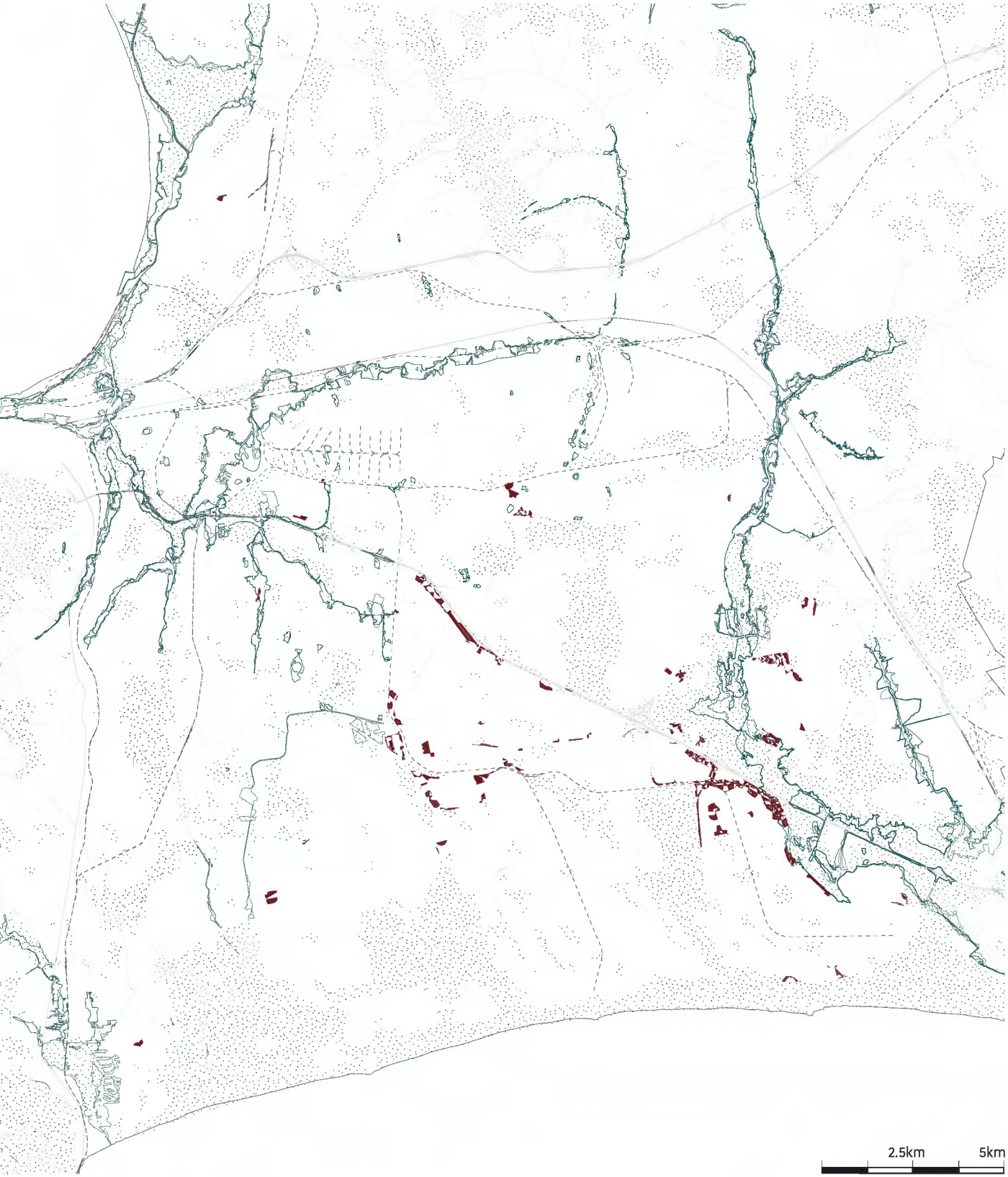
"Though the (township) area is unsuitable for living due to this risk, there continues to be a great influx of residents, primarily from the Eastern Cape. These new residents move to the Cape Flats during the summer months when there is no flooding, find an open location, and unknowingly settle in an area of high flood risk. There is little to no control over how many people move into an area or where they settle in that area." [Bouchard et al., 2007]



Flooding map

Shacks located near flooding lines are most vulnerable for flooding problems.

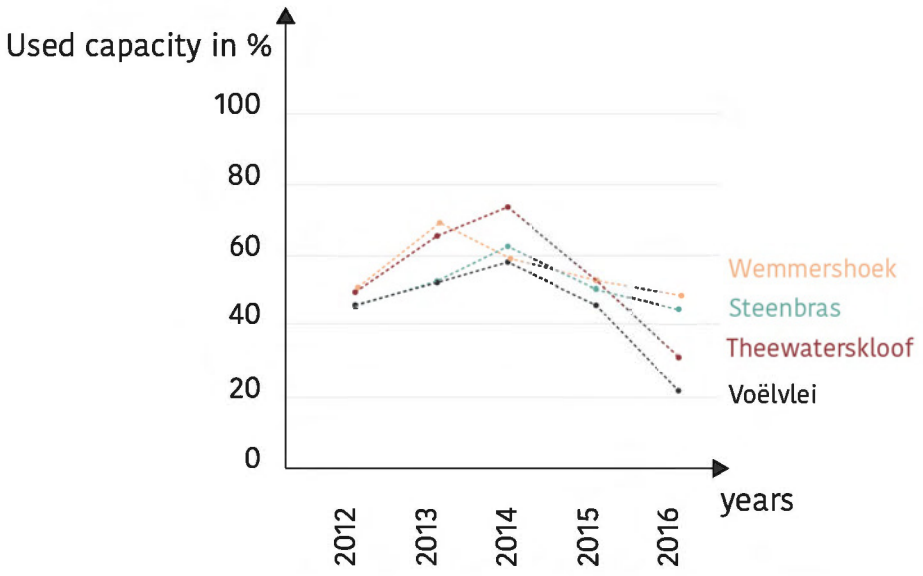
— Floodlines
■ Shacks located at wetlands


2.5km
5km

Coastal areas get increasingly threatened by sea level rise. Together with the city researchers identified 23 locations where risk is highest, these include Milnerton Beach, Saltriver, Green Point, Sea Point, Bakoven Cottages, Camps Bay, Kalk Bay, Strandfontein Road, and Strand. Beaches and dunes face heavy erosion and the Atlantic seaboard is at risk due to big wave coming from the south-west.

In winter, most problems in the city have to do with flooding in the Cape Flats region, while in summer most problems are caused by summer droughts.

As the city struggles with droughts in summer, it is constantly looking out for alternatives to provide safe drinking water.



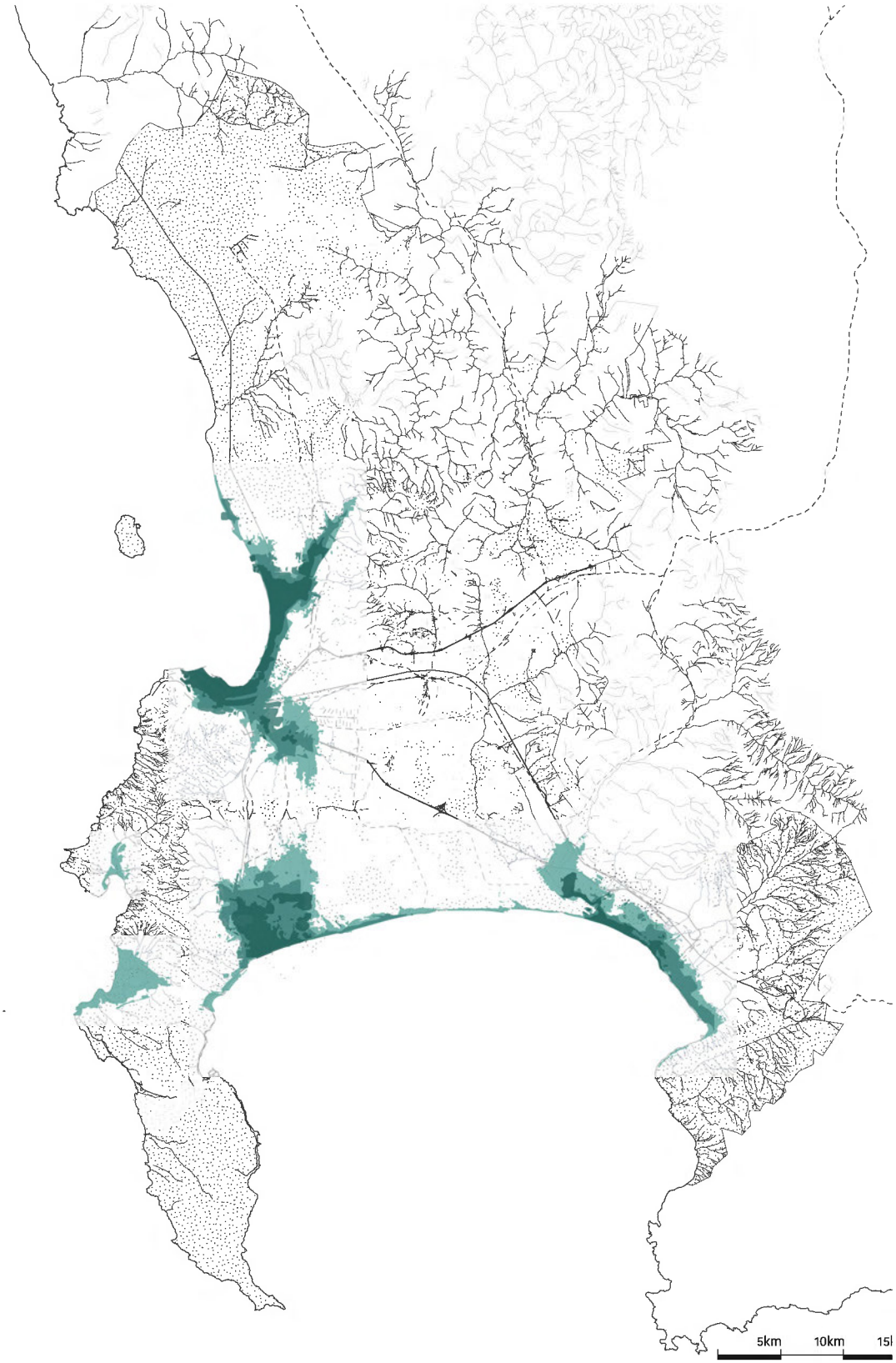
Evolution dam level from 2012 to 2016

Dam levels

Sea level rise

Prediction of expected sea level rise in Cape Town.

- 12m rise
- 9m rise
- 6m rise


5km
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Flooding in Graveyard pond

The current water provision mostly focuses on getting water from dams to the east of the city. However, while the amount of rainfall is decreasing due to climate change, each single rainstorm will become more intense.

Studies show that the volume catched by the dams is already shrinking. Because the dams provide less water and the demand for water increases, shortages during summer become more frequent. Other techniques besides dams have to be investigated. [Cape Town Partership, 2013]

Flooding is nothing but a reaction of the natural system to the pressure generated by urbanization. Before urbanisation, the system was in balance, but because the topographical template is altered, the flow of the water also changed.

The landscape tries to win back its lost territory by showing its presence

Of course this causes serious problems for the people living in flood-prone areas. People's shacks get destroyed, children get sick, electrical appliances get wet causing fires etc. The rivers and wetlands of Cape Town carry much more water than before the urbanisation as catchment hardening prevents water from infiltrating. The permeability of areas is reduced by the construction of hard surfaces like roofs, paths, roads, freeways, pavements and parking lots. A lot of the natural water bodies of Cape Town have already disappeared because of urbanization. [Brown et al., 2009]

Kuils River running through Driftsands Nature Reserve

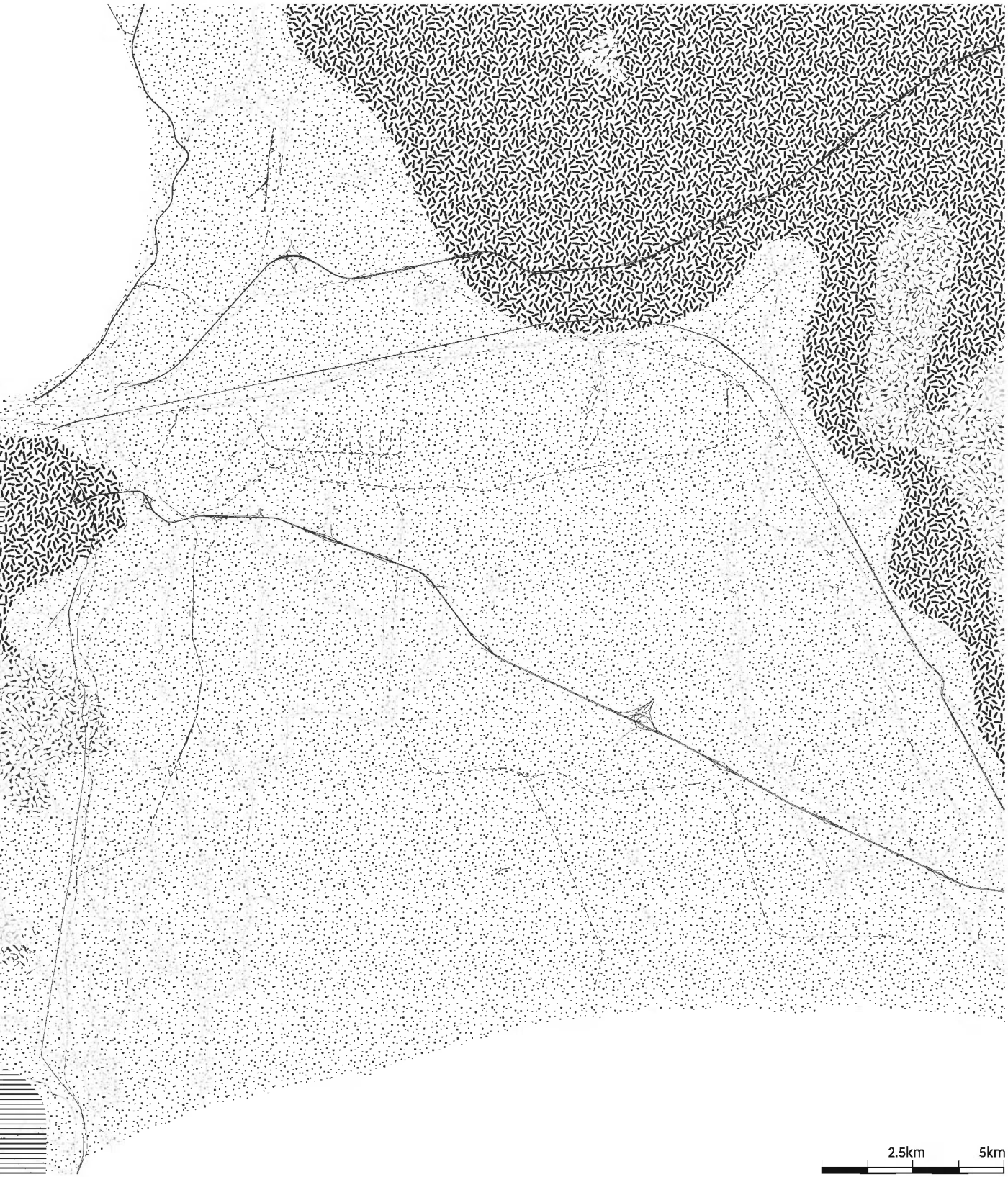
Topography and geology regulating water systems

The Cape Peninsula was created by two main rock formations: the late-Precambrian Malmesbury group (metamorphic rock) and the Peninsula granite. The Malmesbury Group is the oldest rock formation in the area consisting of sandstone and slate in alternating layers. This rock formation was metamorphosed by heat and pressure and folded tightly in an almost vertical direction. About 630 million years ago, the Peninsula Granite intruded the Malmesbury Group as molten rock that crystallised deep in the earth. Since then the prolonged erosion eventually exposed the granite at the surface. The remains of the Malmusbury group formed a base on which the sedimentary rocks of the Table Mountain Group were deposited. The Cape Fold Belt was the result of a collision of tectonic plates 200 million years ago. The older granite and Malmesbury group were raised and deformed by the pressure from the South American, Antarctic and African continental plates slowly moving together. The mountains of today are only remnants of a much larger and higher mountain stain that eroded. [Compton, 2004; Terhorst, 1988; Theron, 1992]

Geology

Cape Town's soil can be classified into 4 geological types.

- Quatemary
- Malmesbury
- Peninsula Granite
- Cape Granite Suite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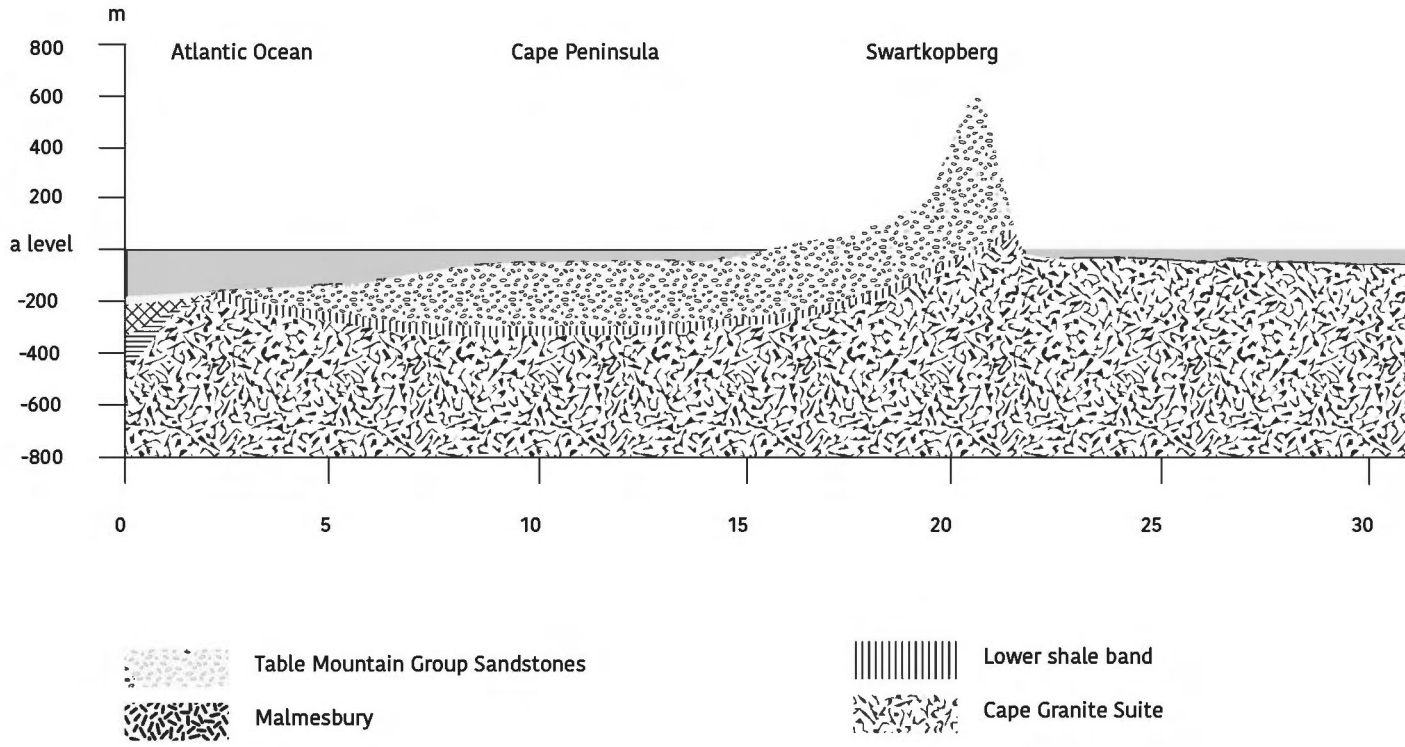


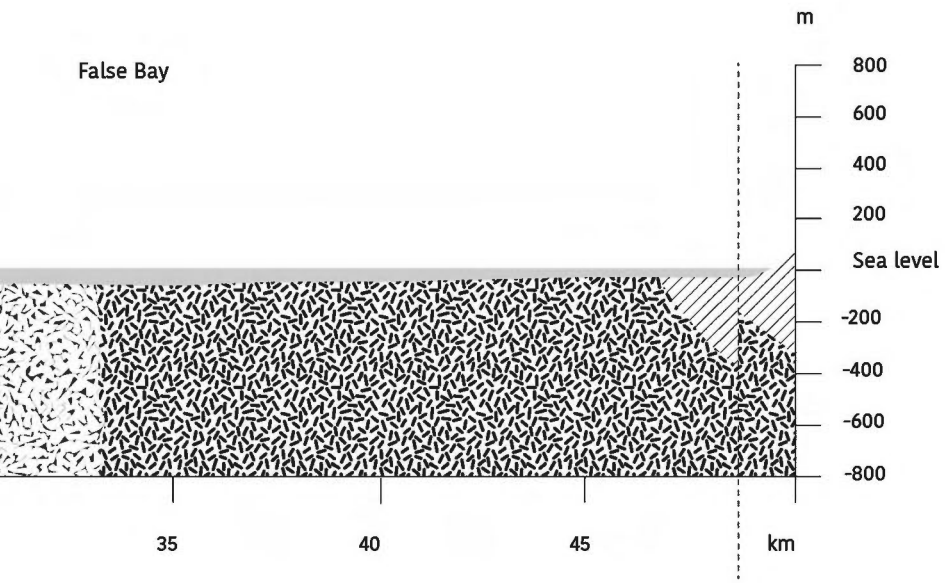
Cape Town has a very characteristic topography, from the Cape Flats to the Table Mountain. The Flats have an average elevation of 30 m above the shoreline, while Table Mountain rises up to 1 038 m and drops sharply to the sea in cliffs at the shoreline. The topography has a wide range of features: narrow flats, chasms and gorges, cliffs, rocky shores, wave-cut platforms, small bays, and sandy and gravel beaches. Sand dunes in particular are very distinctive of Cape Town and rise till 65m above sea level.

Between 15000 and 2 million years ago the sea levels continuously fluctuated between -120 and +200 m from the present mean sea level. The main players in this process were the global temperature and the variable amount of water that accumulated in polar ice. The Cape Flats have been completely covered by the sea at times in the past. About 20000 years ago, the last major regression lowered the sea level to the present altitude, forming an extensive system of dunes. Beach sands were deposited with shell fragments when the sea retreated. Today the Cape Flats are still covered with marine sands. [Compton, 2004; Terhorst, 1988; Theron, 1992]

The topographical structure of the landscape makes some areas very suitable to live, while other areas are less suitable. The flanks of the mountains to the west are mostly inhabited by wealthier Capetonians because of fertile soil. This is why the slopes around the mountains are also planted with vineyards. The proximity of these areas to the historic center is another asset as the are well connected to services.

The Cape Flats area consists of lowlands, covered with Cenosoic sands that favour aquifer development and management. The Cape Flats aquifer covers an area of 400 km^2 and is largely built upon. It recharges quickly and has a relatively low residence time of approximately 20 years. The groundwater flows from the higher lying area near Durbanville towards Table Bay and False bay. It follows flow paths from paleochannels of the Kuils, Lotus, and Elsieskraal Rivers.

The groundwater in the Cape Flats lies within a few metres below the surface, rivers and



Tertiary

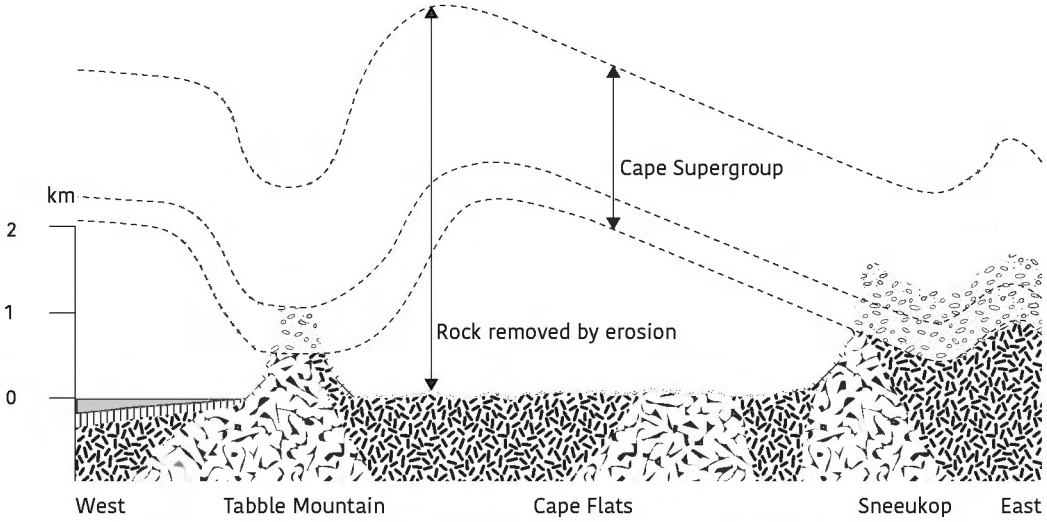
Cretaceous

TMS

Water

Geological section

Geological section of the Cape Peninsula and False Bay (Note: vertical exaggeration 9x)



Section evolution

Possible evolution of the Cape Town landscape according to Compton (2004).Note: The diagram is conceptual, and thus the horizontal axis is not to scale.

TM sandstones

Malmesbury

Water

Cape Granite

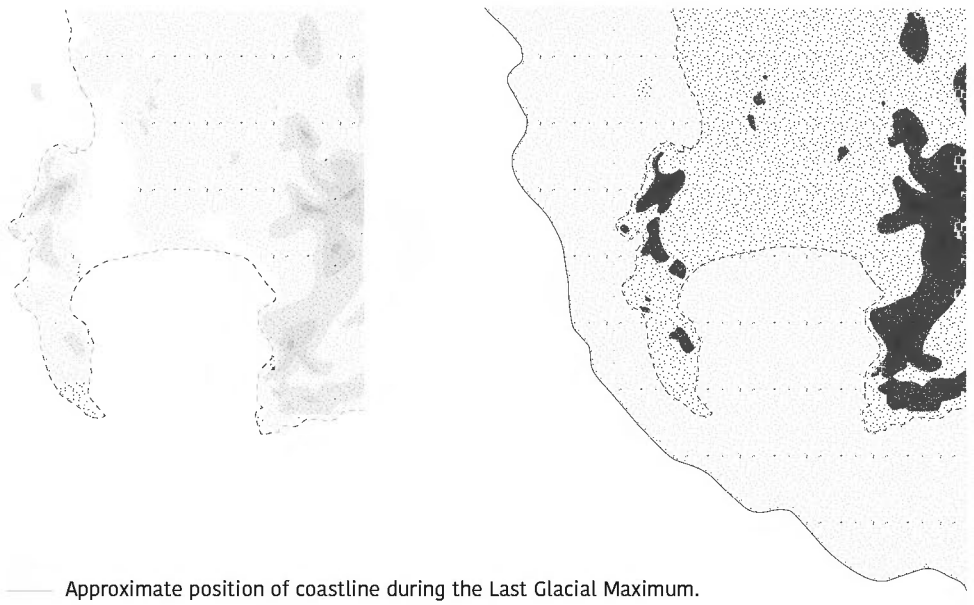
Scree

Dune Sand

Possible ancient landscapes

wetlands are hydraulically connected to it.
The urban expansion poses a pollution threat and made the water non-potable in certain areas, with regard to agrochemicals, heavy metals and salinity. The levels of contamination vary and are caused by pesticides and fertilizers from agricultural practices, waste water treatment plants, informal settlements, unlined or leaking canals, leaking sewerage pipes in some areas and, storm-water runoff. The input to the aquifer sometimes exceeds its current capacity and therefore contributes to problems of winter flooding, with environmental and health risks to the local communities as a consequence. [Adelanal et al., 2010; Hay, et al.]

The marine sandy soils in the Cape Flats are not very fertile, this limits the possibilities of practicing agriculture in the area. The characteristic topography of the Cape region also limits the areas where urban growth can take place. The mountains, dunes and wetlands are not suitable for urban growth without large topography adaptations.

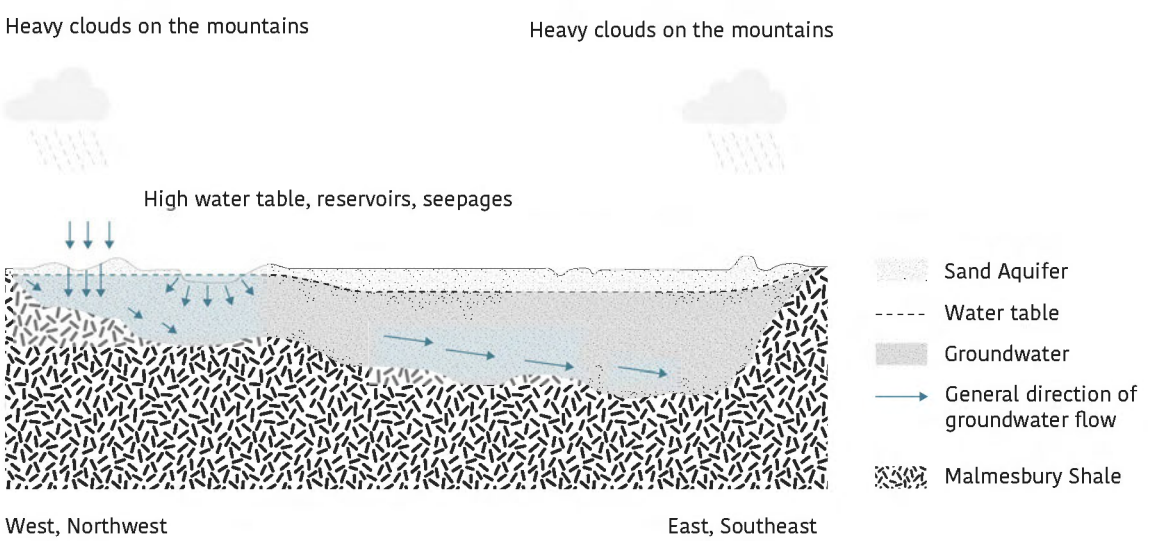


Coastal line

The Cape Peninsula shoreline in the case of 25m higher sea level that occurred around 5 and 1.5 million years ago (left), and 125m lower sea level at the time of maximum ice build-up during cold periods – the most recent being 20 000 years ago (right) (after John S. Compton 2004).

Topography

Map showing Cape Town's topography, with Table Mountain as most significant feature in the west.



Aquifer recharge sources

Conceptual model of recharge sources in a cross-sectional view. (Note: Diagram is not to scale.)

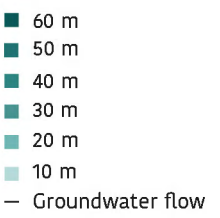
The Cape Flats have been used for the creation of the townships. They lie almost as low as sea level, which means they have problems with flooding, especially when global warming causes sea-level rising. The cause of flooding is not only to be found in the heavy rainfall in winter, but also in the high groundwater levels of the Cape Flats. The water level in these aquifers is quite high, resulting in flooding when minor changes to groundwater levels are made. The problem with this water is that it is mostly contaminated, due to waste pollution or free release of grey water by townships inhabitants. Health hazards for inhabitants of these areas are enormous and should be tackled at first instance. [Brown et al., 2009]

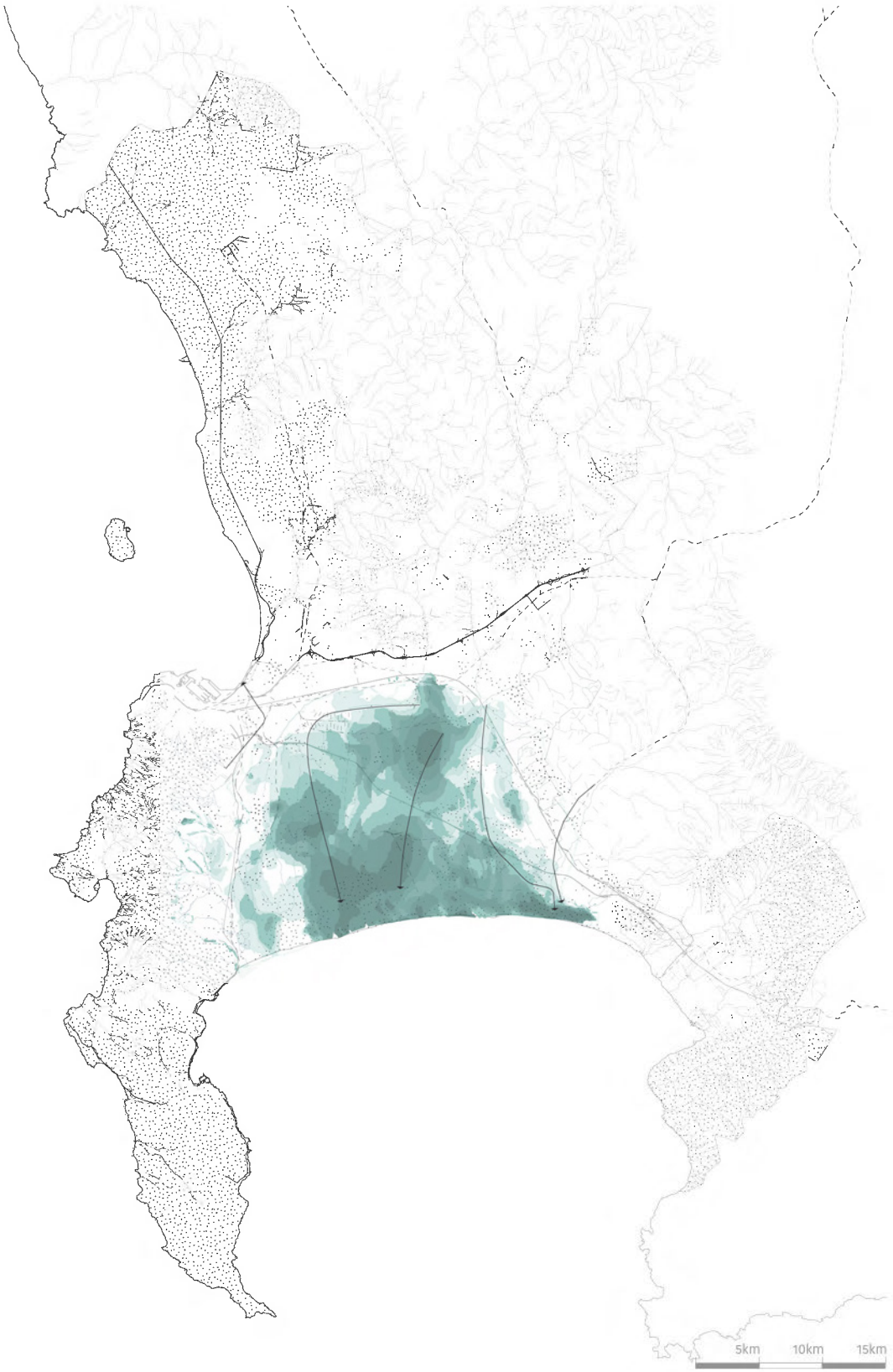
To answer the water demand of the future, other supply techniques should be investigated. Desalination is being investigated, but it is very costly and not yet sufficient. Using aquifers is a very good alternative, it could be a source for potable water. The volume of water in the Cape Flats aquifer highly exceeds that of the dams.

Transport costs would decline as using groundwater is more efficient and several distraction points would provide water in different areas. The aquifer would function as a large storage sink for reclaimed water.

Aquifer map

Location of the aquifer with indication of main aquifer water streams.



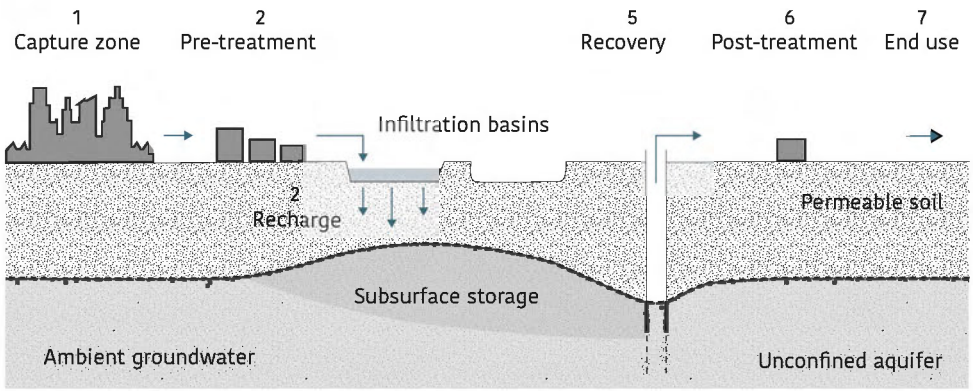

5km
10km
15km

Basic water supply in Lotus Park provided by the government.


A-121

Recharging effluent and then abstracting it at another location would benefit the bulk supply of Cape Town. This technique is already used in Atlantis. There are questions about the quality of the water in the aquifer, but at sufficient depth, the water is much cleaner than the water coming from the dams. In Atlantis, they use aquifer recharge as a way to clean grey water from the city and put it back into the system afterwards. This cyclical use of the water system shows that the landscape can be used in a positive way.

It is needed to systematically reduce and limit contamination from leaking canals, informal settlements, stormwater and leaking sewerage. Through natural or manmade wetlands and vleis contaminated water can be cleaned, this is called bioremediation. The Zeekoevlei and the Philippi horticulture areas show the greatest potential to do this. Bioremediation can clean the aquifer, and even be used to recharge treated effluent from WWTW's. Water can be artificially injected into the aquifer through infiltration basins/ponds or injection wells. Worldwide, many cities like Berlin and Orange County use this technique to supply their water. The aquifer then functions as a subsurface storage facility and water filtration system. Water circulates by recharging the aquifer with good quality water and ultimately the initially contaminated gets cleaned. [Adelanal et al., 2010; Hay, et al.]



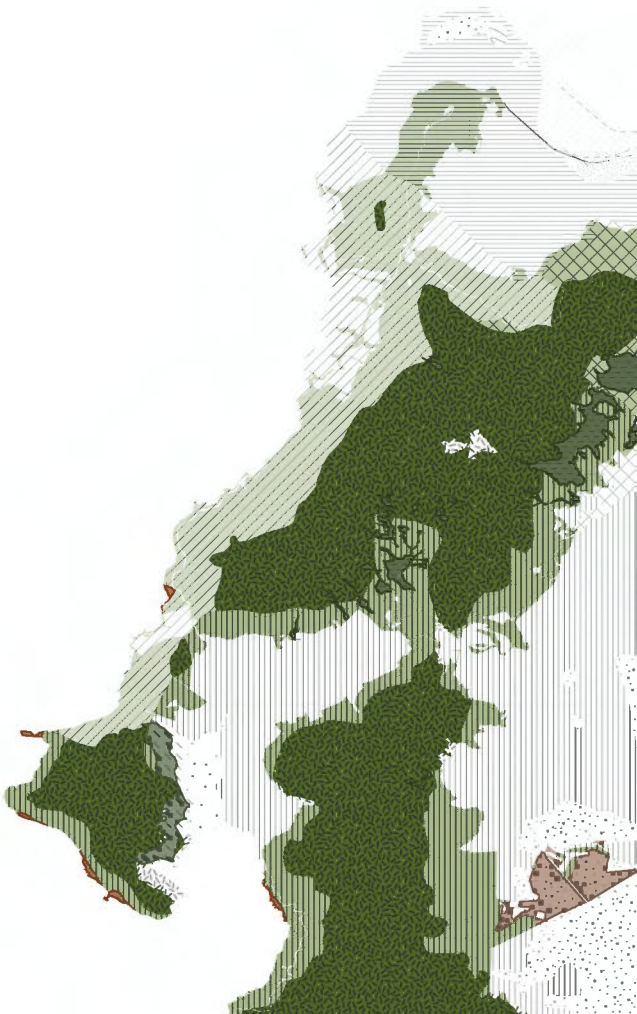
Artificial recharge aquifer

Scheme showing how an artificial recharge aquifer works.

Zandvlei

Fostering fauna & flora

The world is divided into six floral kingdoms, it is a classification system that divides plant species by means of their distinctive flora and forms the basis for an understanding of botany. The system is organised hierarchically in Floral kingdoms, regions and provinces. The six floral kingdoms contain 35 regions and 152 provinces. Each kingdom is a geographic area with a uniform composition of plant species. The boundaries of the kingdoms are soft, translational areas where species overlap from both regions, called the vegetation tension zone. Floristic kingdoms have a high degree of family endemism, floristic regions generic endemism and floristic provinces species endemism.

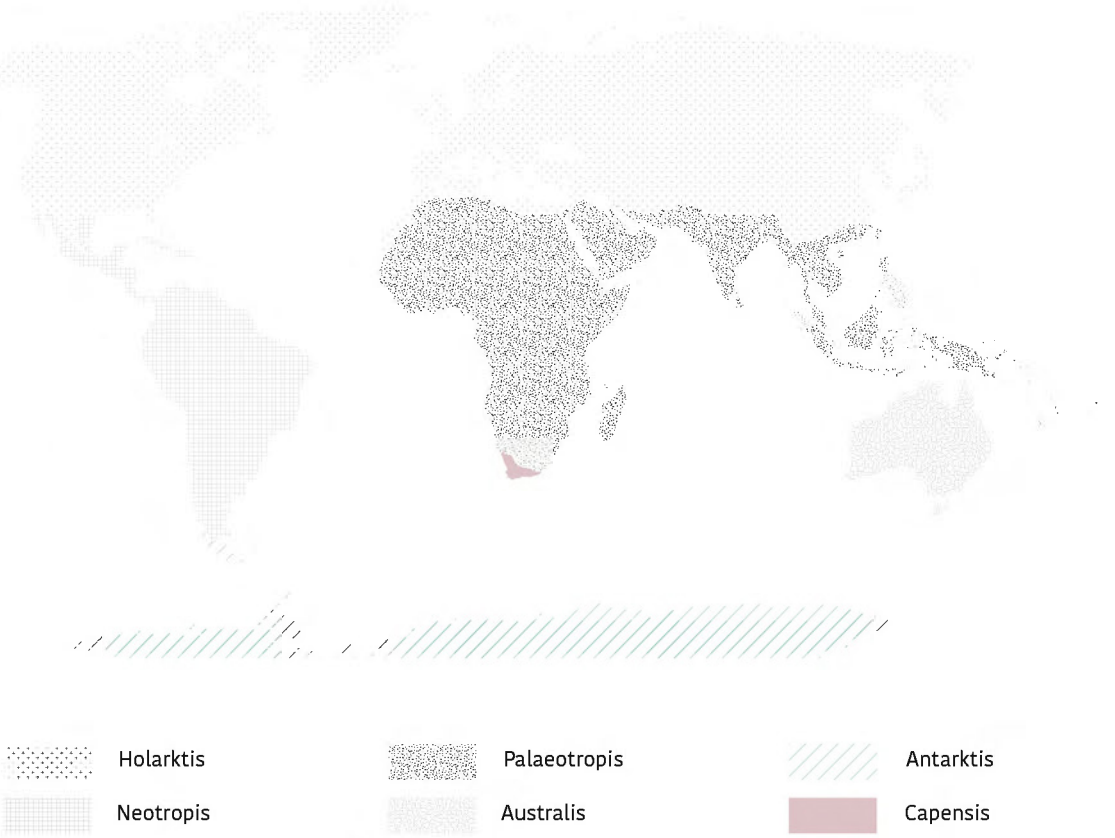


Vegetation

Map showing Cape Town's wide range of vegetation. The remnants are shown in color, the historical presence in black and white.

- Cape Flats Dune Strandveld (Falsbay)
- Cape Flats Dune Strandveld (Westcoast)
- Cape Flats Sand Fynbos
- Cape Lowland Freshwater Wetlands
- Cape Freshwater Lake
- Cape Estuarine Salt Marshes
- Peninsula Sandstone Fynbos
- Peninsula Granite Fynbos
- Peninsula Shale Renosterveld
- Peninsula Shale Fynbos
- Peninsula Granite Fynbos (north)
- Swartland Granite Renosterveld
- Swartland Shale Renosterveld
- Swartland Slicrete Renosterveld
- Southern Afrotemperate forest
- Hangklip Sand Fynbos
- Boland Granite
- Cape Winelands Shale Fynbos


2.5km
5km



Floral kingdoms

The world is divided into six floral kingdoms, it is a classification system that divides plant species by means of their distinctive flora and forms the basis for an understanding of botany.

The Capensis floral kingdom, also known as the Cape Floristic Kingdom is the smallest and richest floral kingdom in the world and consist of only one region: the Cape Floristic region. It is the only kingdom contained completely within one country, giving South Africa the third highest level of biodiversity in the world.

The Cape Floral Kingdom contains 3% of the world's plant species, about 70% are endemic, meaning they occur nowhere else on earth. The Table Mountain National Park alone has more plant species than New Zealand or the whole British Isles. The region only has one province, known as the Cape Floristic province. It has high diversity and 69 percent of the plants are endemic. The fynbos vegetation is unique to the Cape Floral region. It contains much of the biodiversity and has both economical and ecological value. Fynbos' economical worth is estimated at R77 million a year, based on harvests and tourism.

The Cape Floral Region is one of South Africa's World Heritage sites, consisting of eight protected areas. UNESCO declared the area to be of 'outstanding universal significance to humanity' and 'one of the richest areas for plants in the world'. Although in surface area the Cape Floral Region is less than 0.5% of Africa, it is home to nearly 20% of the continent's flora. The eight areas that are most important are protected: Table Mountain, the Hoop Nature Reserve, the Boland mountain complex, the Groot Winterhoek wilderness area, the Swartberg mountains, the Boosmansbos wilderness area, the Cederberg wilderness area, and Baviaanskloof. The Kirstenbosch Botanical Garden at the slopes of Table Mountain is the first botanical garden that has been included in one of Unesco's world heritage sites. Cape Town has 19 veld types of which 10 are listed as critically endangered and 3 as endangered.

Boulders beach

Only 8 of the vegetation types have met the national conservation targets and of 9, less than 10% of their natural area is conserved. Only 2 types are classified as with no concern for the conservation. [Odendaal et al., 2008; The Cape Floral Region, n.d.; Cape is world's extinction capital, 2014]

The remaining dune landscape at the southern coastline forms a natural barrier between the city and the sea. The further development of the cities on the coastline is halted by this natural landscape.

Nature reserves occupy land inside the city that cannot be used for urban growth. Some of the inhabitants don't see its value and are against the protection. They start to built illegally inside the nature reserve, which causes frictions with the existing wetlands and vegetation.

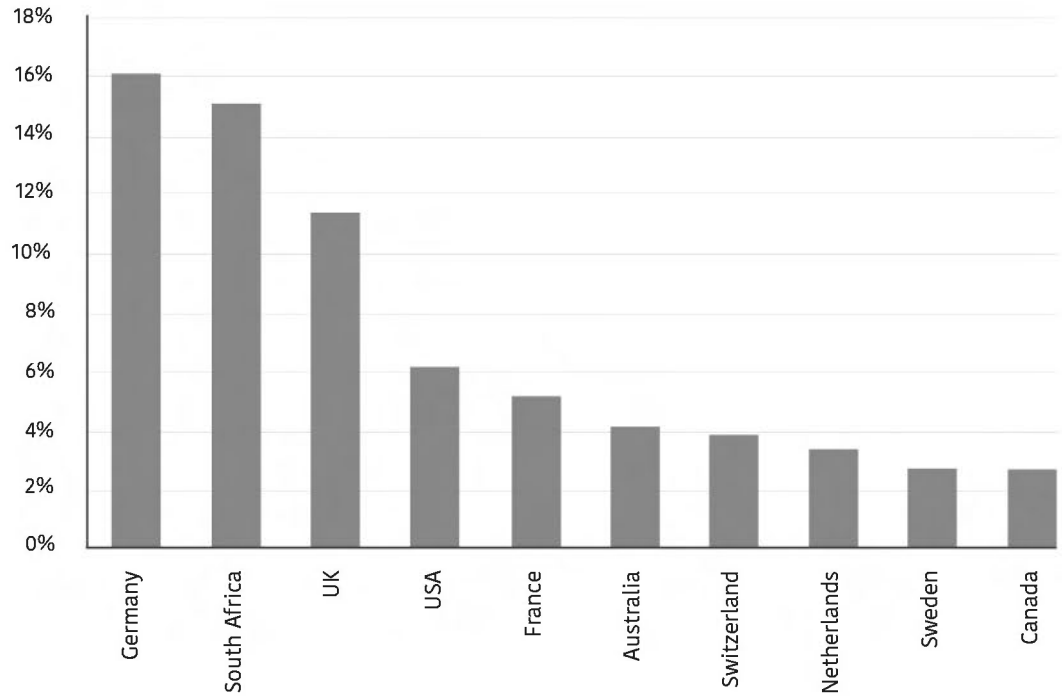
Sikhumbule is an example of a settlement built illegally inside the Driftsands nature reserve. At first it was an informal settlement, struggling with flooding in winter. Because of the law, both the government and the nature reserve could not remove the shacks and had to built formal housing. Today the settlement is still growing informally, but also struggles with flooding issues. In winter the shacks are often completely flooded and their inhabitants have to leave. During the winter these people then seek shelter at the community centre of Sikhumbule. There are other areas where the housing law causes similar problems. People built shacks in spaces not suitable for living, and make the government obliged to provide decent housing on the same site. Moreover installing drainage and hardening the surface against flooding makes the provision of housing in these places much more expensive than in other more suitable areas.

Zandvlei

Driftsands Nature Reserve

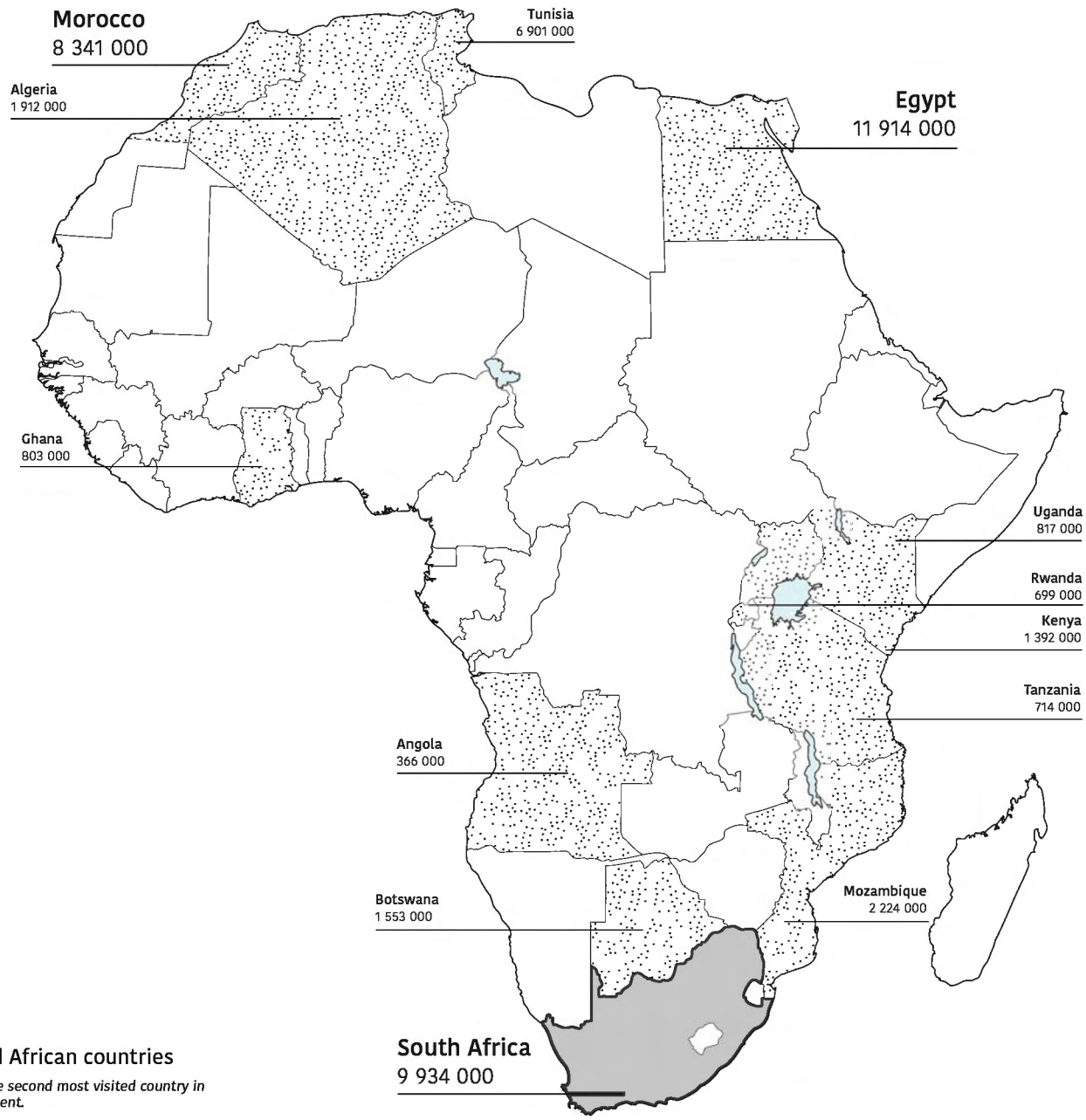
Tourism in South Africa has started to grow in 1994, when it became a democracy. Today it is the second most touristic country of Africa. Tourism constitutes 3.1% of the GDP or R74 billion, and 4.3 percent of the total employment in 2010, it is closely linked to the urban development of the city. Cape Town has become a traditional coastal leisure destination. Some developments have been built to attract tourists: the waterfront redevelopment, casinos, museums, theatres, shopping complexes,... The natural beauty of the region forms the main touristic attraction and is the most characteristic aspect of Cape Town.

There are beautiful beaches, mountains, forests, indigenous gardens and panoramic views. The Table mountain with the cable way is one of the major tourist attractions, and titled as one of the seven natural wonders in the world. The landscape provides a range of nature-based adventure tourism and leisure activities: rock climbing, hiking, mountain



Visitors by country

Most of Cape Town's tourists are originated from Germany and South Africa.

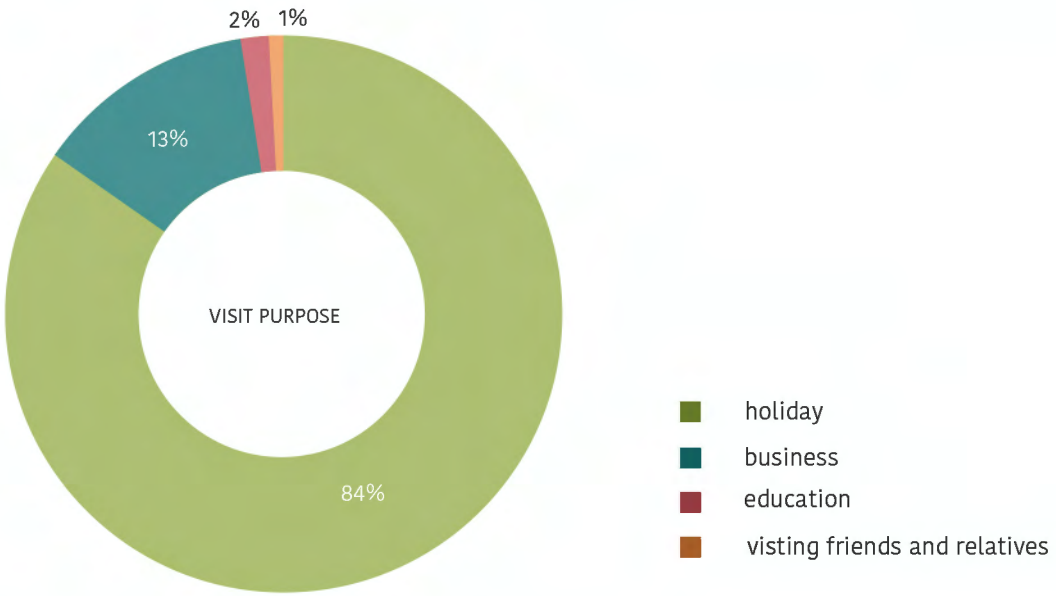


Most visited African countries

South Africa is the second most visited country in the African continent.

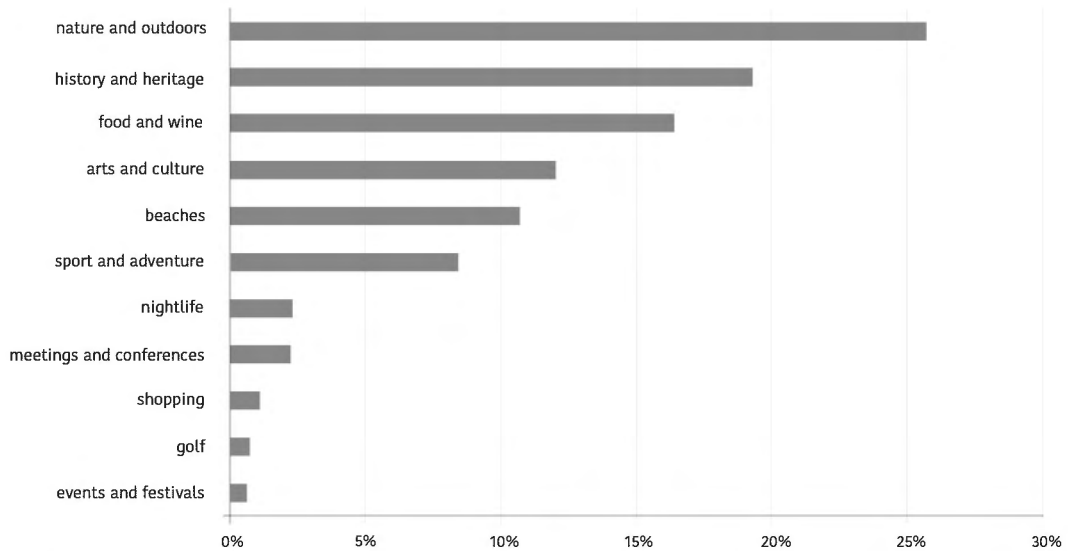
biking, hang gliding, abseiling, shark-cage diving, beach horse riding, birding, fishing, surfing, kitesurfing, kayaking, sunbathing,... Other sport activities like golf, running and cycling are also very popular in the city.
A lot of various events happen in Cape Town: fairs, festivals, exhibitions, cultural activities, music performances, concerts, drama, dance and wine tourism. Safari trips that leave from Cape Town to game reserves in the area.

Cape Town is pictured as a vibrant, diverse, creative and naturally beautiful city with a large heritage. In 2010 the FIFA World Cup was hosted in Cape Town, which boosted the tourist economy. But in all this visions and pictures, only the CBD, winelands and Garden Route are incorporated. The Cape Flats are always out of the picture, even though it is the largest area of Cape Town. [The city of Cape Town, 2013]



Purpose of visit

Most visitors come to Cape Town on holiday.



Tourism activities

Most popular activities for tourists in Cape Town are the nature and outdoors.

Fauna and flora at the Zeekoevlei.

An open letter to Cape Town

Leuven,
Belgium

June 3rd, 2016

Dear Cape Town,

During our very short visit of two months, we did not have the opportunity to get to know you in your full extensiveness. However, we did catch a small, yet very strong glimpse of your situation. As everything has two sides, we believe that the strength of our limited knowledge of you lies in the opportunity of developing different, or more precisely 'cutting edge perspectives'. Our first impressions of your very specific conditions were so strong, that they remained in our minds for a very long time. Moreover, it was simply impossible to ignore your very specific character. It struck us in such a way that we eagerly have been elaborating on it for almost a year. As a result, it has opened our eyes to various hidden potentials. However, we are convinced that the story can not end at this point. On the contrary, we are strongly convinced of the fact that our insights require further elaboration in order to entail certain vital changes in the future.

According to us, your condition can be characterized by a very strong duality between the remnants of the natural landscape (the voids) and urbanity. The latter reminds us of schizophrenia, from which you have been suffering for such a long time. Currently it is so strongly present, that it can be found almost everywhere and in all of your facets, both on different scales and in various locations. We notice a determined fight between these voids and the schizophrenic development of the urban growth. The latter is mainly rooted in the legacy of the social engineering of apartheid which came down to a very successful model of spatial planning. Although this regime has ended more than two decades ago, the sense of apartness remains as strong as ever. The apartheid's segregated, zoned, contained, nuclear and cellular mindset of how a space is perceived seems to be craved in your urban form. You either have a highway, a nature reserve, a township or a TRA, but never a combination of several of these elements together. This very autistic way of dealing with the elements is reflected in the fact that everything is separated from each other through a buffer or a fence.

Furthermore, your variety of cultures, landscapes and much more leads to frictions at places where their divers worlds meet, touch or overlay. It is this friction that makes your specific character striking. The different elements on their own are not as interesting as the adjacencies between them. In your very specific case, landscape is interesting because of the adjacency of urbanity. It provides an opportunity for activities that need nature to take

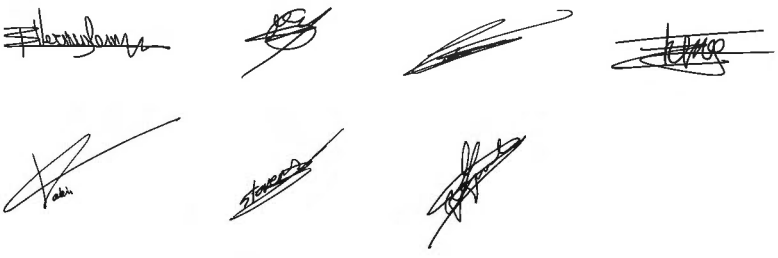
place in an urban environment, for example traditional initiation rituals. We are firmly in the realm of the fact that these zones of friction form the breeding grounds for small scale initiatives that hold a lot of opportunities for the future. Small incentives for change that occur in these places go hand in hand with bigger metropolitan developments and posses a great opportunity to benefit from each other. Therefore, we strongly believe that the foundation of your future lies in benefiting from the existing contrasts such as big versus small, natural versus organized, fast versus slow and how these contrasts grow towards each other. The juxtaposition of the different conditions where various things start to coexist forms a creative foundation for your future. We are convinced that giving you a master plan is very top-down and thus irrelevant and inappropriate. Therefore, we acknowledge your frictions and we react to your dualities through speculations and explorations of some sort of an hybridization so that different elements can start to coexist. In this way landscape and urbanity can start to ally each other.

Finally, we encourage you to imagine yourself as …

"a leading example for developing cities"
"a hybrid city of both natural landscape and urbanity"
"a city with landscape as a structure that could serve as a backbone"
"a city with landscape as protagonist for urban growth"

Yours sincerely,

Studio Cape Town



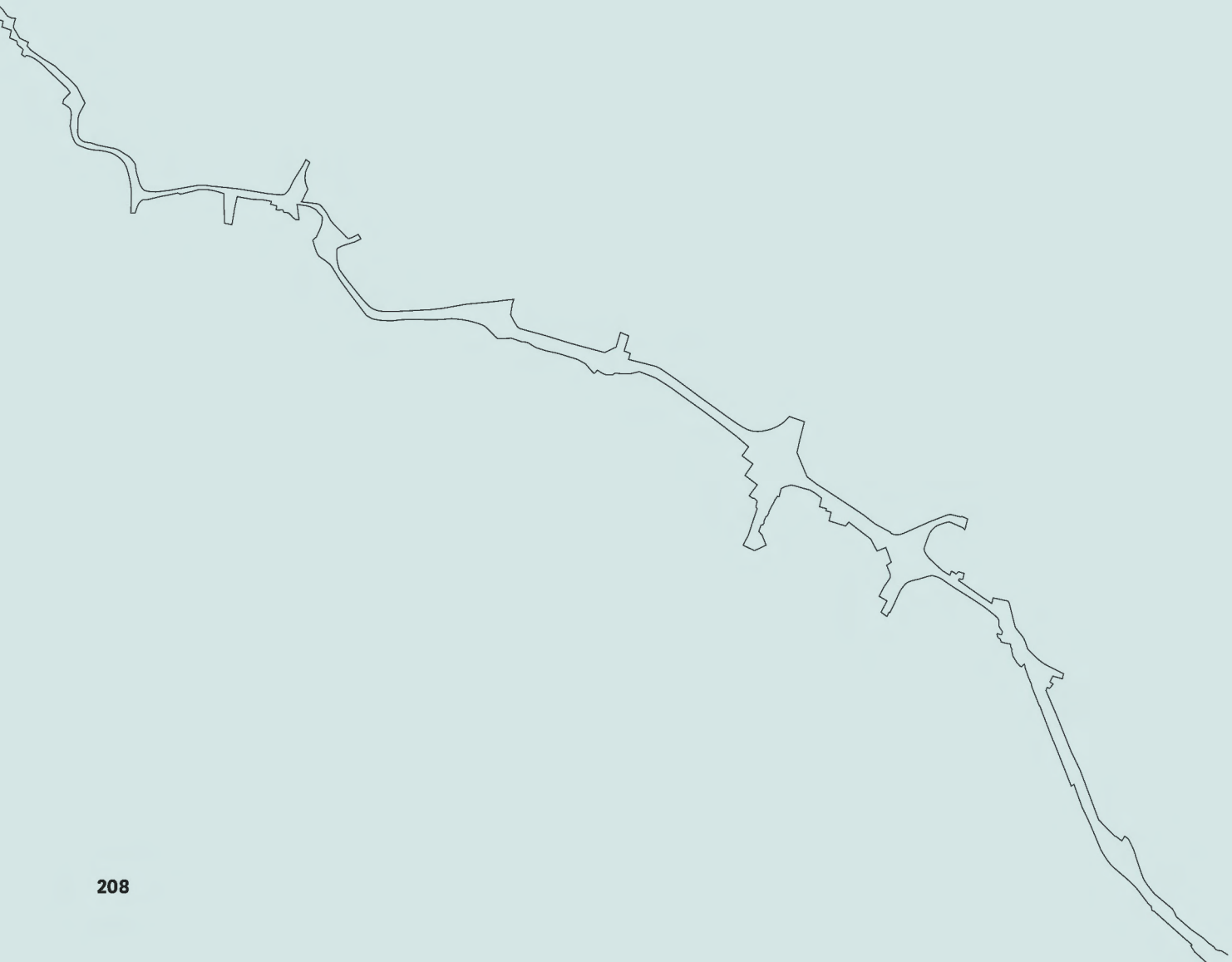
figures

introduction

Departing from the landscape, Cape Town is drawn by three different types of figures: urban cracks, urban rifts and urban crevices. Urban cracks, rifts and crevices are, respectively, long linear elements, large plains and smaller sequences of the city.

The reading of Cape Town in these figures, is one way of characterizing the city and is rooted in the studio's approach with the landscape as an ally. All of the three figures are elaborated on in the following sections on the basis of a general description followed by one case study for each figure. The case studies are design projects that illustrate the possible potentials of the figures.

urban crack



Thirty-meter high lighting masts that loom above the homes at regular intervals, with floodlights glaring down all night over the wide streets. Housing is set back at least 50-60 meters from the road, a dimension, like the lightning masts' height, that is governed by the distance you can throw a stone.

The Urban Crack is the figure of the motorway. The motorway constitutes like a crack, a narrow but compelling separation between elements of the urban fabric. It creates an in between space in the urban landscape. It is the residual space around the main infrastructure lines.

The figure of the Urban crack is an infrastructure. An infrastructure necessary for Cape Town's operation. It occurs in all cities but acquires a special role in Cape Town as an automobile city. The motorway is in fact a place where Capetonians spend much time of their lives. People are required to travel by car to work in the CBD, resulting in traffic jams during peak hours. This is because Cape Town is disurban. The city tissue is spread out and does not have the density of a metropolitan city. The motorways are the backbone of the city, but they also brought the flesh. It is a fixture to hold the urban fabric. Cape Town grew around these lines, not according to an urban sprawl from a nucleus, but in accordance with a dispersed grow further and further away from the CBD.

The shape of the Urban crack is linear and by this means clarifies its specific condition. Movement along it is unhindered and straight from A to B. The motorway winds itself in a rigorous way through the landscape, not taking it into account a lot. Crossing is often difficult so that the line forms a barrier between the townships.

The figure of the Urban crack is separating. The social engineering of apartheid came down to a very successful model of spatial engineering," says Edgar Pieterse. He explains how natural landscape features and manmade infrastructure were employed as physical barriers to keep the racial communities as isolated as possible. Between the buildings and the infrastructure lies an undefined buffer zone. This zone consisting of elongated strips, buffers the way from the rest of the city fabric. It reduces the roadside to dull meaninglessness. This zone from now on is called no man's land.

Freeways and rail way lines and their respective buffer zones were used to reinforce the apartheid city and up until today, these have a profound impact on integrating the city. and its people. This situation is also largely impacting on the ability of the metropolitan south east (MSE) sector to be spatially accessible to the mainstream of the city's activities, including large employment nodes.

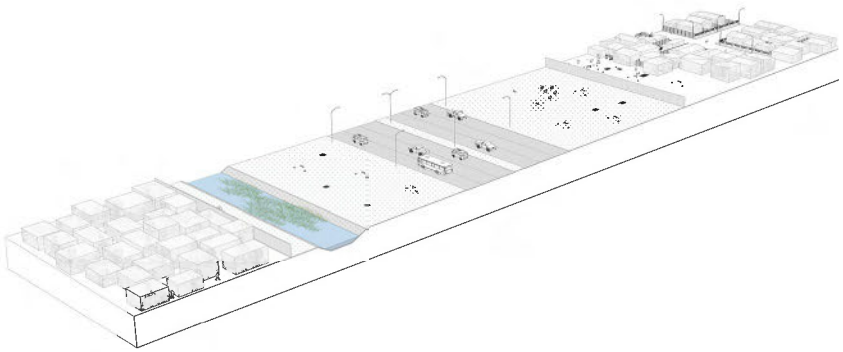
The figure of the Urban crack is a sequence. The Urban crack is experienced with movement and speed. Hereby monotonous landscapes are strung together as a rhythmic exposition of elements of attention. Car ducts, intersections and landmarks emerge as notes in a music play. The road also makes cities comprehensible. The driver can see how the city is organized.

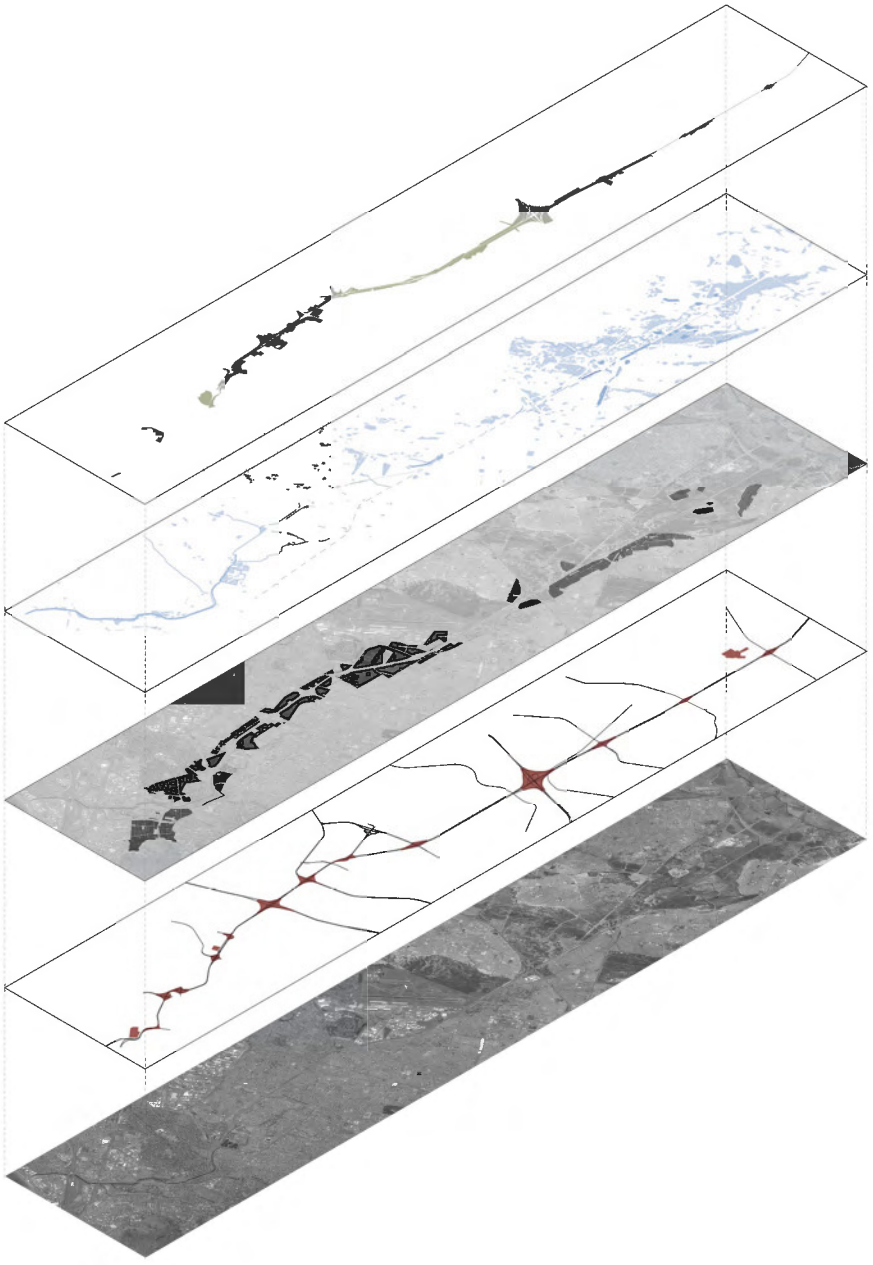
The figure of the Urban Crack is aesthetic. At first sight seen as something banal and ugly, these great engineering achievements have a potential beauty. The car ducts, major junctions and ramps are beautiful structures and have something peculiar. Road watching from the perspective of the passenger is a delight and the motorway is - or at least might be- a work of art (Banham 1971a). The view from the road can be a dramatic play of space and motion, or light and texture, all on a new scale (Banham 1971b).

This figure consists of a number of elements. These elements can be found in other figures as well, but the shape of the crack gives it a specific condition. The elements are barriers, buildings, road infrastructure and elements of attention.

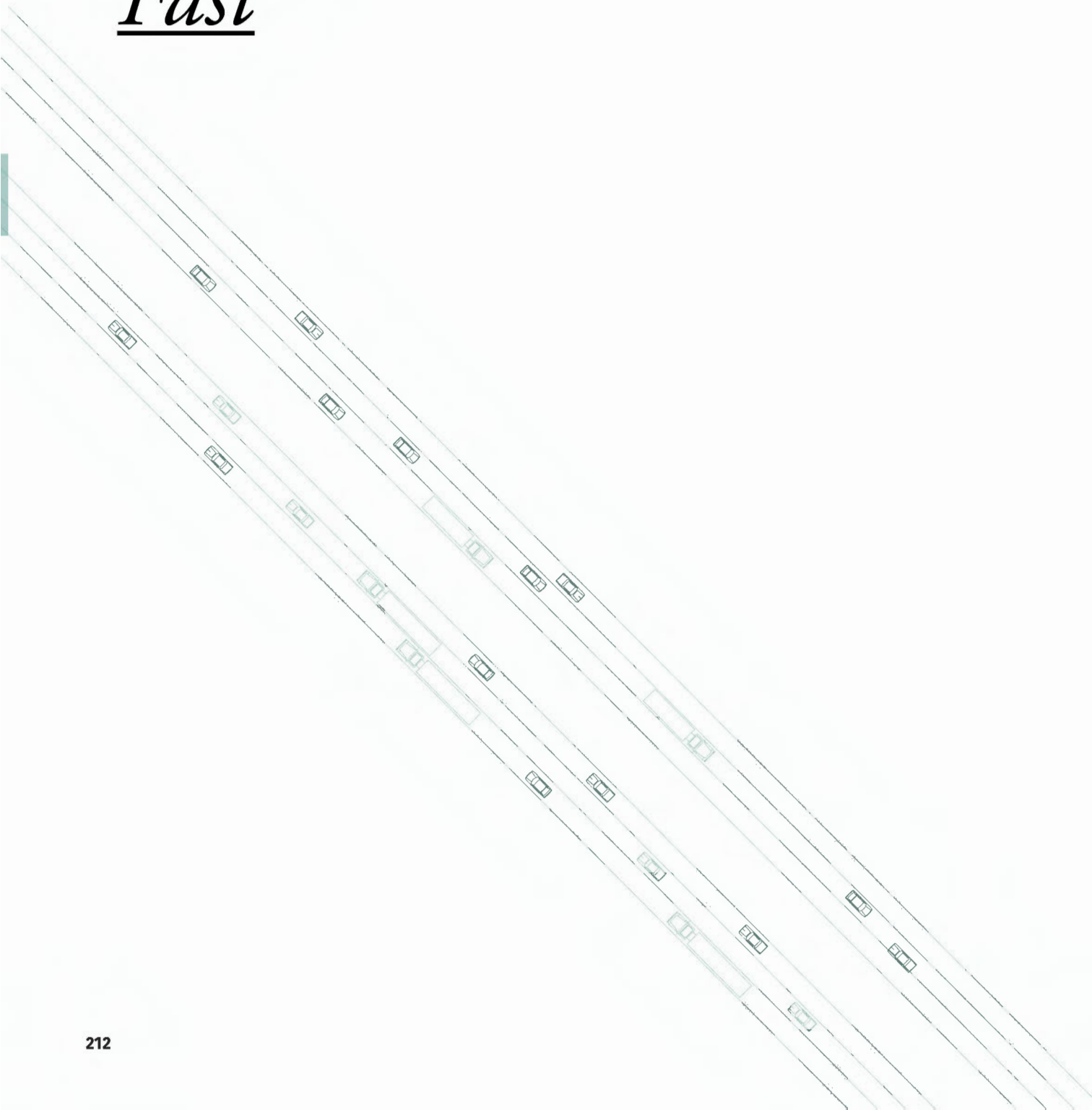
The barrier element appears in different forms. They can be man-made such as fences, but also natural such as water and no man's land. The water layer consists of rivers and wetlands. The no man's land is the remaining undefined open space between the road infrastructure and the urban fabric.
A second element is the urban tissue, which is bordered by a sharp edge. The urban tissue doesn't involve itself with the road landscape.

A third element is road infrastructure. These are the roads, but also the elements of attention. Elements of attention are places where an increased focus is created. This is done at intersections, bridges, land marks, ... This third element is thus all the infrastructure and machines that are required for the operation of the city.





Fast



Slow

Introduction

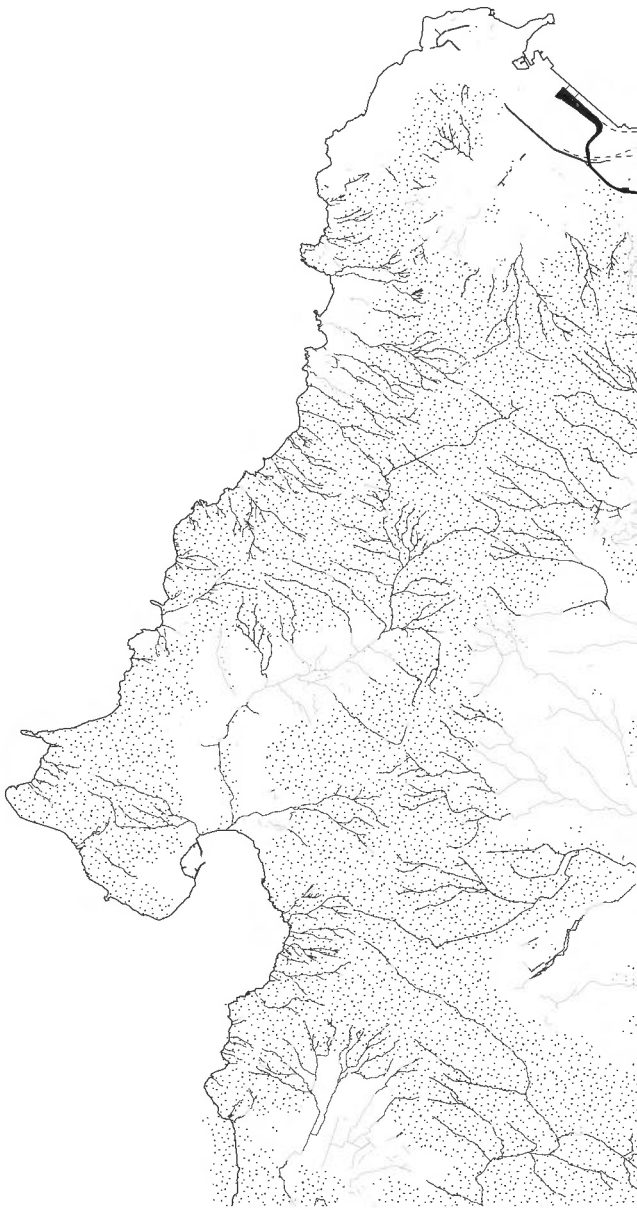
The proposed project for the urban crack investigates the duality between the landscape and urbanity. The autistic way of dealing with space is very present along the crack. Due to the immense scale of this figure in the landscape, we believe it this has great potential to become a backbone of the city. The space is merely used as a space of flow, and we envision it to become a space of destination. For this we work on multiple scales, longitudinal and transversal on the crack. The figure goes alongside with a buffer zone, that we see as an opportunity. It is in this space that we see an opportunity for an interplay of scales between fast and slow, big and small. The smaller scale initiatives can take over the metropolitan space, hand in hand with big implementations.

Context

location

As a case study of the figure of the urban crack, we investigate Settler's Way. It is part of the larger-scale N2 highway, a national route in South Africa that runs from Cape Town through Port Elizabeth, East London and Durban to Ermelo. It is the main highway along the Indian Ocean coast of the country.

Running diagonally between the CBD and the Cape Flats, it is a specific characteristic for Cape Town.




2.5km
5km

Evolution Settler's Way

Settler's Way was constructed through the Cape Flats before any major townships started to develop.

The map below shows an aerial picture of 1945, right before the apartheid planning began. Once out of the CBD, drivers passed rural areas, going out of Cape Town into the rest of the continent.

1945

The landscape which was unaltered has now undergone a definite claim by man. Over the course of time the landscape came under more and more pressure by the construction of the airport, housing and industry. Settler's Way is used as a physical barrier during apartheid planning.

The map below shows an aerial picture of Cape Town in 1988, when most largest townships were developed and when Cape Town grew significantly.

1988

Access points into townships.

\+ Access point
--- Railway line

Friction in speed

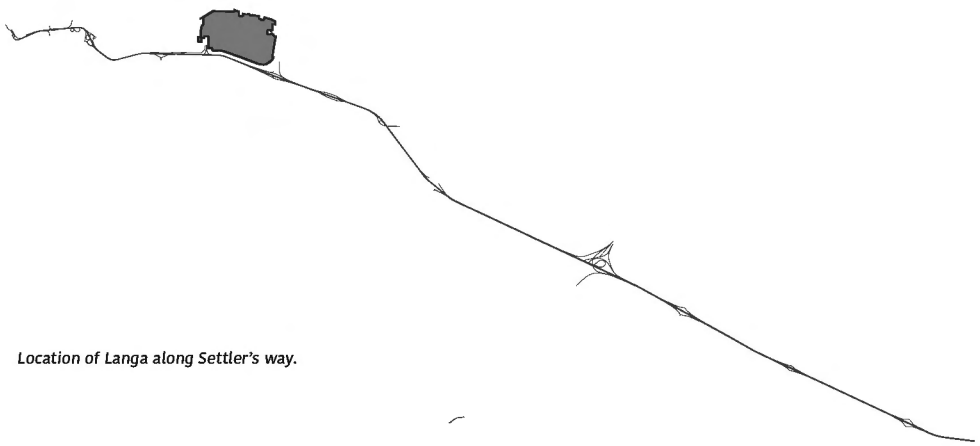
Because of the militaristic way of planning a township, it has very little access points into it, resulting in even more isolation.

Due to the limited access, the townships are only reachable by a very inefficient route. Drivers have to make a detour by driving successively along roads with reducing speed. This leads towards a sequence of different speeds, causing frictions between them. Starting from the highway with the highest speed of around 110 km/h, drivers can enter the township through a series of detours by roads with a speed of 50 km/h.

This characterizes the first duality between fast and slow.

We will take a closer look to this phenomenon on a bigger scale. Langa is an ideal example of the militaristic ideal of apartheid. It is the oldest planned and controlled townhip in Cape Town, established in 1923.

Langa can be considered as a strictly isolated enclave, only accessible from three entrance roads, which – in case of agitation- can be closed of easily to control it.



Location of Langa along Settler's way.

Langa case study: entrance points and speeds.

- 110 km/h
- 90 km/h
- 70 km/h
- 50 km/h

Friction in space

Townships are most often hemmed in by highways, rail lines, rivers and valleys, and separated from the affluent white suburbs by protective buffer zones of scrubland. It is this buffer zone, in combination with the urbanity next to it, that makes the second duality.

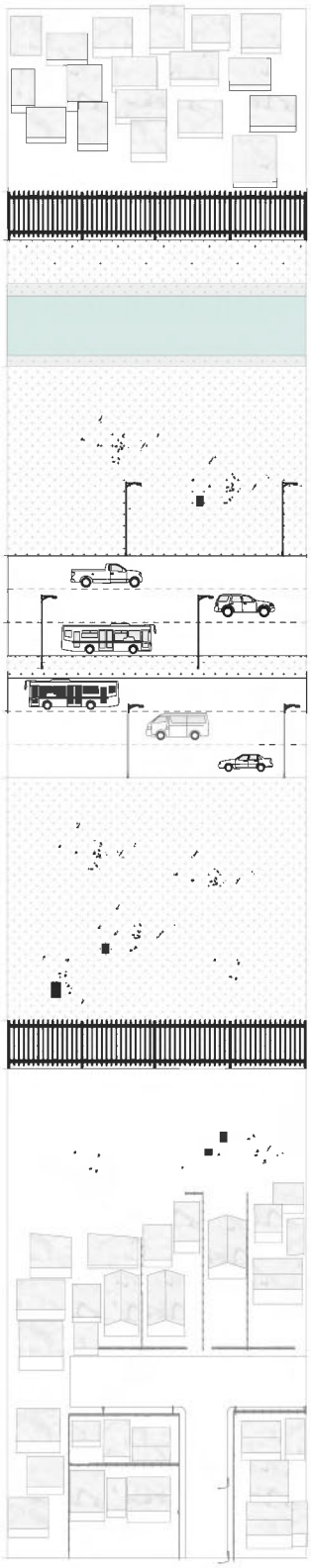
The no man's land

Thirty-metre high lighting masts that loom above the homes at regular intervals, with floodlights glaring down all night over the wide streets. Housing is set back at least 50-60 metres from the road, a dimension, like the lightning masts' height, that is governed by the distance you can throw a stone.

This zone, from now on referred to as "no man's land", is kept intact by governmental and non-governmental forces that do not allow informal settlements to come closer to Settler's Way.

This no man's land gives the landscape the possibility to absorb water from the highway, often resulting in small streams leading to greater wetlands. This allows for a natural cleaning system of surface water, but is underused.

Typical section of Settler's way.

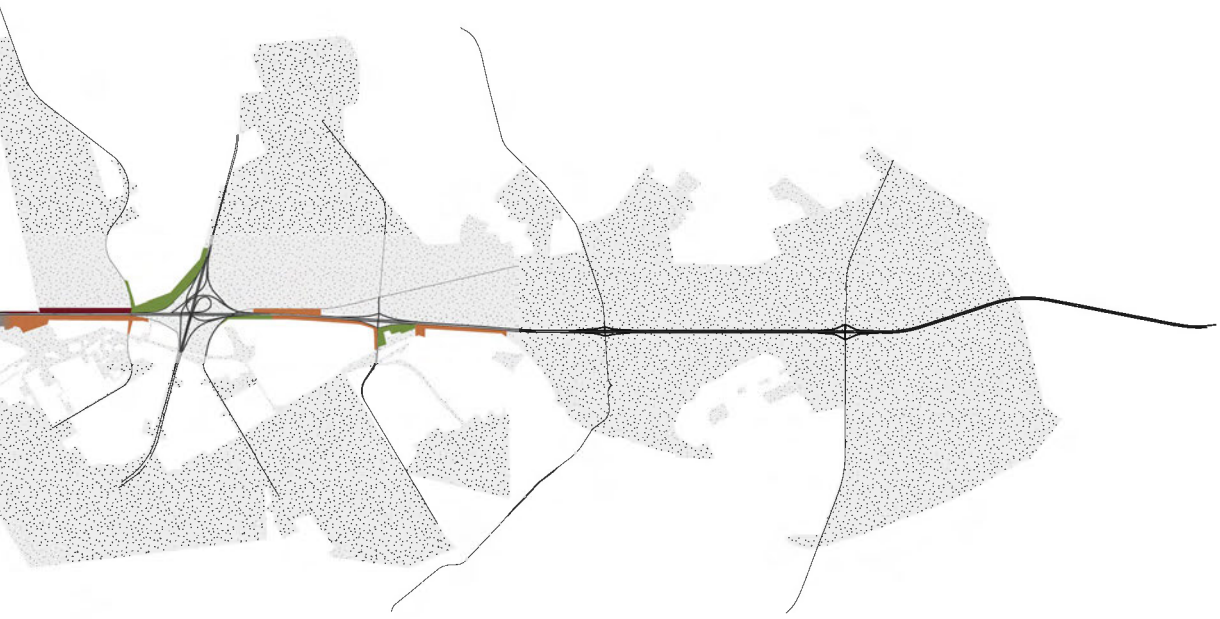

informal settlement
fence
water buffer
no man's land
car lane
IRT bus lane
car lane
no man's land
fence
formal settlement

Although this no man's land today is undefined, it is used by inhabitants of the townships. Several informal activities take place on this mediating space. Some activities that take place on the non-defined no man's land are walking, playing, swimming in the canals, keeping cattle, rituals, sitting, doing laundry, ...

No man's land atmosphere. These pictures were taken by us while driving along Settler's Way.

Types of no man's land.

- No man's land next to formal settlement
- No man's land next to informal settlement
- No man's land next to industry
- Open space

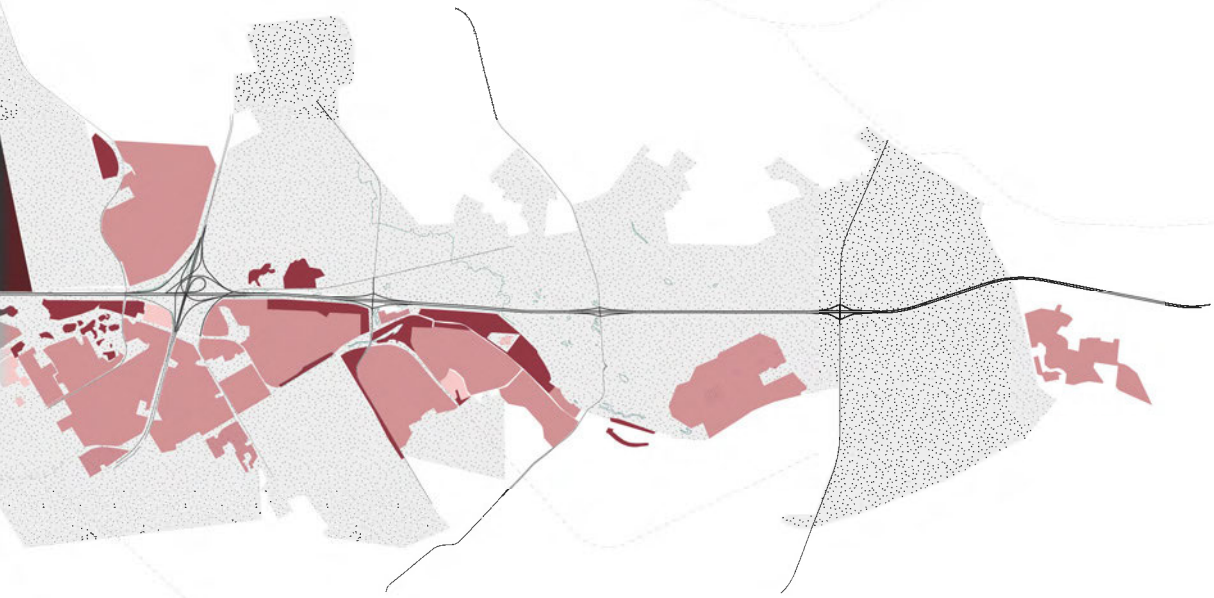


At first sight, the no man's land seems to be monotonous and repetitive. Yet this elongated landscape can be divided into a sequence of strips with their own character. Depending on the nature of the adjacent enclave, we distinguished three different groups.

No man's land adjacent to an industrial area lends itself for more top-down programmes, while no man's land along a residential area rather must have a meaning for inhabitants living next to it and therefore need a bottom-up approach.

Types of enclaves.

- Housing
- Industry
- Informal housing
- Special programme
- Open space
- --- Railway line
- — Rivers and canals



The enclave

The other actor is the urbanity. In our reading of Cape Town, we characterized it as a city of enclaves. Isolated and monofunctional islands, which are always one thing or the other.

Driving along Settler's Way, this enclave structure of Cape Town becomes visible. Commuters sequentially pass industrial areas, formal settlements, informal settlements, nature reserves, ...

Water bodies along Settler's way.

- Wetlands
- Waste water treatment works
- Floodlines
- Pipeline

Water layer

Driving along Settler's Way, there is a continuous water story present with bigger and smaller significance. At several intervals wetlands are crossed, mainly located at crossing points, where storm water from the road is collected and seaped into the ground. Also canals and rivers run accross and along. There are three big waste water treatment works, located at Athlone, the Boquinar industrial area and at Khayelitsha. Rivers and canals are connected to these waste water treatment works. A big part of the main pipeline for water provision runs along Settler's Way and crosses at the Kuilsriver trefoil.

Mobility layer

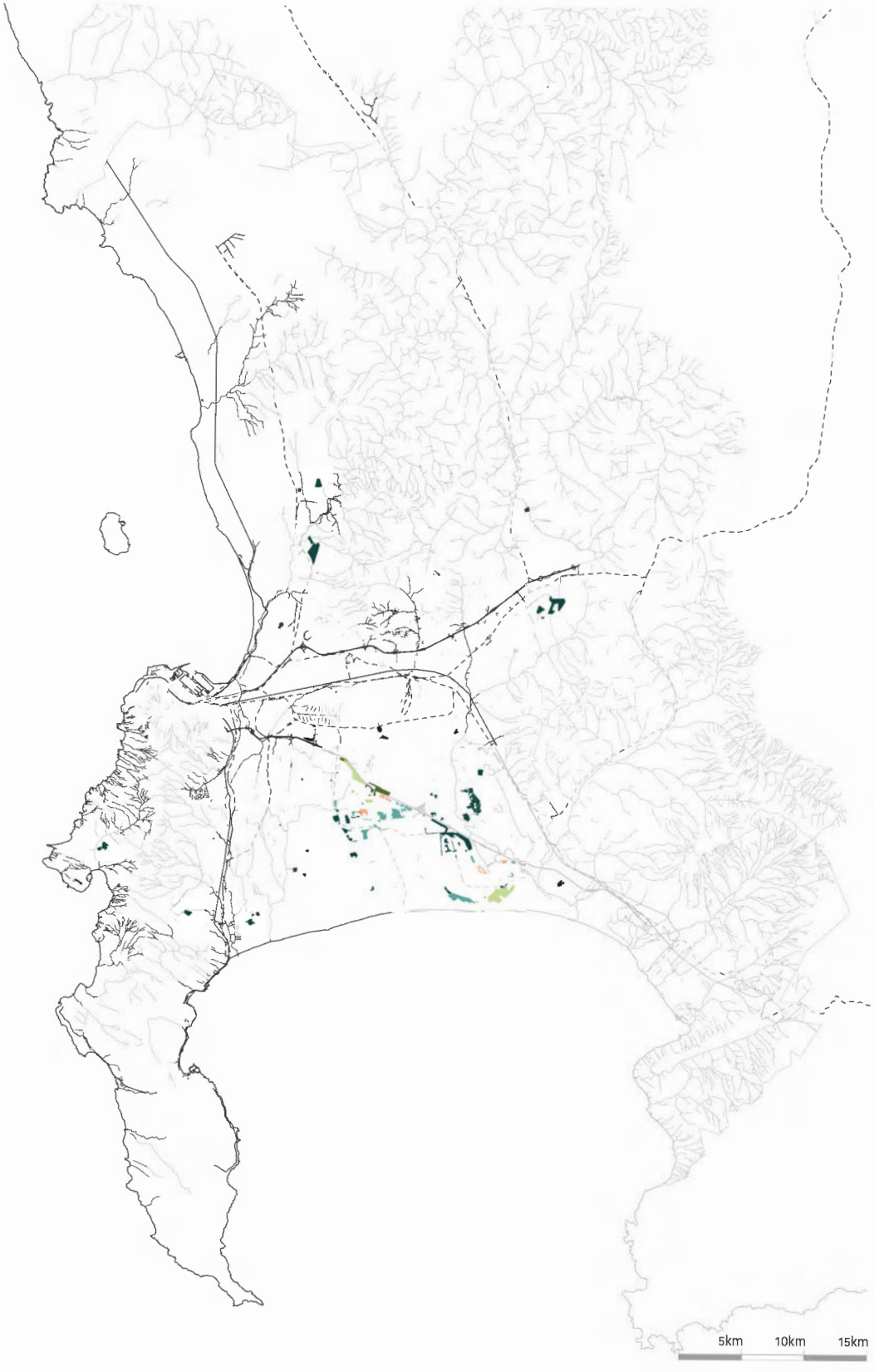
The map shows the distance from high transport areas for informal settlements in Cape Town. The main high public transport mediums are the IRT bus system and the railway lines.

The existing bus network is mainly concentrated closer to the CBD. Also one encounters fewer railway stations when leaving the CBD and going to the Cape Flats.

Most informal settlements are located away from the centre and thus have a poor access to high public transport areas.

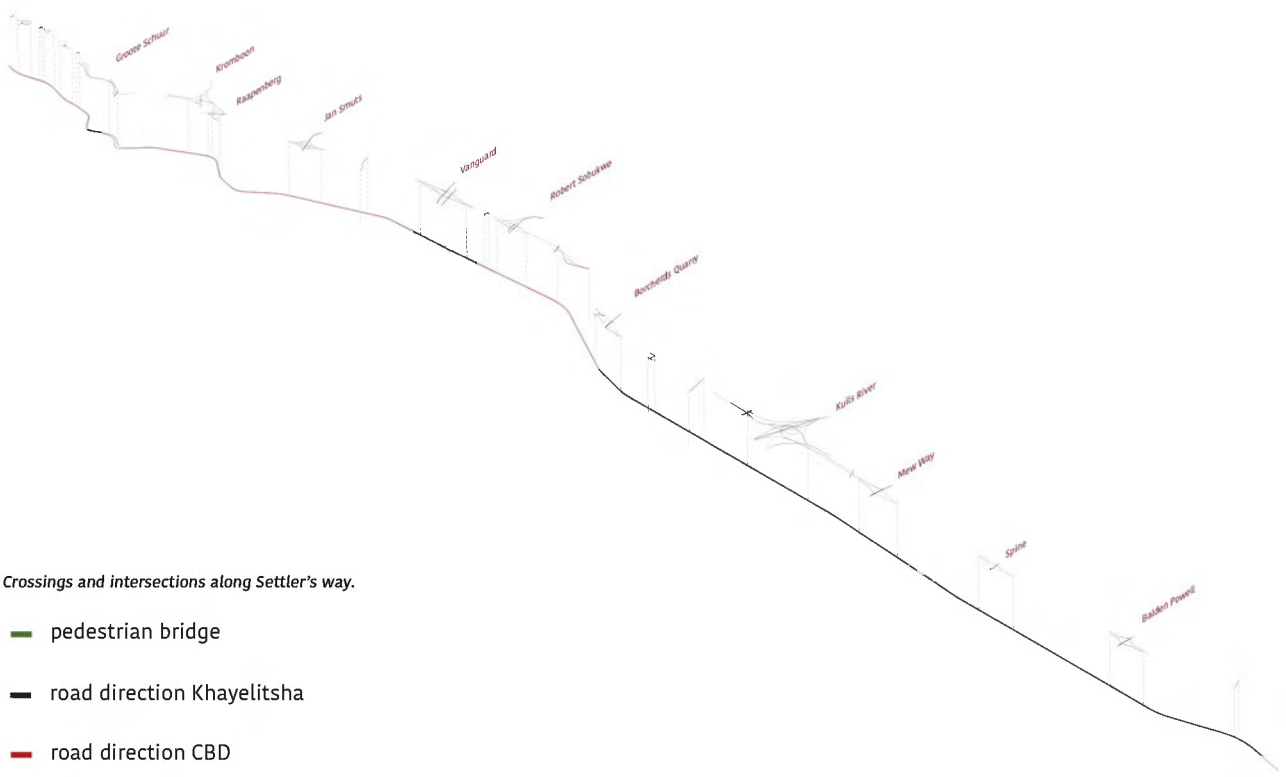
High transport accessibility of informal settlements.

- 0 - 400 m
- 400 - 800 m
- 800 -1600 m
- 1600 - 2400 m
- 2400 - 32 300 m
- --- railway line
- —— main roads


5km
10km
15km

Friction in direction

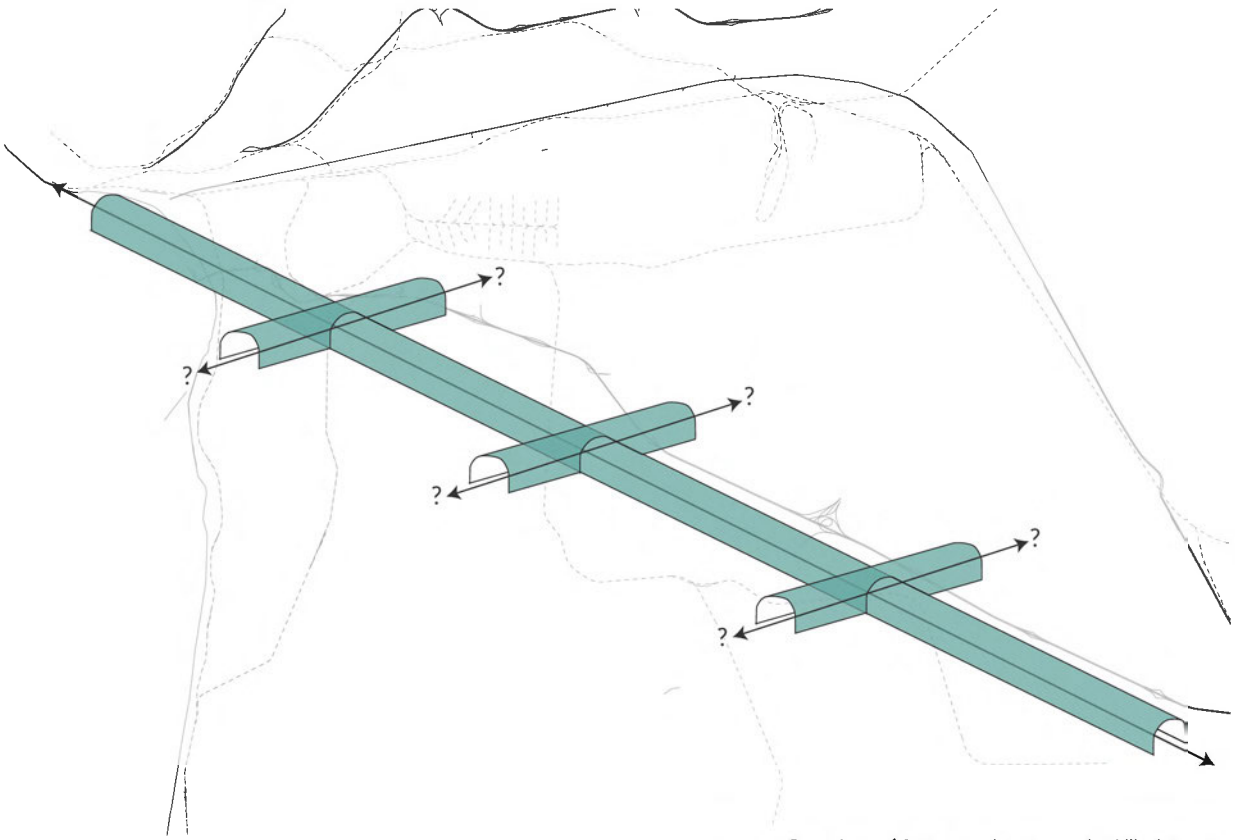
Settler's Way allows for unhindered movement of automobile traffic without any intersections, traffic signals or property access. Crossings are carried out by overpasses or underpasses, any other way of crossing is near impossible. It forms a barrier between the different enclaves.



Crossings and intersections along Settler's way.

- pedestrian bridge
- road direction Khayelitsha
- road direction CBD

This friction can also be seen in a more abstract way. The dominant direction of resource flows is now longitudinal along Settler's Way. Our aim is to investigate the potential of breaking open this linear flow by working transverse on it. (cfr. Brown-Luthango, M., 2015).



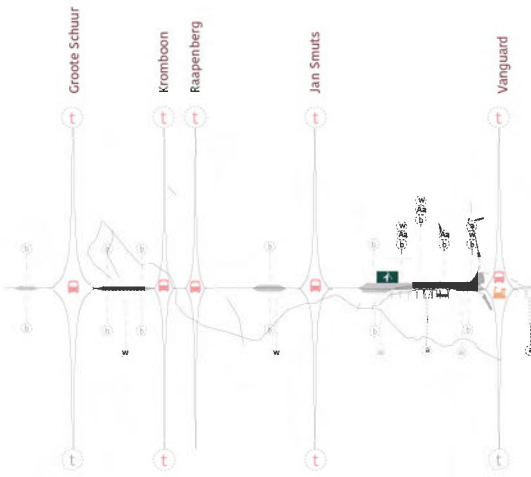
Resource flow scheme. (cfr. State/Society Synergy in Philippi, Cape Town).

Settler's Way is a separating longitudinal flatline, stringing together monotonuous sequences of entangled layers. Development and mov

ement happens parallel to it, resulting in a coordination of urban tissue, water bodies, natural landscape, road infrastructure et cetera.

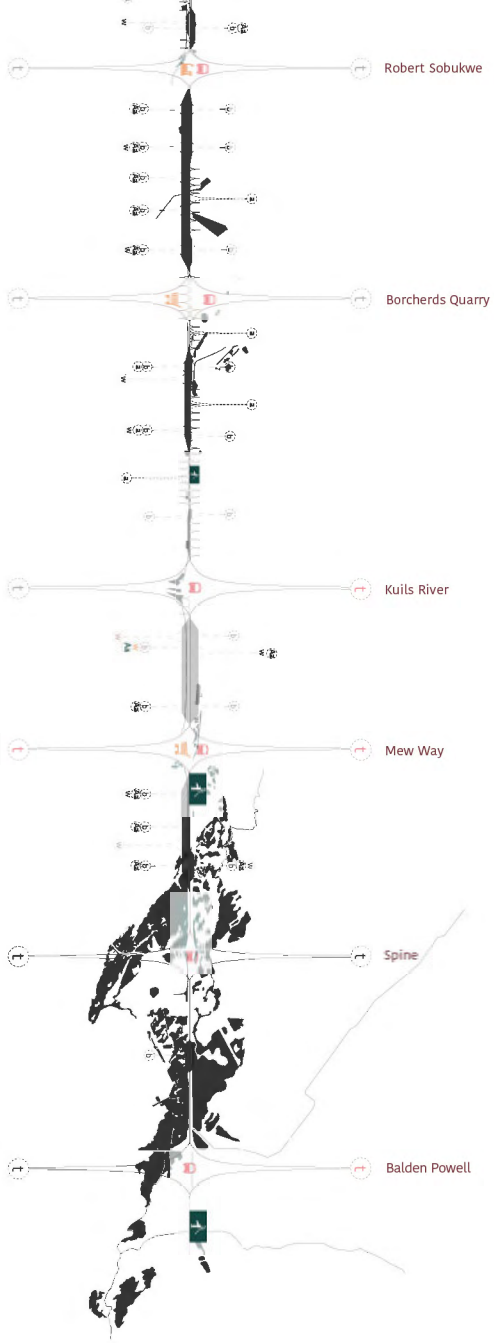
Strategy

The proposed strategy is to alter Settler's Way from a space of flow into a space of destination. We believe that the figure has the possibility to become a backbone for the city. Therefore we work on very different conditions, big and small, fast and slow. These conditions are present at the same space and in the same time. By their coexistance and interaction, they have the potential to strengthen each other. We focussed on different fundamental layers, necessary for a functioning city: water, waste, transport and food production. These layers go hand in hand and form the base of the framework for our strategy.



Our strategy doesn't only cover the physical built environment, but also touches the social and economic aspects of the well-being of the city users. By claiming strips of no man's land and connecting it to the surrounding township, we give it a meaning for the inhabitants.

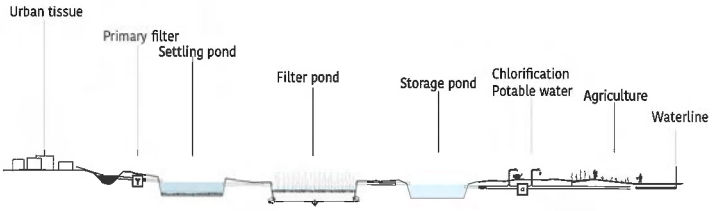
More specifically, we implement small and large scale infrastructure at a certain inverval along Settler's way. Here we take the opportunity to combine all of the before-mentioned layers into hybrids, instead of treating them separately. Combining and connecting them along the strip, interaction can occur.



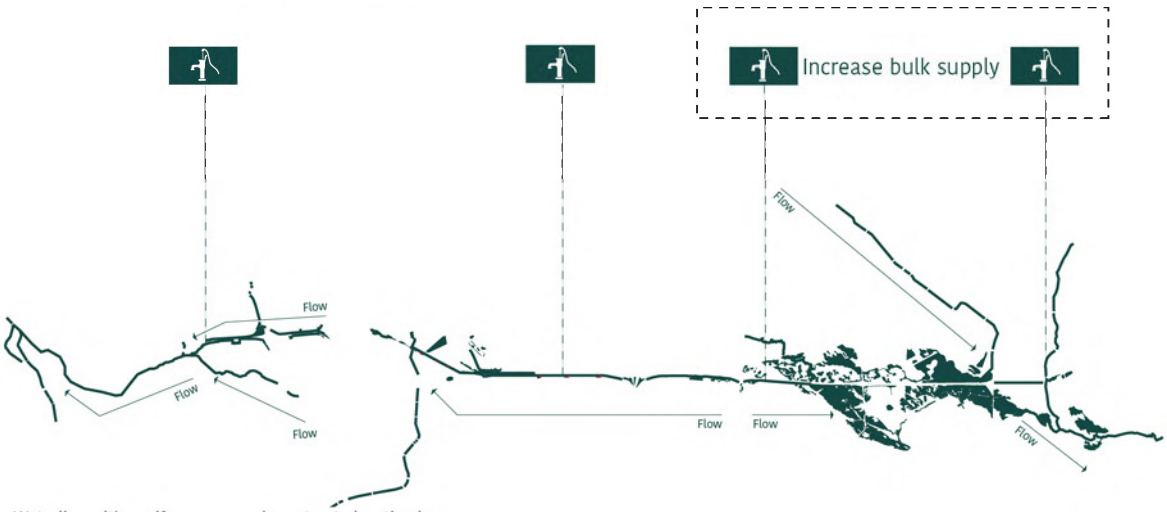
figures | urban crack

Water as a backbone

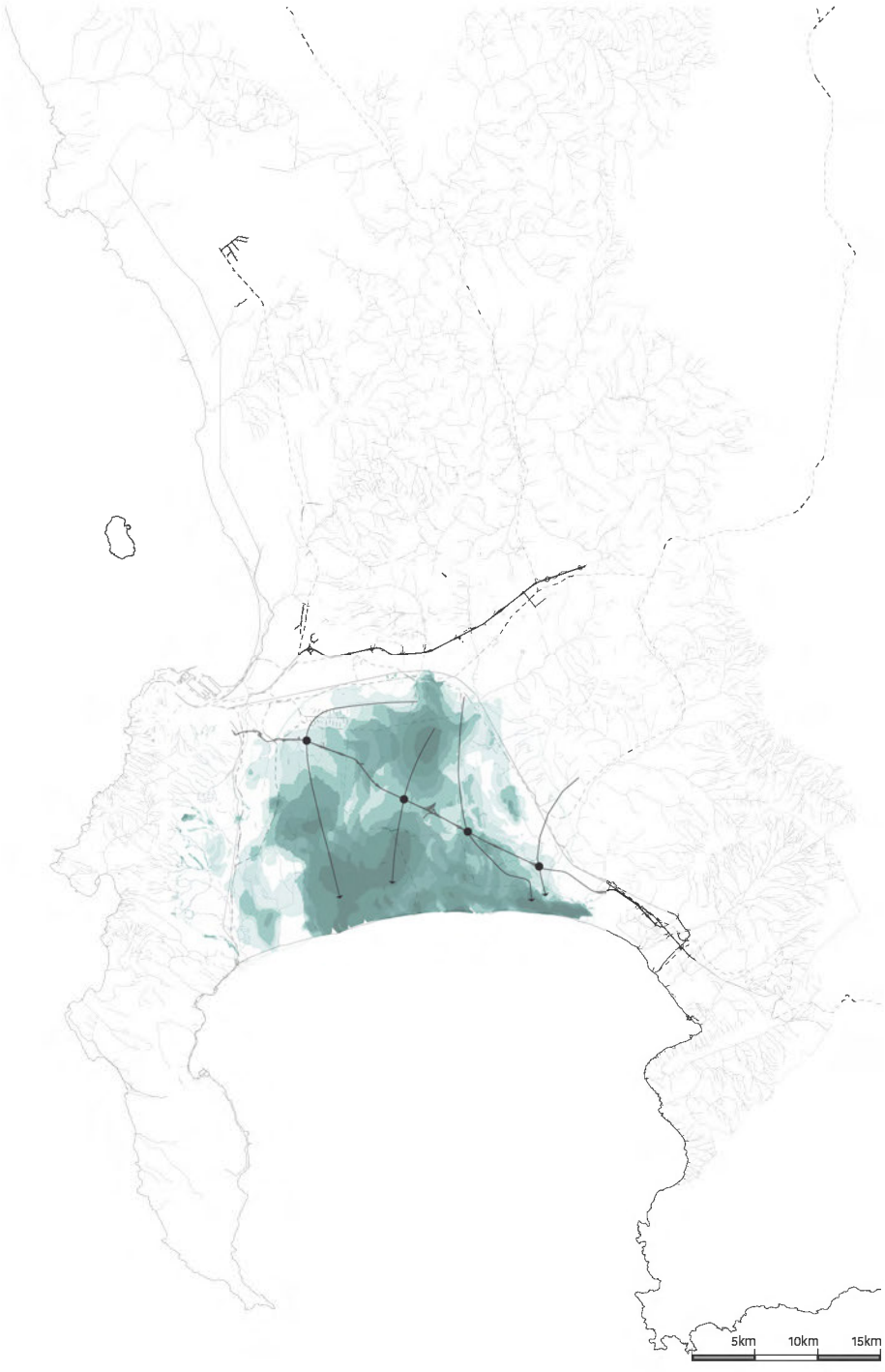
Water is the backbone element of the project. Since Cape Town as a whole lacks bulk supply of potable water, and suffers from flooding in winter, the project alongside Settler's Way must provide answers to these problems. The proposed water system is disconnected from the centralized main water systems, as a centralized approach is not the only answer. Yet both should meet and work together to cope with the different water fluxes. The starting point is the Cape Flats Aquifer. Currently the input into the aquifer is greater than the output, which leads to a high water table and groundwater flooding. Yet people in the informal settlements have no easy access to water, limiting the possibilities for urban agriculture. We propose to create a water line along Settler's Way, making use of the existing canals. The canals are connected into longer segments. By pumping water out of the aquifer into these canals, we can form a structuring water line. The water line provides fresh water to the urban tissue and the no man's land. It is a key element for thriving urban agriculture, on the large and small scale. It also allows for an increase in washing facilities and sanitation. As a second function, it is used to deal with the excessive water flows in winter, increasing stormwater drainage via the water line to the wetlands.



Principle of a constructed wetland



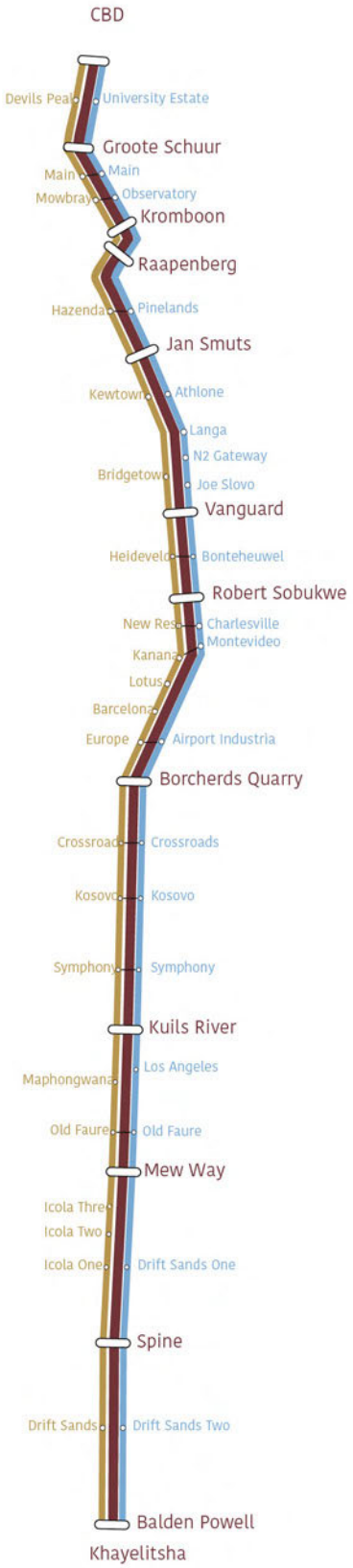
Waterline with aquifer pumps and constructed wetlands

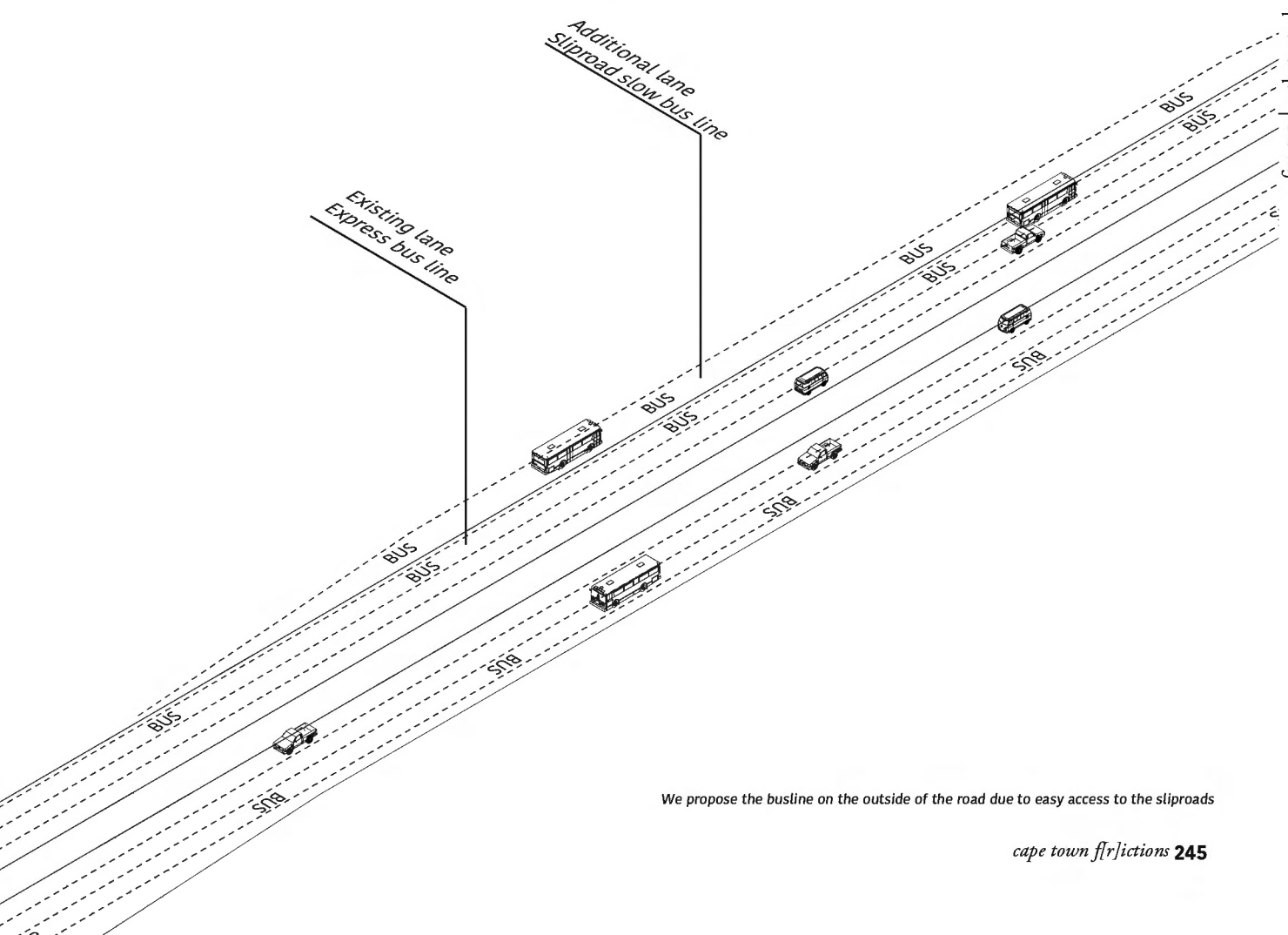


The pumps are placed where the groundwater flows intersect Settler's Way

Trunk and feeder

Currently Cape Town is implementing a trunk and feeder bus system to improve public transport. We wish to use this feature and implement it in our strategy. We propose a dual system, an express bus system and an interstop system. The express bus has stops at the major road crossings along Settler's Way. We want to convert these crossings to hybrid bus stations that house different functions. These stations are connected to the minibus taxi system and serve as a terminus where the minibus can load and drop off commuters. People from the townships can take the minibus taxi towards the express bus station, from where they can continue their travels along the express way. In parallel with the expressline an interstop system uses sliproads to gain access to the edges of the townships. These bus stations form entry points into the urban tissue, increasing access to transport. Extra road infrastructure has to be added to accommodate the sliproads. These sliproads come on and off Settler's way at certain intervals, creating a rhythm diagram. They become the carriers of a new urbanity, adding addresses and front sides to the backside of the settlements.



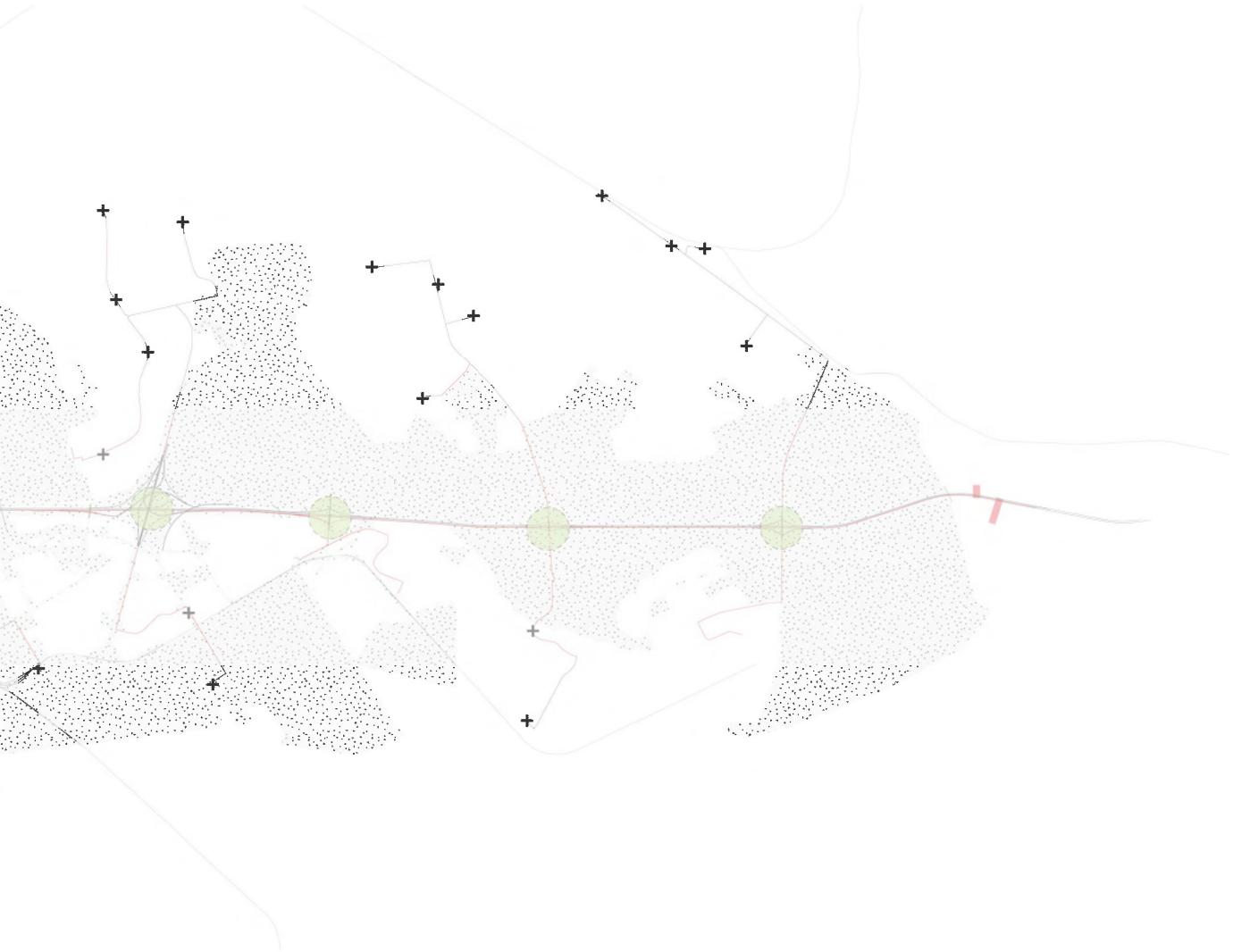


We propose the busline on the outside of the road due to easy access to the sliproads

Proposed minibus taxi - bus interchange

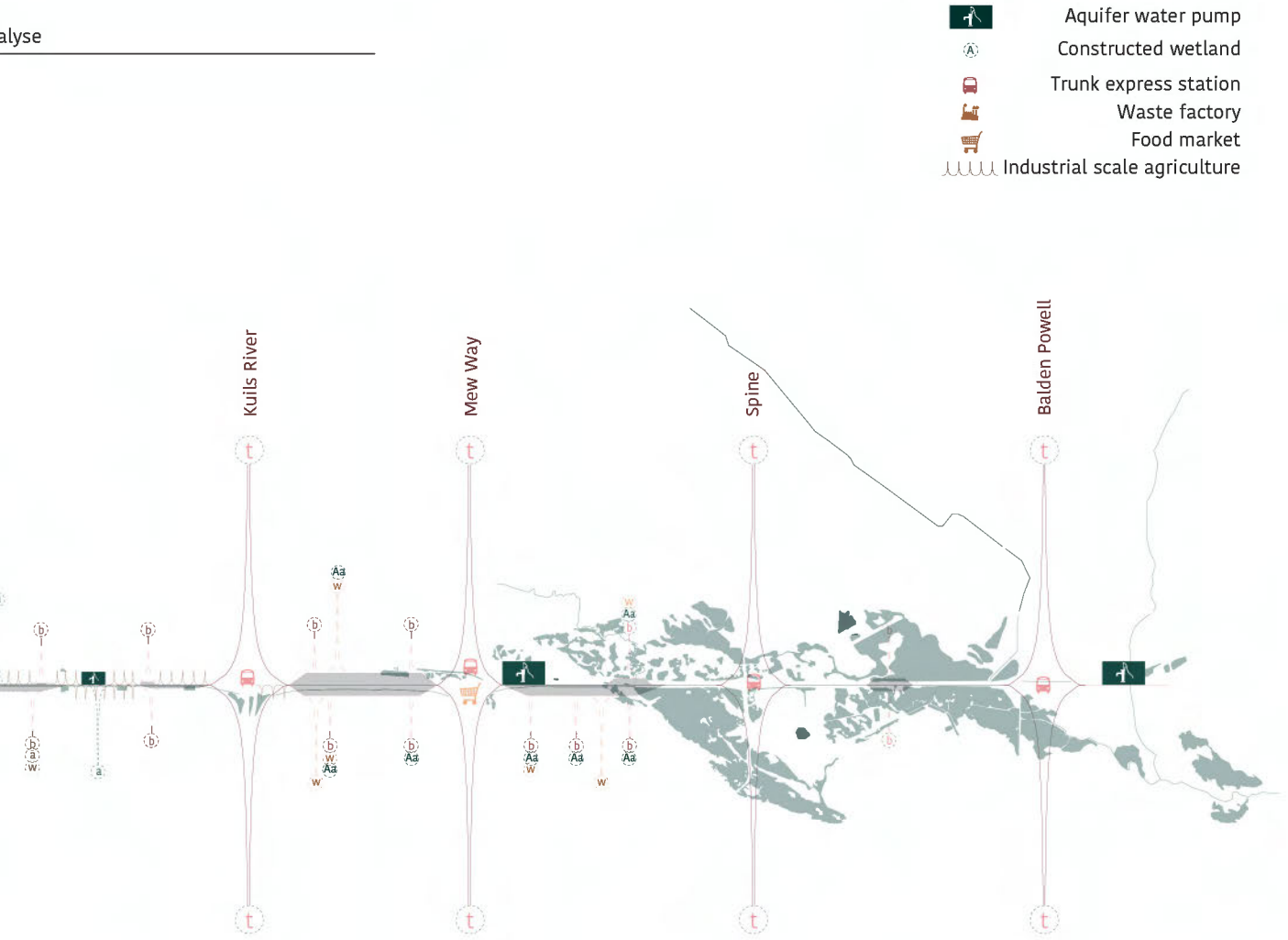
Existing minibus taxi rank

Possible taxi route to interchange



small

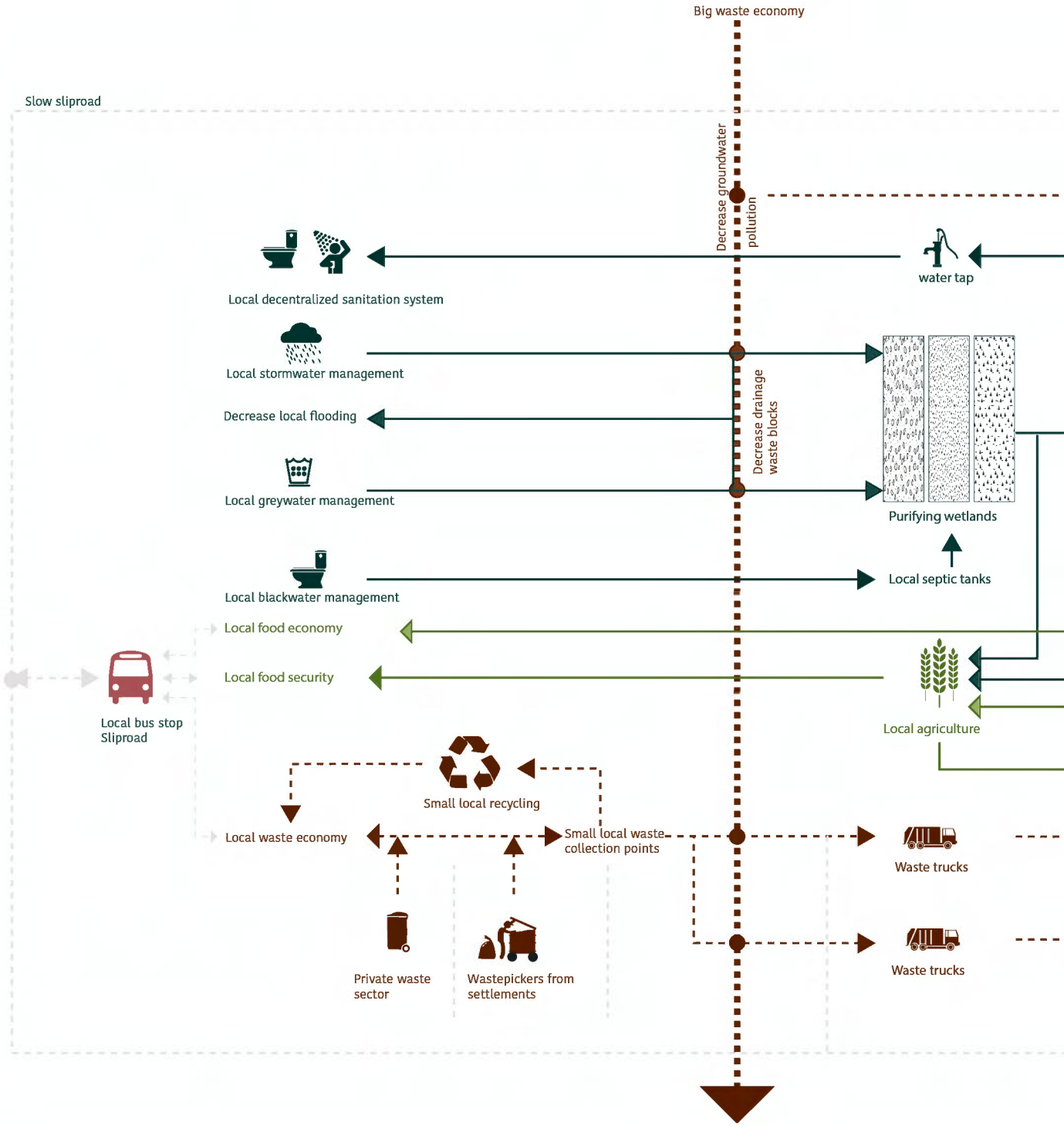
Local water extraction point
Feeder taxi rank
Trunk slow bus station
Waste collection point
Local urban farming



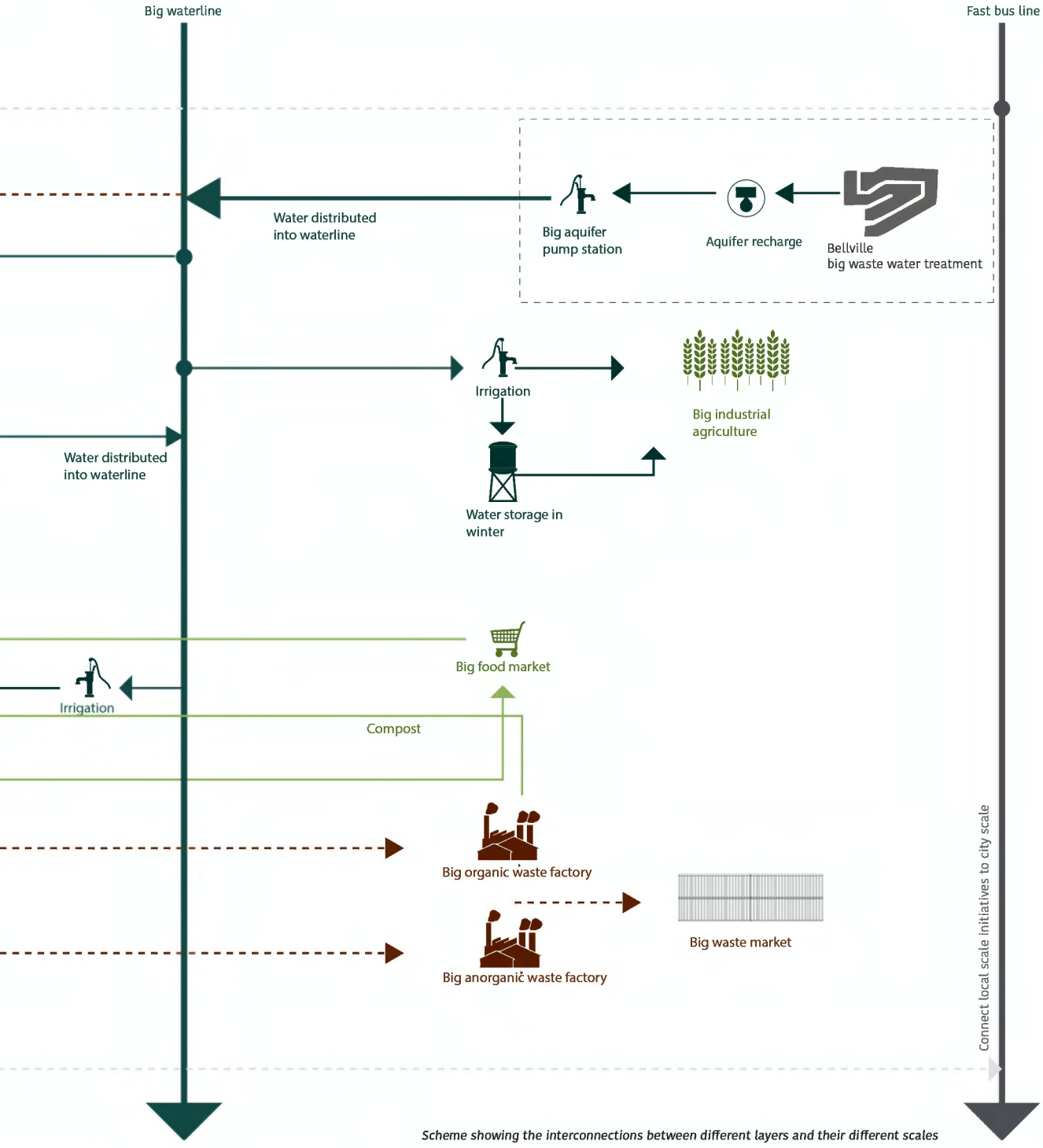
The interplay of rhythms

In total we have identified several layers that are key towards creating a space of destination. Water, transport, waste and food production are the foundations of the project. Where big and small actors meet, they start to coexist. The bigger programmes occur at frequent intervals: the express bus station, the waste factory, the market, gas stations and other programs are located here. The strips between two crossings are occupied with industrial agriculture, made possible by the water line.

small
bottom up
slow
decentralized



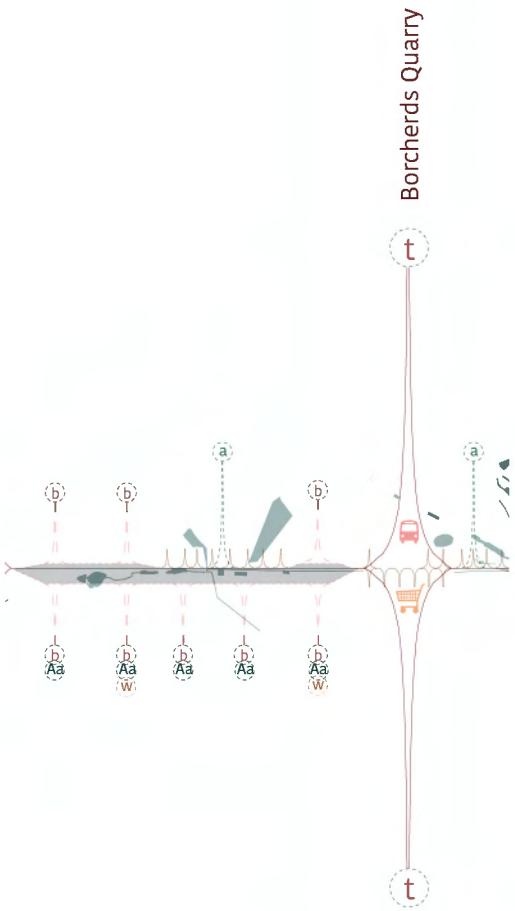
BIG
TOP DOWN
FAST
CENTRALIZED



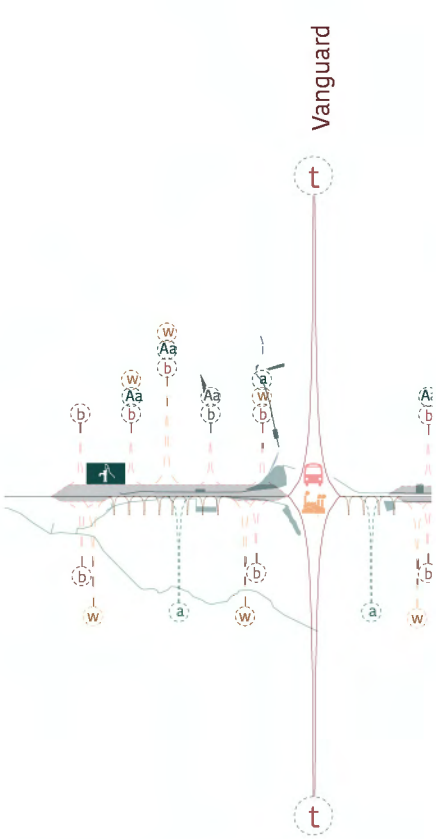
Scheme showing the interconnections between different layers and their different scales

Implementation

We will implement the large scale strategy on two specific sites, located at a complex of different layers, where they all start to influence each other. The first site discussed is the strip of no man's land located next to an informal settlement in Gugulethu next to Borcherds Quarry, and has a main focus on providing basic services and public transport, where basic services are seen as a tool towards strenghtening livelihoods and not as the goal. The other site is located in Langa, where the N2 Gateway Project is being developed. Here we wish to break open the coordination of functions by concentrating them together in the so called "hybrids" and to show their connection with the bigger scale of city infrastructure, located at the Vanguard intersection.



Informal strip in Gugulethu



Formal strip in Langa

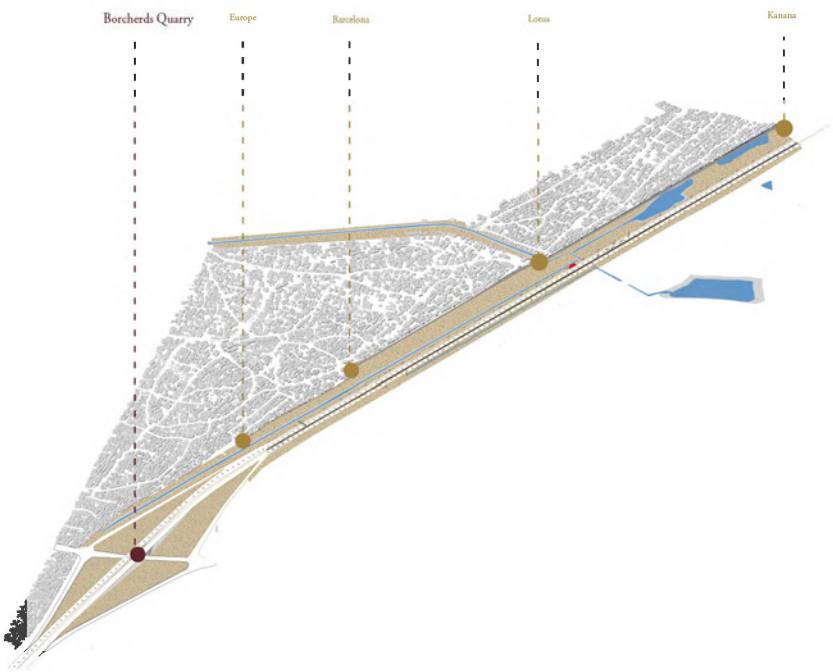

Central Business District (CBD)
Kanana
Europe
Barcelona
Heideveld station


Airport
2.5km
5km

The informal strip

Barcelona, Kanana and Europe informal settlements are situated 15 km east of Cape Town CBD on a strip of land running in parallel to N2 in Gugulethu. Like most Cape Town informal settlements, the settlements sprawling growth was fuelled by the influx of people from rural areas and other residential areas of Cape Town in search of a better life and employment opportunities. These settlements have some sanitation services which were installed by the City council but have always been insufficient. Most people make use of bucket toilets, which are theoretically collected and cleaned twice a week. This is also the case for waste, that is being collected by municipal waste collection. These services are often experiencing difficulties, which makes for low health conditions in the settlement.

The spatial setting of the informal settlements, flanked by Settler's Way could be a positive factor towards their mobility. In reality this isn't the case. The settlement is set apart from Settler's Way with a zone of 50 metres "No-mans- land". This zone holds some smaller wet- lands, and a small stream flowing towards Lotus River. On the other side an economic hub containing the airport and it's industry is located. This site also contains a water buffer, that can be used in case of heavy rainfall, but it seems not to be helping the people of the informal settlements who often experience flooding.



Aerial map of Kanana, Barcelona and Europe

Evolution

The site was first used as a landfill in the times of Apartheid. The landfill is not lined, which means that pollution of the groundwater is very likely. After the closure of the landfill the space was occupied by the first squatters. Now we can see that the nomansland between Settler's Way and the informal settlements is not being built on, and the fence that is put in place is not crossed by housing. The space is sometimes being used by children playing, people walking or by a goat farmer.

1988 - The site as a landfill

1996 - Squatters inhabit the space

View from the road towards Barcelona informal Settlement

EWWS

Distribution of electricity poles in Europe

Energy is distributed by the municipality by different electricity poles that have been placed. The people their homes are self built and electric sevices are pirated, with residents plugging into power lines through illegal cable connections. This is known by the city, and is being tolerated. People also make use of gas fires to cook food, which brings risks of shack fires.

Distribution of toilets

Sanitation is one of the major issues in Europe. No households reported using water system toilets and the overwhelming majority use the bucket system as their toilet (95%). The remaining 5% uses the bush. (Europe enumeration report) An plausible alternative is the Ecosan toilets, as the site does not allow for standard sewage systems, however people are not accepting Ecosan systems yet.

Distribution of installed water taps

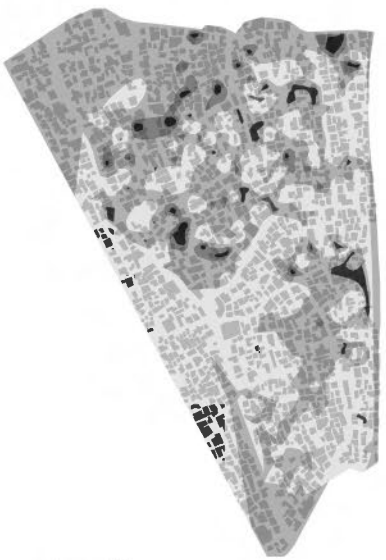
Potable water is provided by the city who have installed water taps throughout the settlement. The taps are however often victim of vandalisation, causing more diffficult access to potable water.

Earth and concrete drainage

The drainage system consists of self constructed earth drains and one concrete drain installed by the city. The drains are clogged regularly causing flooding. The flooding is aggrevated by the location on a former landfill. The drains are often clogged due to the lack of trash containers and waste disposal.

Formal and informal waste dumps

The municipality, making use of private contracts, is responsible for the solid waste collection. In Barcelona, Kanana and Europe the blue bag and green container system is used. These containers are however often closed, or not collected causing pollution. The enumeration report also identified several illegal waste dumping spots, combined with waste being dumped in drainages.



Flooding risk

The amount of people affected by flooding due to groundwater flooding and stormwater flooding is very high in Europe. With 3626 people affecetd, in total 82,2 % of the total population of Europe this is a big issue. . The flooding is only increasing as holes in the road are filled with sand, causing the roads to be higher than the shacks, increasing the amount of flooding. (Europe enumeration report)

Barcelona residents angered by piles of rubbish

Rubbish is piling up in front of people's homes in Barcelona informal settlement near Gugulethu and the airport in Cape Town. Residents showed their displeasure this morning by dumping rubbish on the N2. *groundup.org.za*

South Africa: Barcelona Residents Throw Poo Onto N2

A dispute over who should clean the informal settlement's toilets is escalating. *groundup.org.za*

N2 closed again due to faeces protests

The N2 in Cape Town had to be closed once again due to informal settlements residents throwing tyres, stones and buckets full of human faeces on the national highway. *West Cape News*

Nearly 4 000 affected by Cape Town flooding

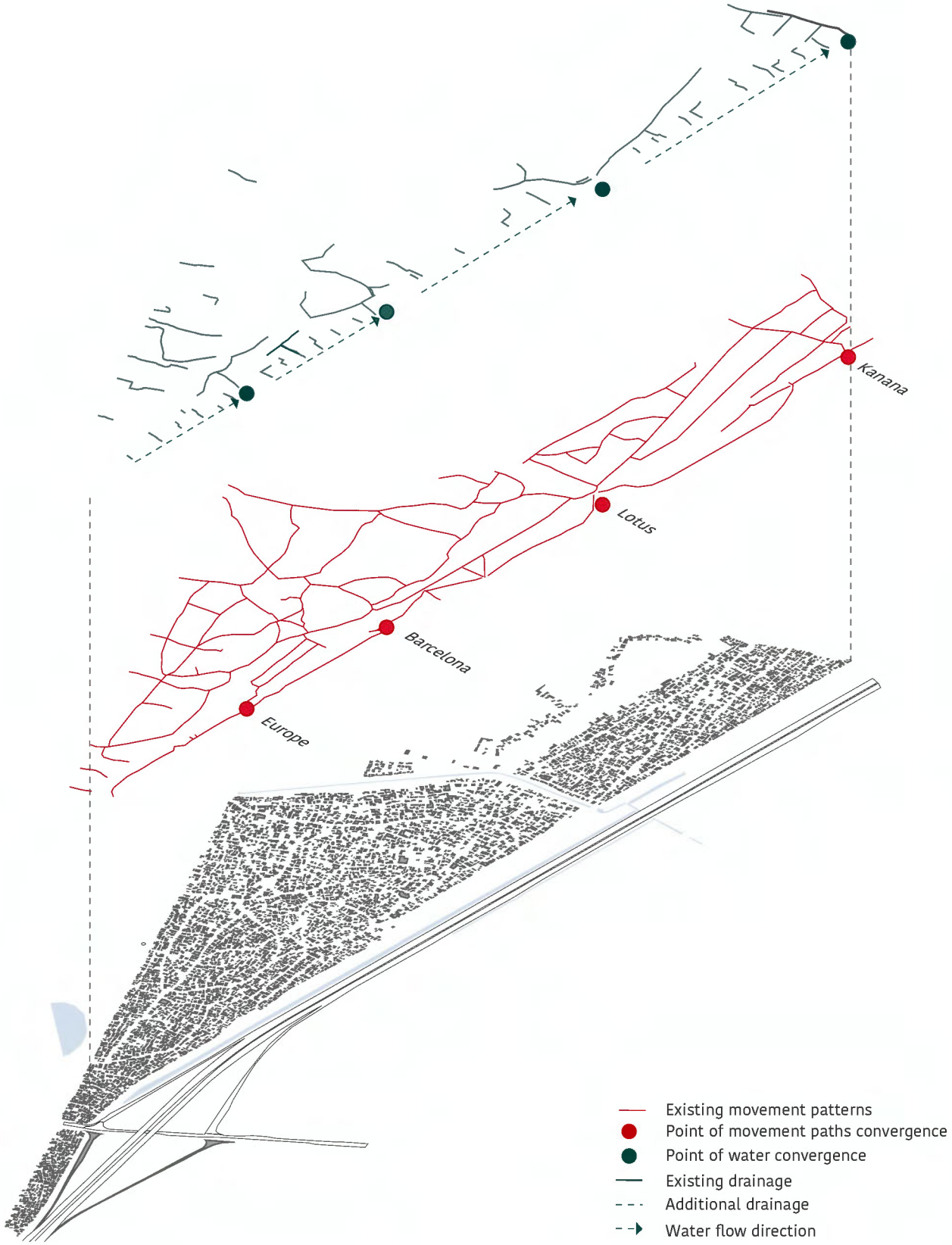
A total of 3 836 people in a number of informal settlements around Cape Town have been affected by flooding, the city's disaster risk management centre said on Wednesday. (Kanana) *News 24*

Woman throwing rubbish onto Settler's Way as a protest

Points of insertion

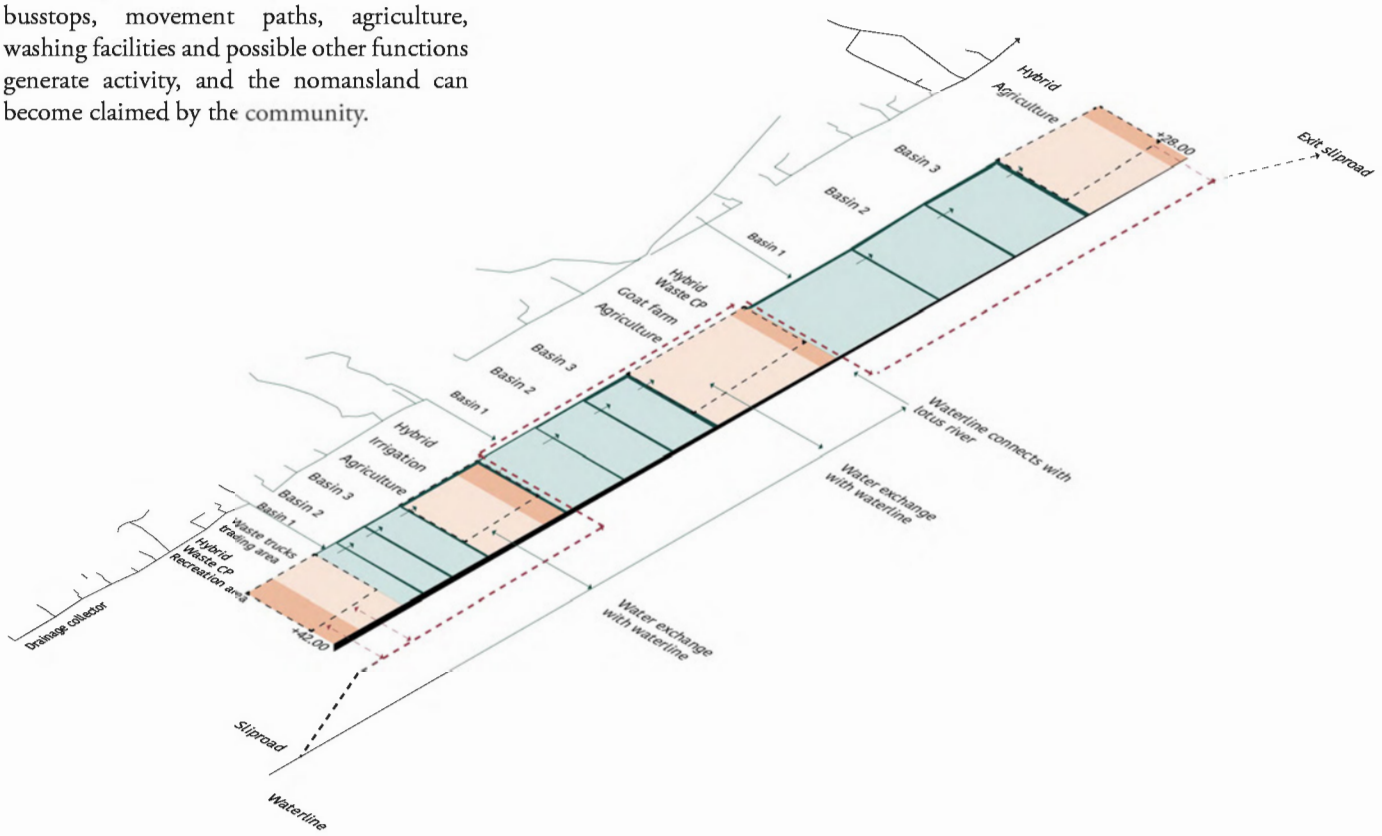
To create future points of destinations along the strip we examined the existing situation. In the axonometry we show the existing movement paths currently used in the settlement, that we have identified by aerial photography. These paths are an estimation, based on the different tracks that we found in the aerial photographs. We did the same for the existing drainage, where we looked at where the existing water taps are (based on the enumeration report), the topography lines, and water puddles that we could distinguish from aerial photography.

We saw that there is a clear relation between the paths of movement and the waterflows. These points of convergence are the nodes that we see as opportunities to start putting claims on the no-mansland. These points will become the start of the small scale process.

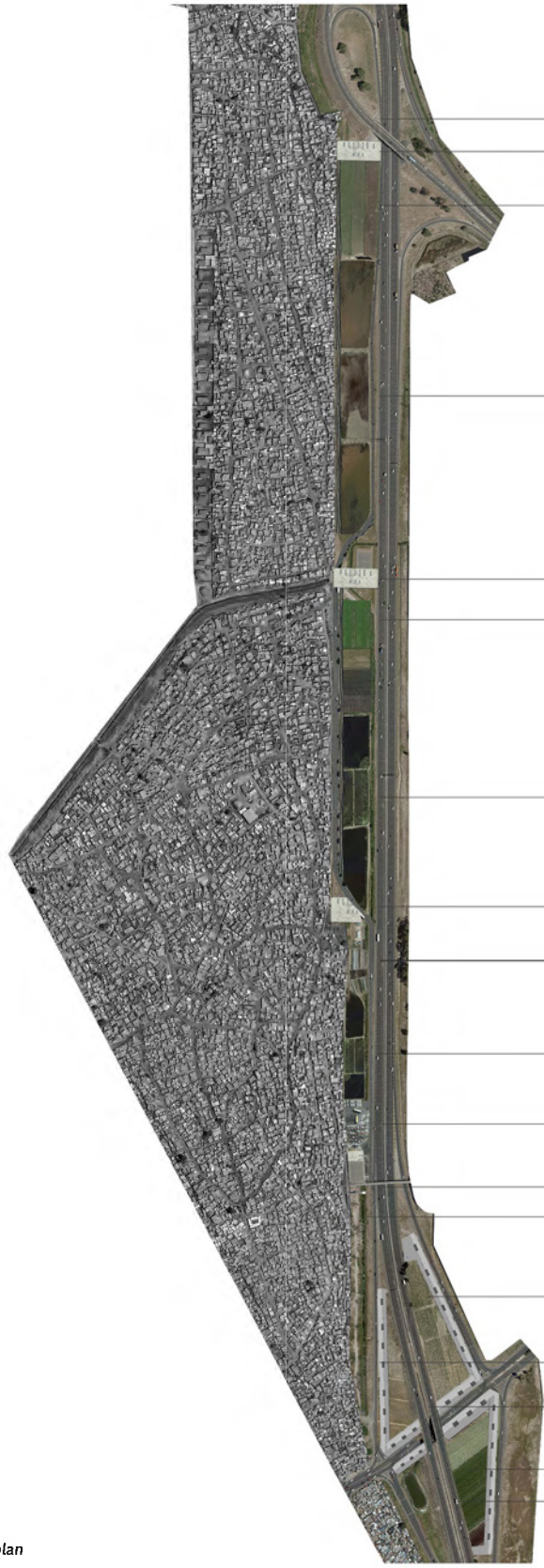

Kanana
Lotus
Barcelona
Europe
Existing movement patterns
Point of movement paths convergence
Point of water convergence
Existing drainage
Additional drainage
Water flow direction

Site plan

The site plan shows how we envision the strip and the crossroad. The site has a height difference of 12 meters along it's longitudinal section of 2000 meters. The strip has a clear structure where constructed wetlands are followed by productive landscape that is connected to a hybrid structure. The hybrid is located at a point where waterflows and movemement paths converge, and where we install bus stops connected to the sliproad. This will also be the place where we install water taps for washing facilities. These busstops, movement paths, agriculture, washing facilities and possible other functions generate activity, and the nomansland can become claimed by the community.



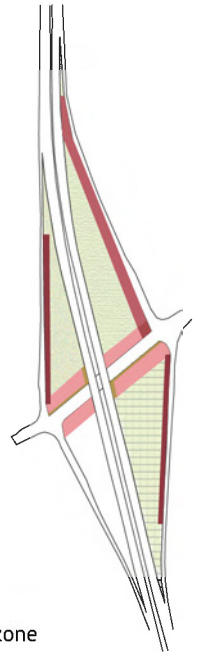
Scheme of the programmatic sequence at the strip showing the different water and movementflows combined with the functions of the program.


End sliproad
Kanana Hybrid
Agriculture (in extension of hybrid)
Purifying wetlands
Lotus Hybrid (Wastepoint)
Agriculture in extension to hybrid
Purifying wetlands
Barcelona Hybrid
Agriculture in extension to hybrid
Purifying wetlands
Waste truck area in extension to hybrid
Europe Hybrid
Start sliproad
Infrastructure in function of market
Gas station
Market connected to express bus station
Gas station
Agriculture learning centre

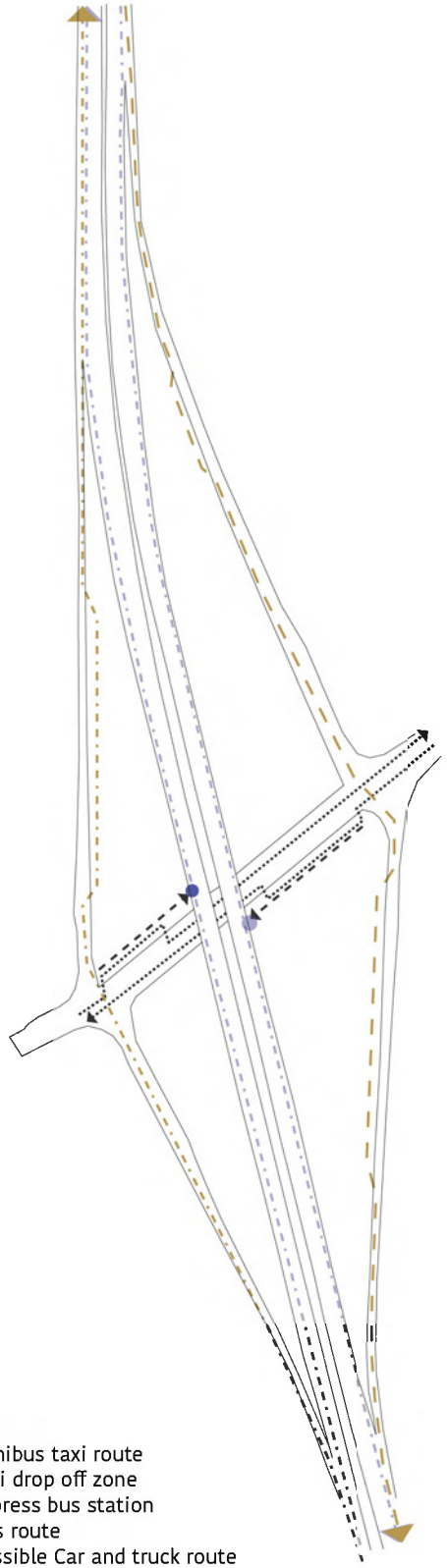
Site plan

Borcherds Quarry

The crossroad, Borcherds quarry, is one of the express bus stations. This is where the mini bus taxis, the feeders, drop off their passengers to the trunk route. The crossroads has different flow patterns, coming from cars from Settlers Way, the express and interstop bus, and minibus taxis. This activity is combined with certain functions like a food market, gas stations, an agriculture learning centre and agriculture. In total the area is 59000m2 of open unused space that can be turned into a hybrid of the above functions.

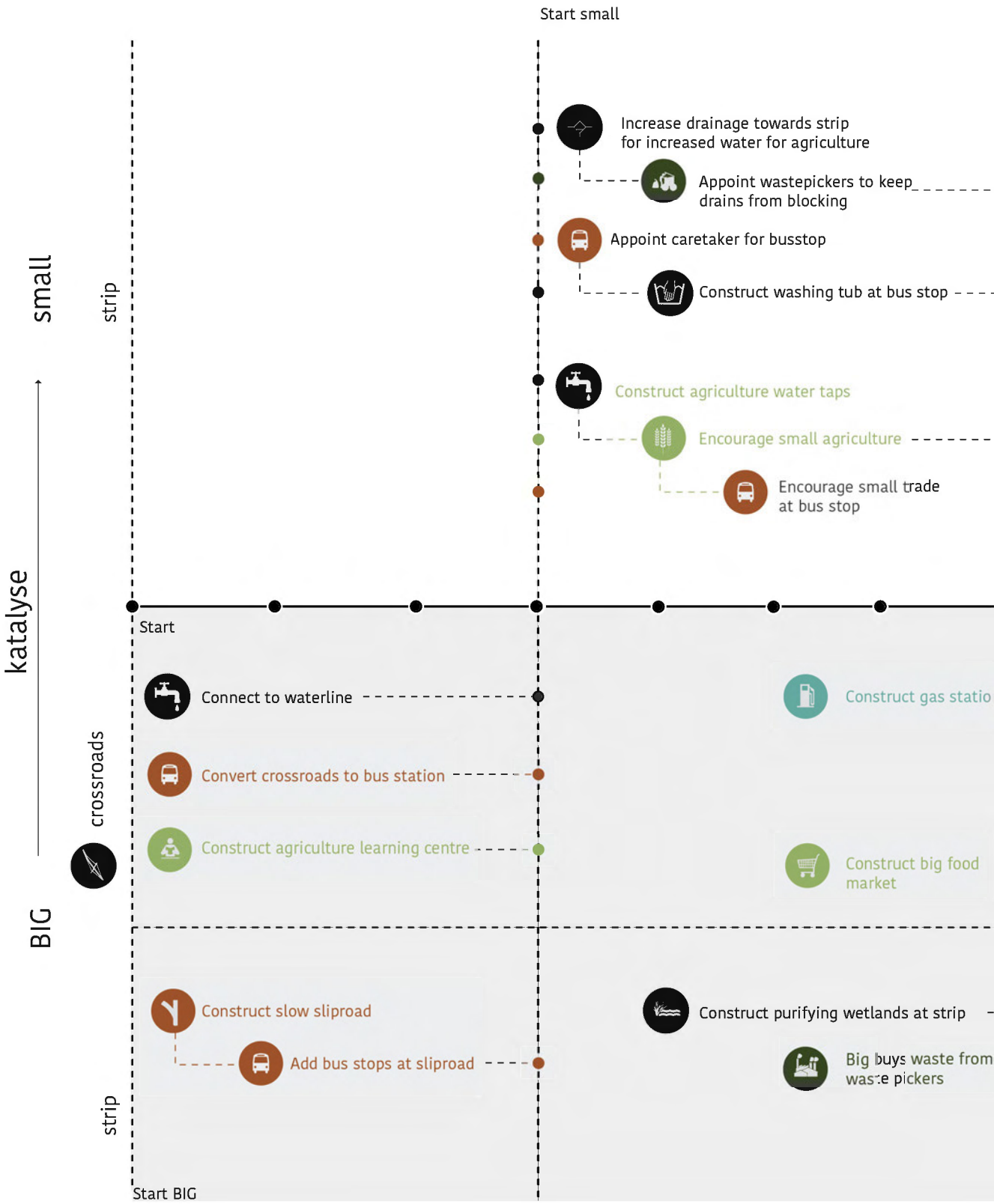


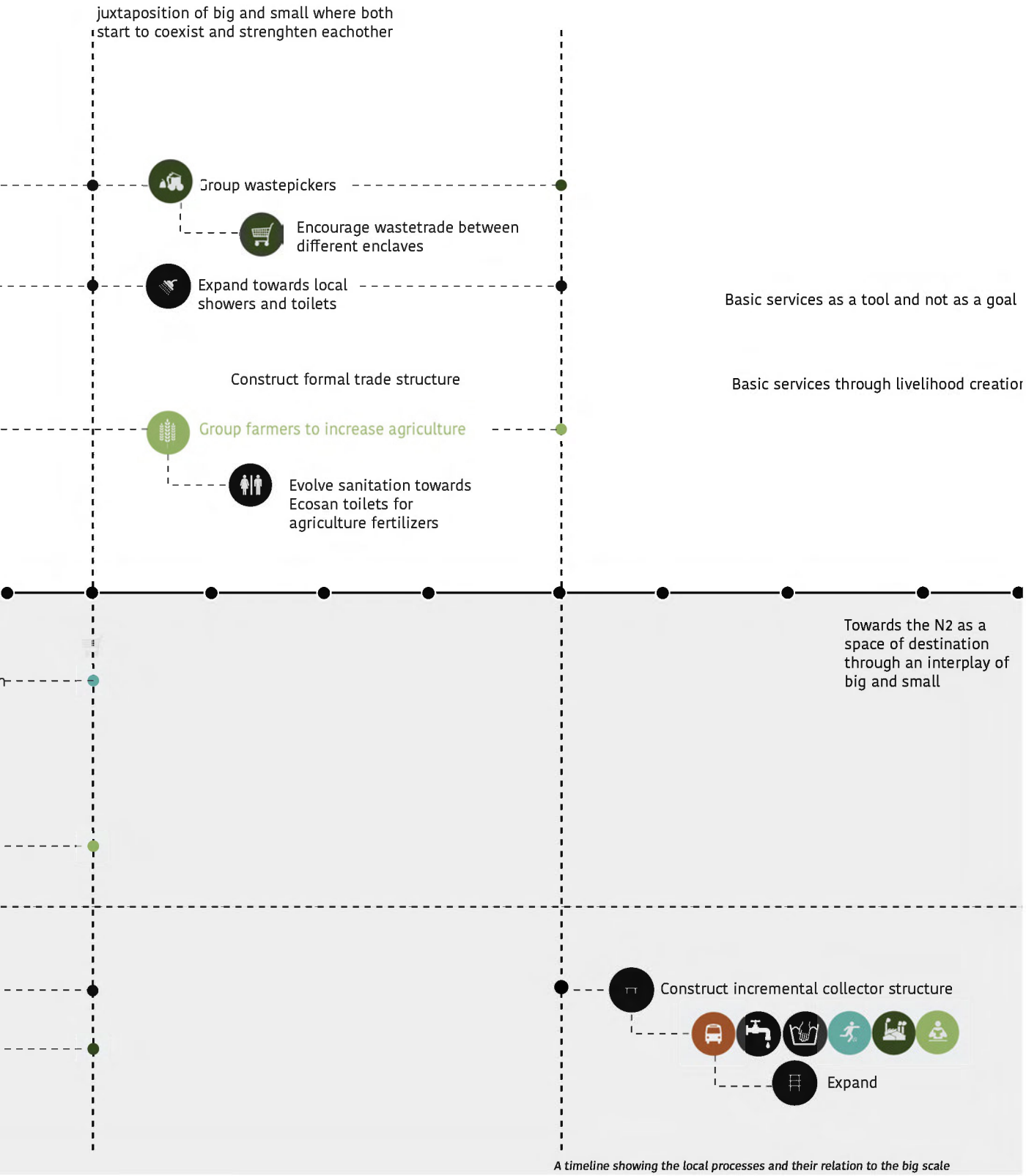
- Taxi drop off zone
- Agriculture
- Agriculture learning centre
- Gas station
- Agriculture storage
- Food market



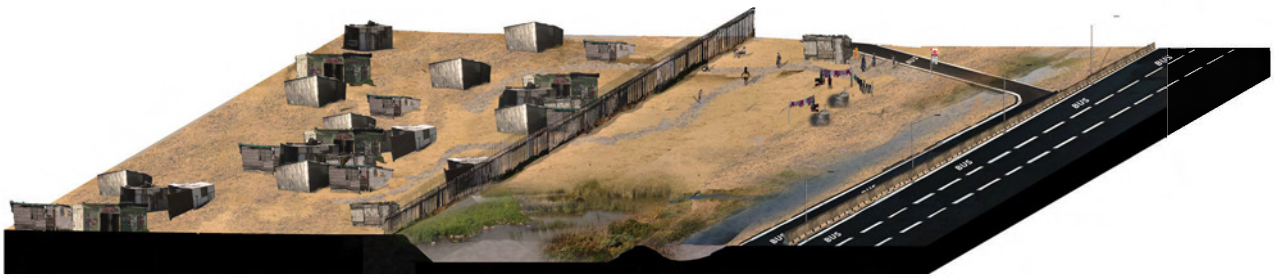
- Minibus taxi route
- Taxi drop off zone
- Express bus station
- Bus route
- Possible Car and truck route

View from the sky of Borcherd's Quarry


Start small
small
katalyse
BIG
strip
crossroads
strip
Increase drainage towards strip
for increased water for agriculture
Appoint wastepickers to keep
drains from blocking
Appoint caretaker for busstop
Construct washing tub at bus stop
Construct agriculture water taps
Encourage small agriculture
Encourage small trade
at bus stop
Start
Connect to waterline
Construct gas statio
Convert crossroads to bus station
Construct agriculture learning centre
Construct big food
market
Construct slow sliproad
Add bus stops at sliproad
Construct purifying wetlands at strip
Big buys waste from
waste pickers
Start BIG

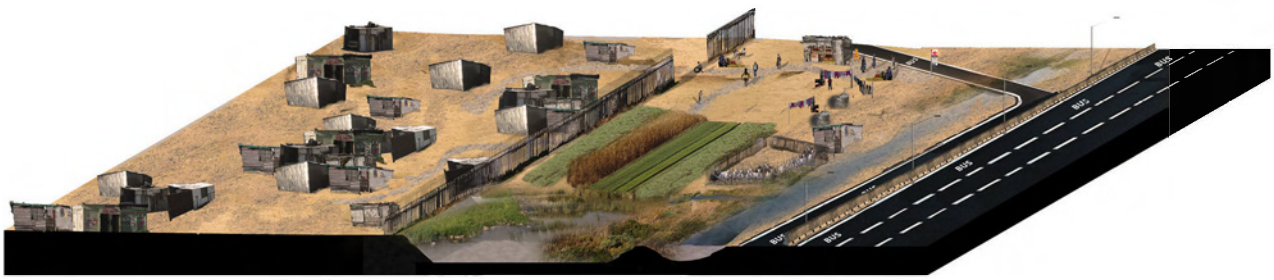


A timeline showing the local processes and their relation to the big scale



Possible start of a hybrid at Barcelona

The nomansland located next to the informal settlements is not accessible for a sole top down approach, as these interventions have a great chance not to get accepted by the community. We have learned in Cape Town that a pure bottom up approach is also not effective enough to create real changes. The strategy here is to let the top down and the bottom up coexist in order to create a gate into the informal settlement, and this is done by working in phase. The proposed start is by connecting some water taps to the waterline where people can do their washing. We also add a sliproad with a busstop to the strip. The bus stop brings different activities likestreet vendors selling coffee, bread, cigarettes, and are rendez vous spot for catching the bus. This busstop and washing facility is monitored by a concierge who takes care of the infrastructure. At the same time we construct simple purifying wetlands at strategic locations, depending on the topography and the existing drainage lines in the settlement. These wetlands have the purpose to deal with rain and greywater very locally, and it allows for the extension of the existing drainage inside the settlement.



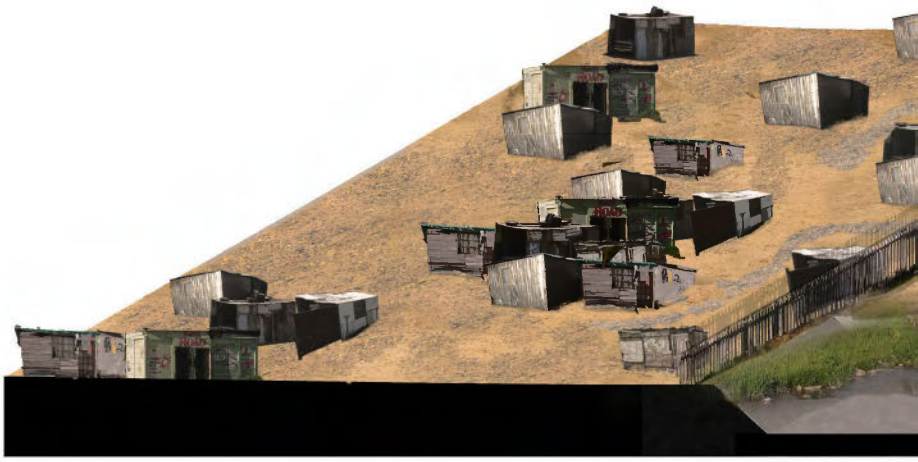
Increased activity around bus stop at Barcelona

The busstop and the washing facilities are functions that cause activity. A bus stop is therefore a location that is an ideal setting for small traders who can sell something to people who are leaving or arriving. On the other side the wetlands have an increased influx of water due to the upgraded drainage systems inside Barcelona.

In the strategy the government has constructed a agriculture learning centre at Borcherd's Quarry. This centre focuses on engaging people in urban agriculture as to strenghten their livelihood. The constructed wetlands, and the water taps offer the possibility to start small scale urban agriculture. The combination of providing grey and rainwater drainage with urban agriculture makes that there can be a sense of ownership over the drainages. People need the drainage for the food they produce and thus will be more likely to keep them from blocking. This can then be extended by informing people about EcoSan toilets, that are a good solution for the informal settlements but are not yet being accepted by the communities. The strategy here continues not to start with constructing buildings. The aim here is to change a nonplace to a place that is claimed by the community, and at the same time learning what infrastructure they need.

Imagination of the possible start of a hybrid by introducing a bus stop, generating activity


BUS

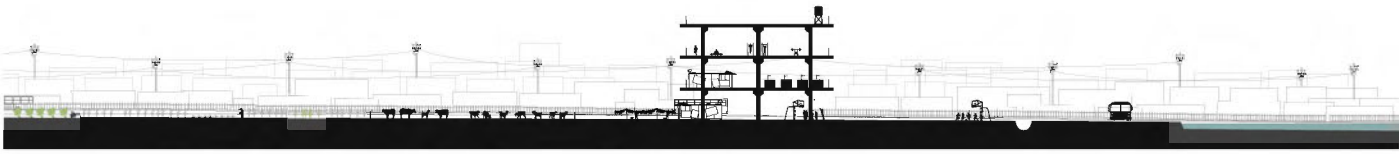


The hybrid is a building that can be incremental, where floors can be added in time if the community requires it. From this moment on when you drive along Settler's Way you pass by a sequence of features, wetlands, agriculture, and activity. The hybrids can become places that are very unique in it's kind along the strip, that are connected to eachother by their different functions. The hybrid could become a place where the fast and the slow, the big and the small coexist and reinforce eachother.

During our time in Cape Town we spoke with many people, most of them cabdrivers. One of the most important things many of them told us was that they acknowledge that there are problems with basic services, the housing backlog, jobs and many other things, but it should not be the only aim of this government.

"Basic services and drainage is boring. It's necessary, it should be a basic right, but we also want fun stuff."

We have tried to design by these words. We want to achieve an improvement towards basic services, water, sanitation, wastewater and waste collection, and increase transport accessibilities but we have not set this out as the end goal. We have used these elements in aspiration to have them as a tool to upgrade livelihoods.



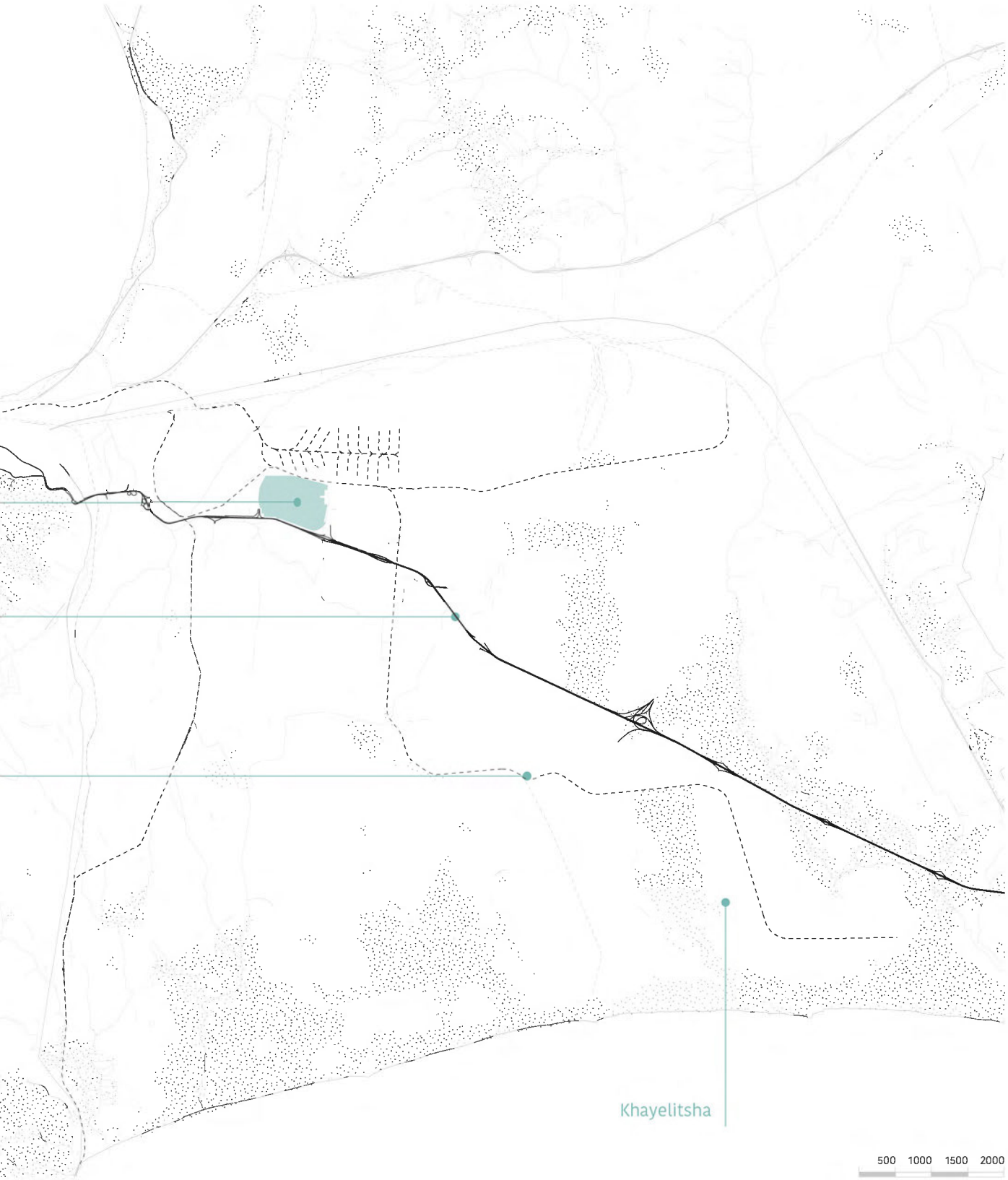
Possible section for Lotus where we show that the hybrid can have a main focus on recreational and social functions.

View from the road

Langa

Langa, one of the oldest planned townships in Cape Town, has a special role along Settler's Way. It is a corner stone between the richer areas of the CBD and the poorer Cape Flats. Driving along the Settler's Way clearly shows this transgression.

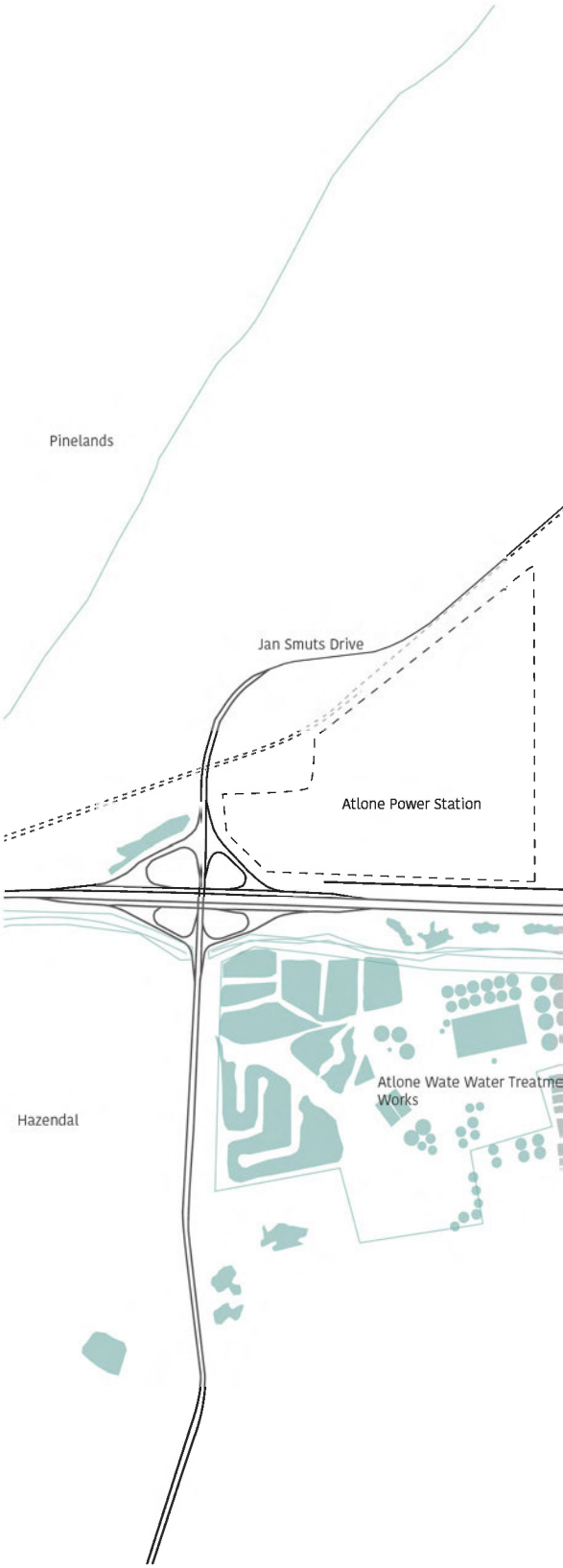
Location Langa along Settler's Way.


Khayelitsha
500 1000 1500 2000

Location

The area of focus is the outer band of informal settlements next to Settler's Highway, bordered by an open water stream connecting two water treatments plants (one at Boquinar Industrial Area near the airport and the other at the Athlone Waste Water Treatment works).

These informal housing structures are a consequence of the rapid growth during the last century and are known as the Joe Slovo informal settlement, which today is one of the biggest in South Africa.



Important infrastructure and townships around Langa.


Epping industria
Langa railway station
Langa
Washington Drive
N'Dabeni Street
Phase 1
Phase 2
Phase 3A
Phase 3B and 3C
N2 Gateway Project
Bhunga Avenue
Bluegum Street
Bonteheuwel
Vanguard
Bridgetown
Heideveld
Jakes Gerwel Drive

Aerial picture of Joe Slovo.

In 2004 the N2 Gateway Project was launched by the government, aiming to provide 25000 housing units in Langa, Delft, New Rest and Cross Road. In Langa the project was situated in the informal settlements neighbourhood Joe Slovo along Settler's Way. It has had a lot of criticism. 'Its detractors claim that the N2 Gateway is a beautification project for the 2010 FIFA World Cup. They cite government documents prioritising the development in light of its visibility near to the Cape Town Airport.' (Wikipedia 2016).

Also an important feature of the project is the temporary relocation of the inhabitants to areas near Delft, far away from their original residence and on a long waiting list for getting a new house. This resulted in a lot of protest in Langa in 2008 and 2009 and also a law case where a judgement is still reserved.

The N2 Gateway Project consists of three phases where phase 1, 2 and 3A are already been completed. The other phases 3B and 3C are still going on.

This project is a typical example of façade urbanism. The new development covers the rest of the tissue that lies behind. This enlarges the isolation of the township and strengthening the apartheid regime. Another problem perceived by us, is that there are very poor quality public spaces in the master plan. The Joe Slovo inhabitants spend most of their time outdoors on the street and this is why public spaces should be one of the most important features, maybe even more important than housing itself.

Planned N2 Gateway Project in Joe Slovo.

Design

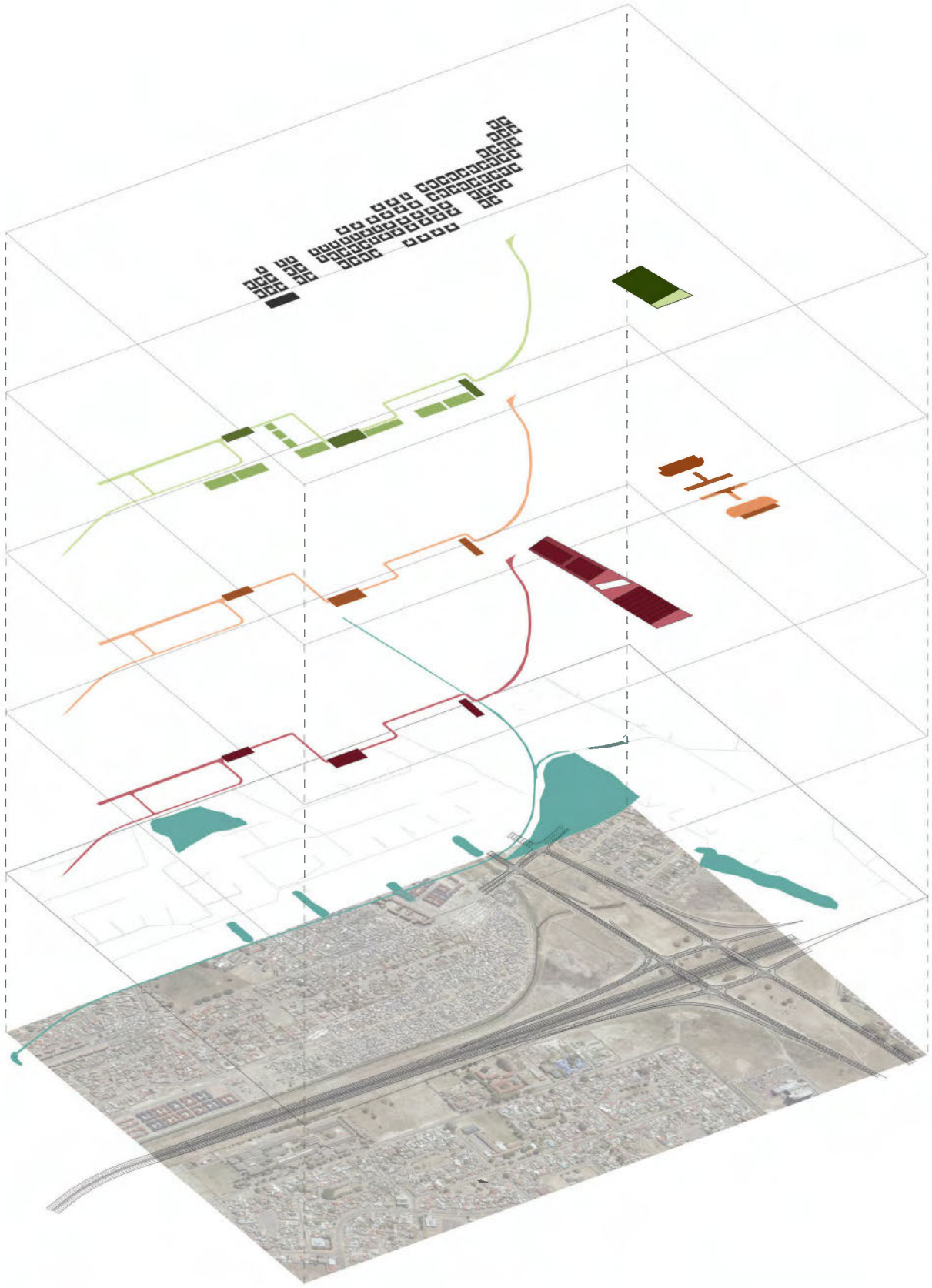
The design proposal consists of many dualities, which will influence each other and frictions will occur. The proposal will show how is dealt with these frictions and how they are taken as a benefit to create interesting and functional public spaces. Although the plans for the new development already exist, this proposal is a reaction to show how it can be done differently.

It is an implementation of all layers of the bigger story. These layers are not just put next to each other but hybrids are made, causing frictions between them.

The hybrids are located at several points in the tissue of the N2 Gateway project, creating public spaces around them. Actually this design investigation aims to make a real gateway project, by plugging in local smaller structures, that are connected to the bigger ones at the crossroad.

Layers of the design proposal.

- Water layer
- Waste layer
- Mobility layer
- Agriculture and compost
- Housing



Applying all the layers of the bigger story, a matrix can be put up showing the underlying system.

Big and small incentives have to go hand in hand on each layer. They influence each other and are dependent on each other.

The connection between the big and small scale on each layer is extremely important and will be discussed per layer in what comes next.

System matrix of the layers.

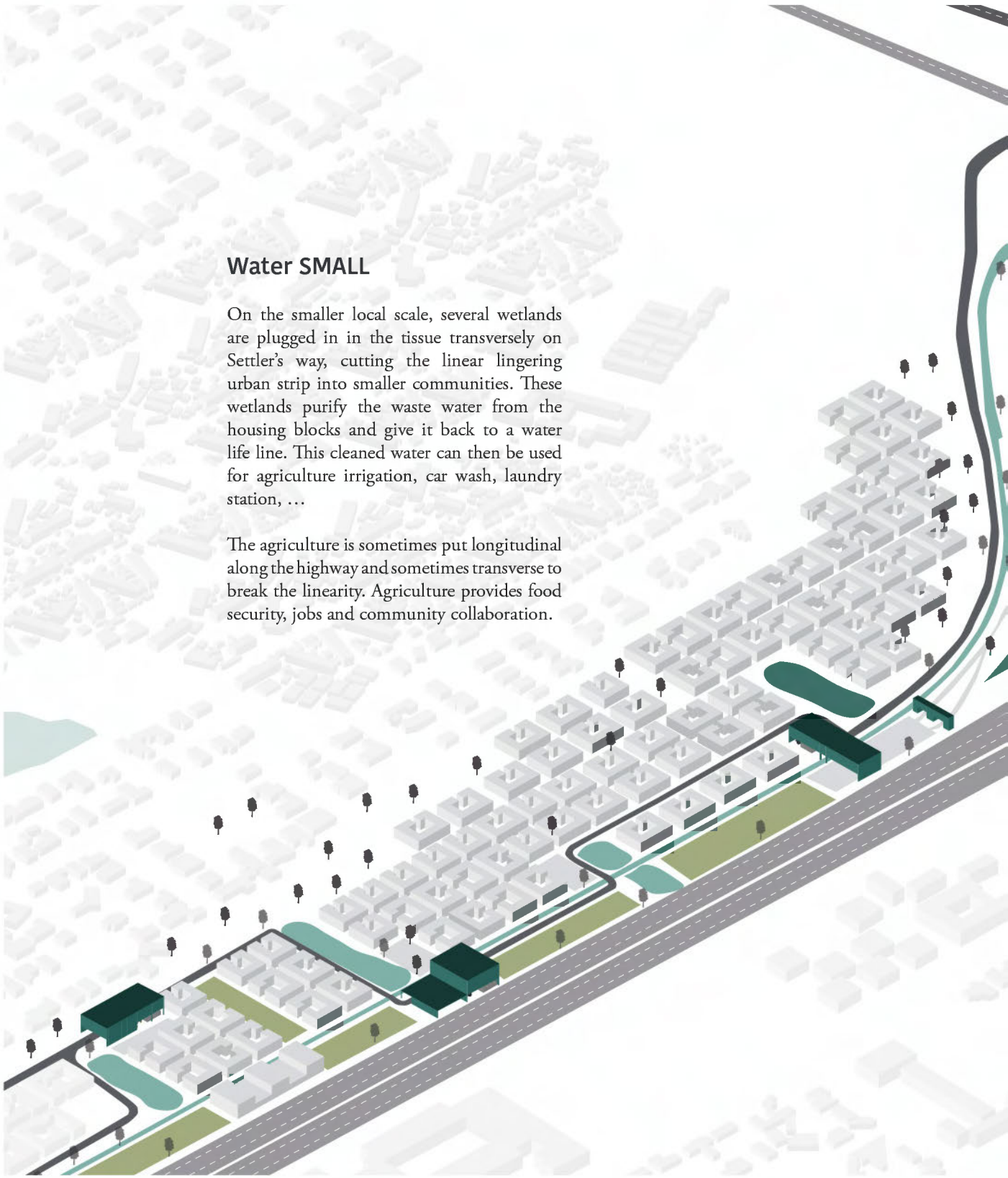
- Water layer
- Waste layer
- Mobility layer
- Agriculture and compost
- Housing

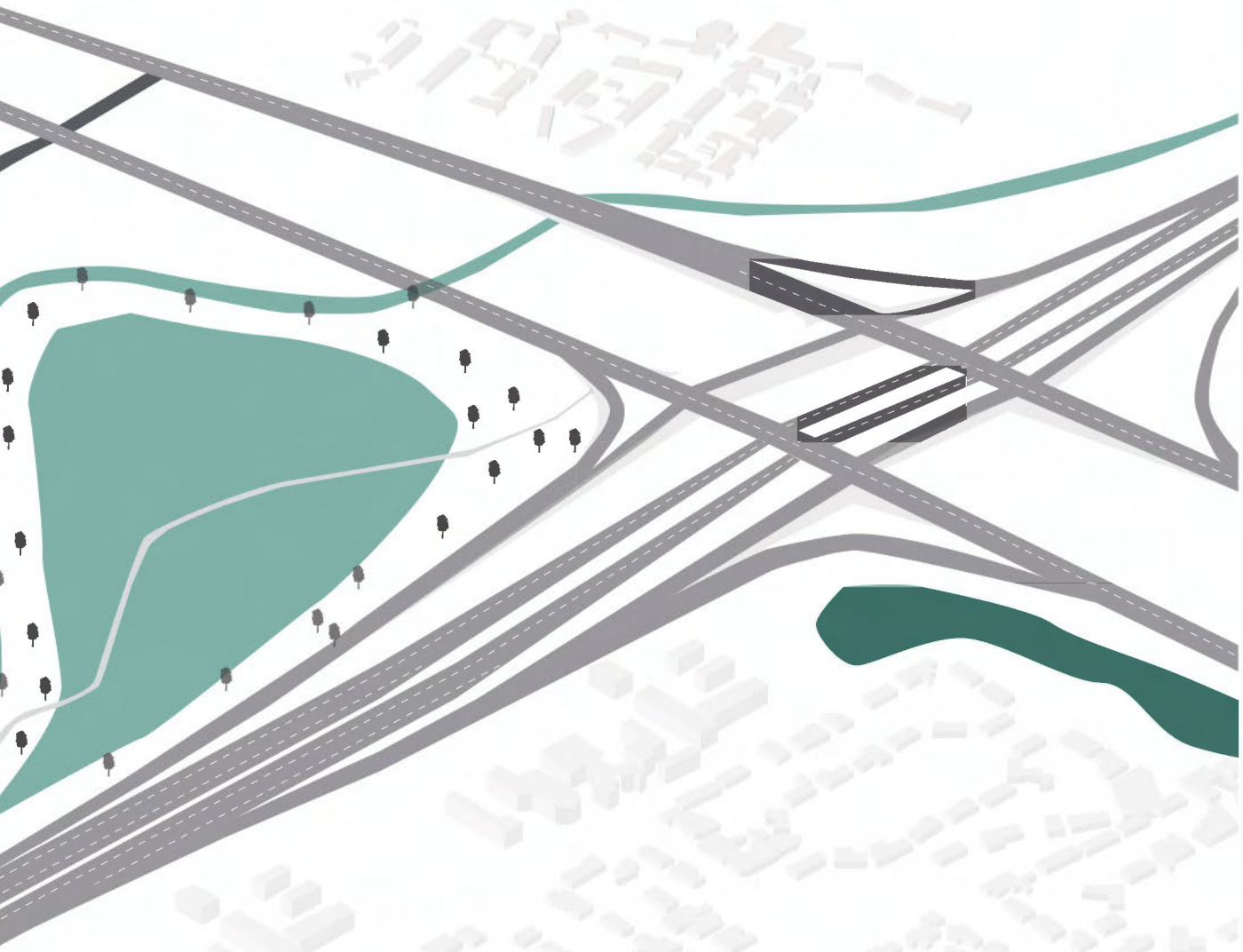

BIG
Vanguard
SMALL
Joe Slovo
Construct wetlands in tissue
Increase drainage towards lifeline
Connect with bigger lifeline
Add water functions
Irrigation
Laundry
Car wash
Urban farming
Agriculture fields
Restaurants
Supermarkets
Compost
Waste incinerator
Compost factory
Waste factories
Waste trade
Arts and crafts shop
Waste collection point
Anorganic waste
Organic waste
Recyclable waste
Arts and crafts workshops
Elektricity
Local commerce for commuters
Express bus station
Big mobility rank with taxi transfer station
Local mobility station
Sliproad
Local bus station
Intensify with housing
Hybrid

Water SMALL

On the smaller local scale, several wetlands are plugged in in the tissue transversely on Settler's way, cutting the linear lingering urban strip into smaller communities. These wetlands purify the waste water from the housing blocks and give it back to a water life line. This cleaned water can then be used for agriculture irrigation, car wash, laundry station, …

The agriculture is sometimes put longitudinal along the highway and sometimes transverse to break the linearity. Agriculture provides food security, jobs and community collaboration.





Water layer.

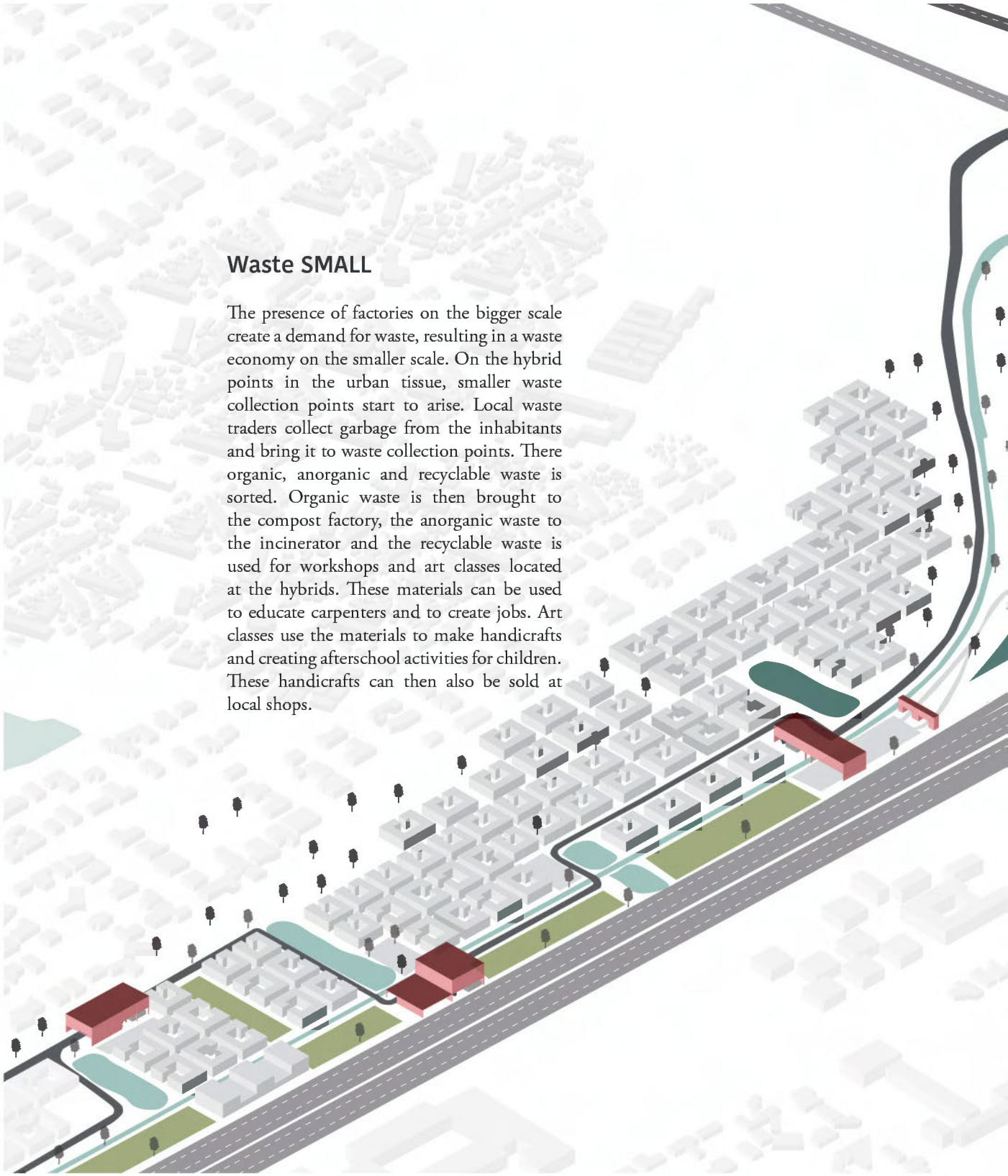
- Water layer
- Waste layer
- Mobility layer
- Agriculture and compost
- Housing

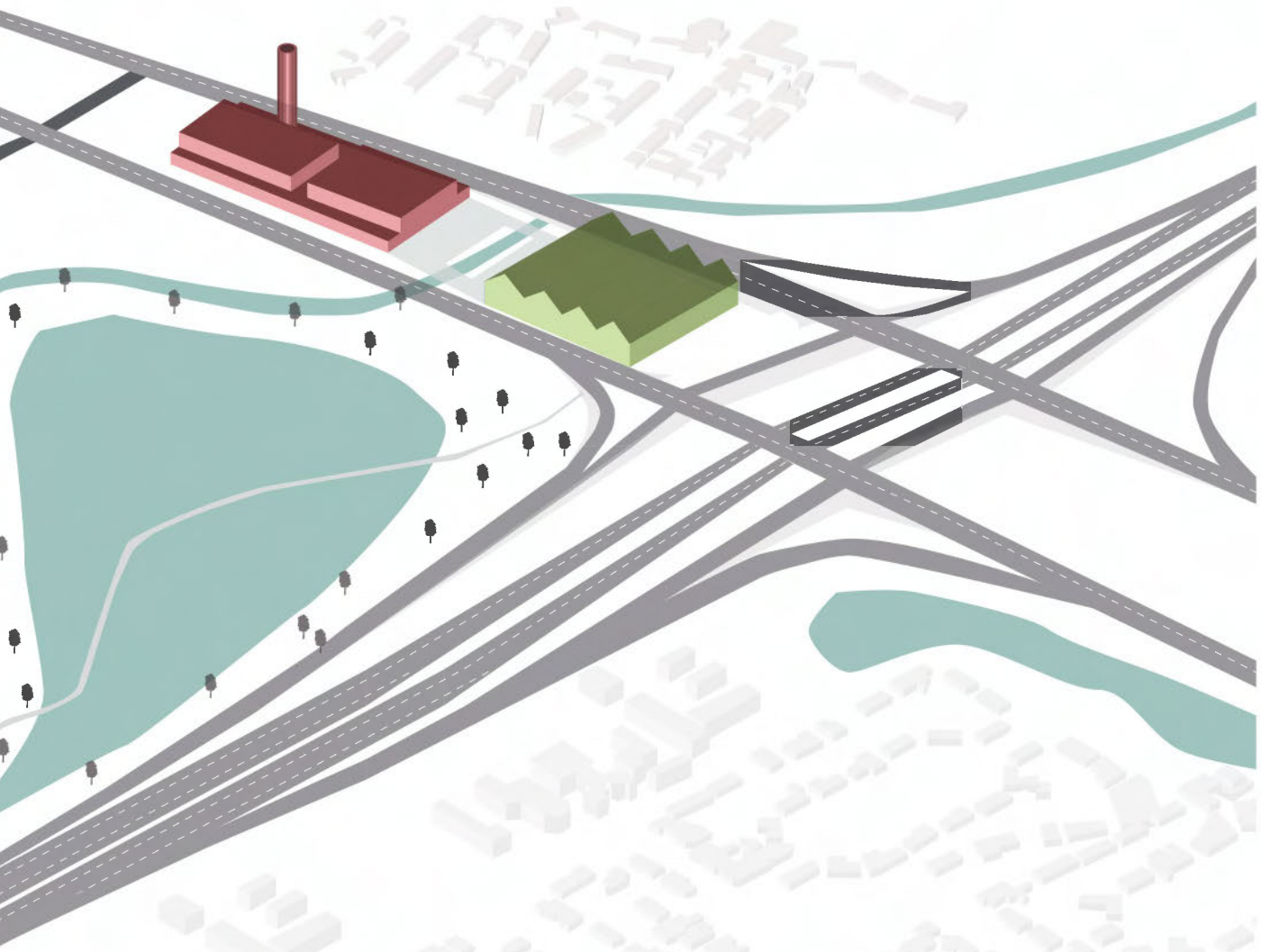
Water BIG

Going back to the bigger story, a water life line arises because of the pumping of water on several points along Settler's Way. The lifeline runs on the same line as the existing canal, but is now intensified, providing more clean water.

Waste SMALL

The presence of factories on the bigger scale create a demand for waste, resulting in a waste economy on the smaller scale. On the hybrid points in the urban tissue, smaller waste collection points start to arise. Local waste traders collect garbage from the inhabitants and bring it to waste collection points. There organic, anorganic and recyclable waste is sorted. Organic waste is then brought to the compost factory, the anorganic waste to the incinerator and the recyclable waste is used for workshops and art classes located at the hybrids. These materials can be used to educate carpenters and to create jobs. Art classes use the materials to make handicrafts and creating afterschool activities for children. These handicrafts can then also be sold at local shops.





Waste layer.

- Water layer
- Waste layer
- Mobility layer
- Agriculture and compost
- Housing

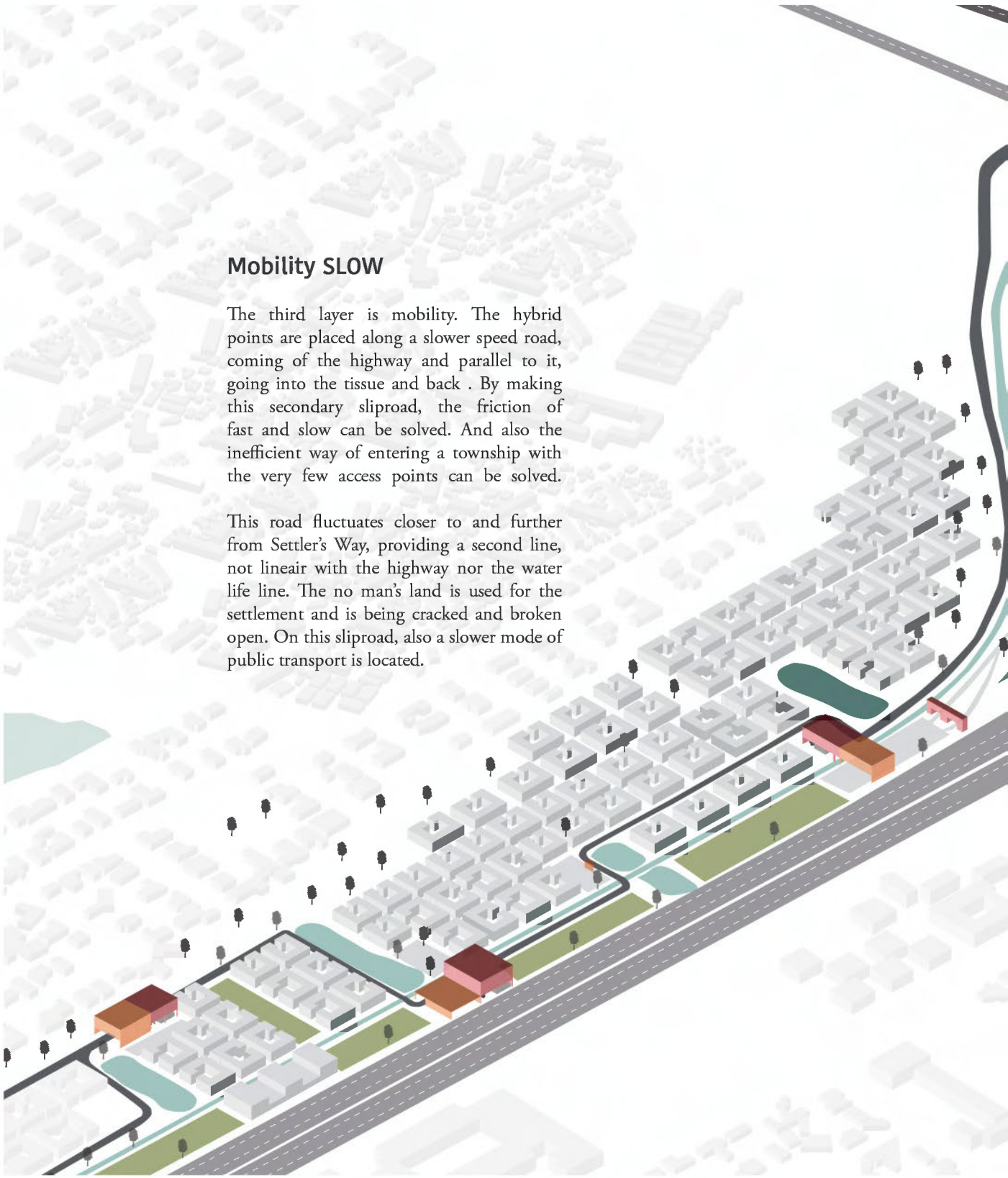
Waste BIG

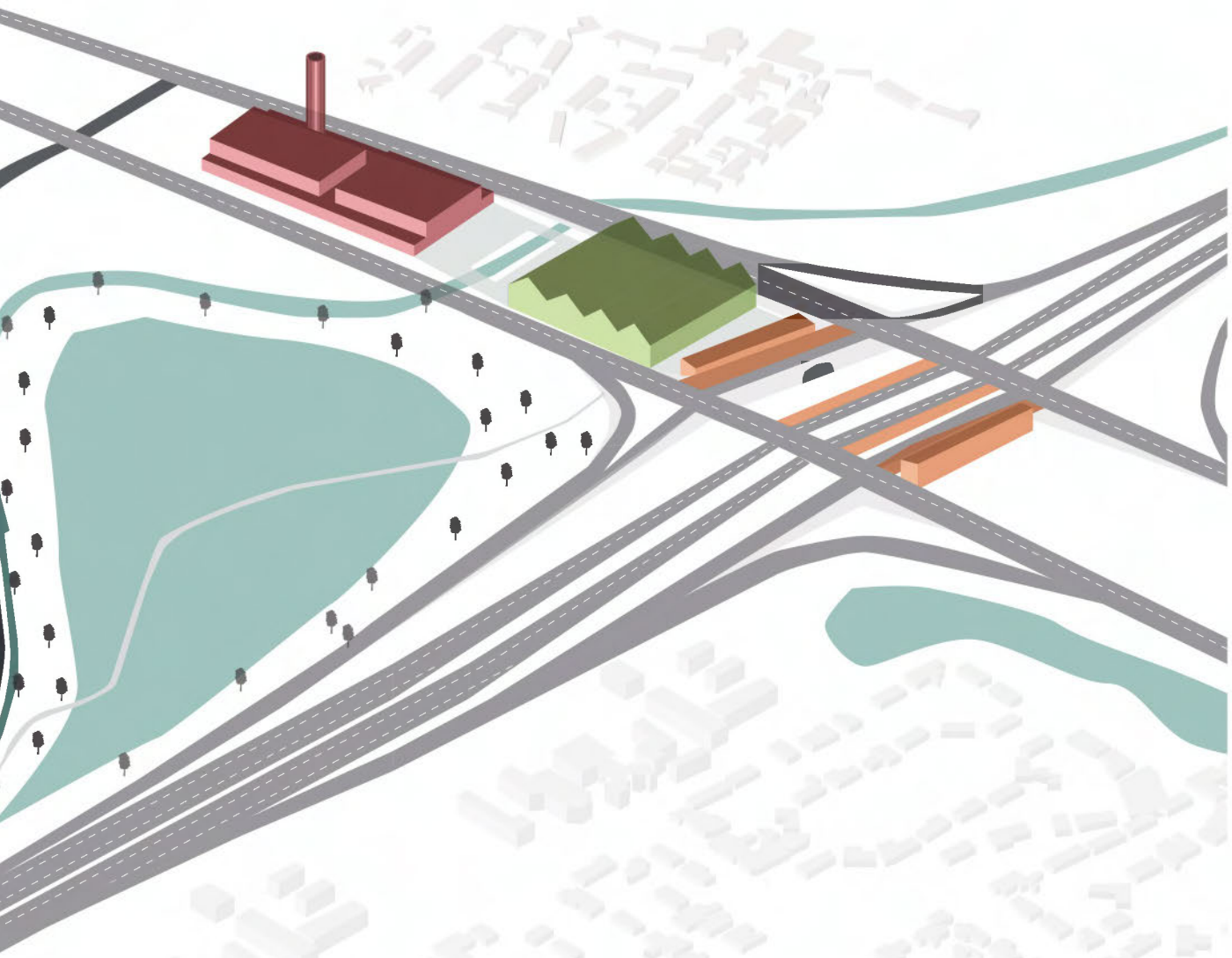
On the bigger top-down scale, two factories are put at the Vanguard crossroad. One factory is an incinerator and uses anorganic waste to produce electricity. The electricity is distributed through the existing infrastructure of electricity masts of the old Athlone power plant. The other factory uses organic waste to produce compost. This compost is brought back to the hybrid points and from there used for the agricultural fields.

Mobility SLOW

The third layer is mobility. The hybrid points are placed along a slower speed road, coming of the highway and parallel to it, going into the tissue and back . By making this secondary sliproad, the friction of fast and slow can be solved. And also the inefficient way of entering a township with the very few access points can be solved.

This road fluctuates closer to and further from Settler's Way, providing a second line, not lineair with the highway nor the water life line. The no man's land is used for the settlement and is being cracked and broken open. On this sliproad, also a slower mode of public transport is located.





Mobility layer.

- Water layer
- Waste layer
- Mobility layer
- Agriculture and compost
- Housing

Mobility FAST

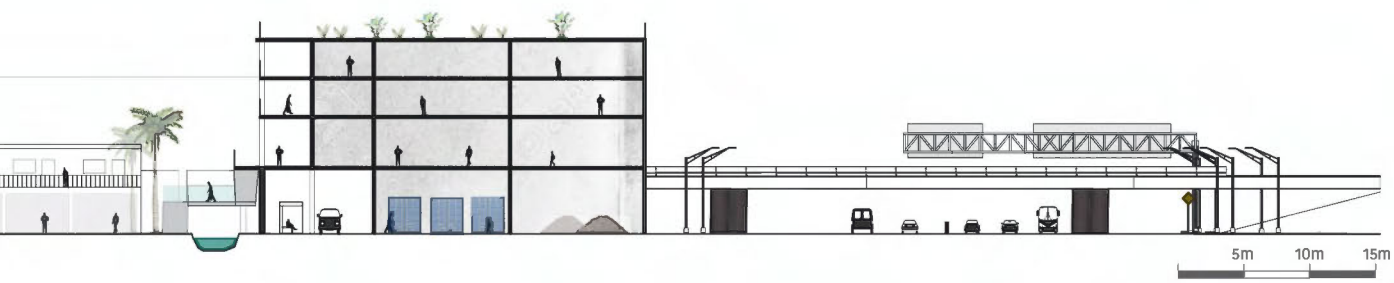
In our bigger story we made a distinction between the express bus, which drives only on Settler's Way and at a higher speed and the interstop bus which drives at a lower speed and also goes into townships through sliproads. These interstop bus stops are placed at the hybrid structures on the local scale. On the bigger scale a bigger transport station is located at the Vanguard crossroad, where commuters are fed by the minitaxis.

Hybrid

All these layer have influence on each other when put together. We will look at a hybrid point and how is dealt there with the frictions that exist when all layers come together.

The hybrid consists of one building, connected to a public space and wetland. It is placed at several intervals along the strip, making a connection between the urban tissue and the road. The secondary road passes through it, where a local bus stop is located on the ground floor of the building. Here also the waste collection and compost point are located. the ground floor is an open structure, making it visible towards the users and transparent and clear for the surrounding inhabitants. On top of this open structure, the arts and crafts workshop and store are located together with a semi-public space which for example can be used for outdoor classes. This space is accessible from the public space on the groundfloor. In addition, housing can be added on top, accessible by galleries.

Image of a hybrid and adjacent public space with local shops, seen from Settler's way. On the first floor of the hybrid, art and craft workshops are located with an open space for outdoor classes.



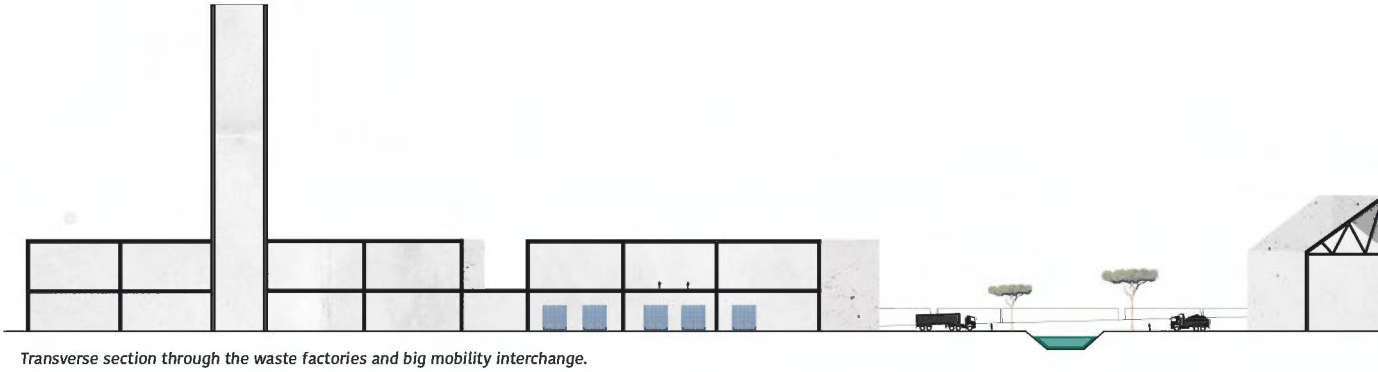
Waste factory

A waste incinerator and compost factory are located as landmarks at the Vanguard intersection. They are part of the necessary infrastructure a city needs to work.

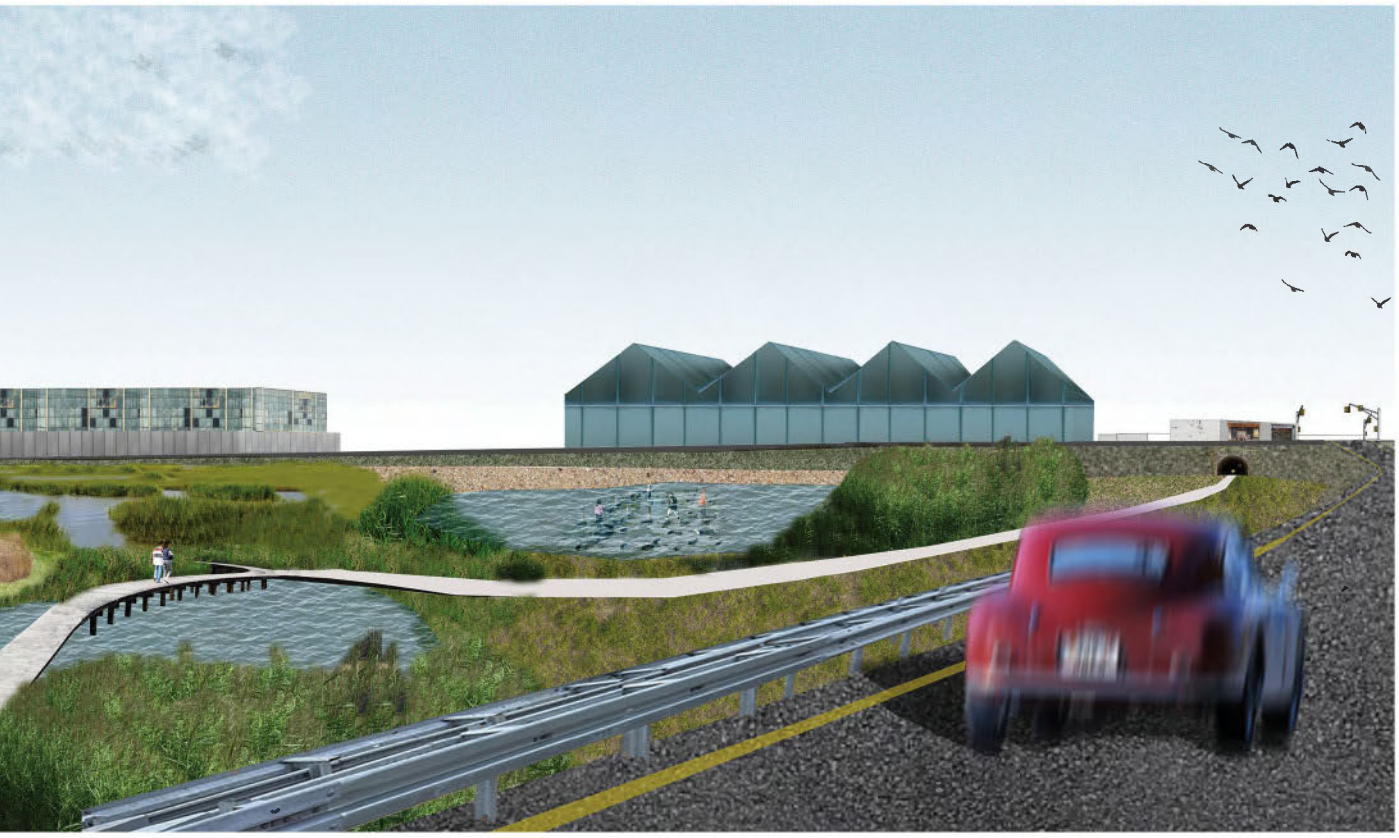
The factories are accessible through smaller sliproads coming off the Vanguard Drive by a common platform between the factories, making interchange between waste trucks easier.

At the intersection, also a big mobility station is located. On the upper floor, minitaxis feed passengers from the townships to this station on a platform. Connected to this platform is a structure providing commuter infrastructure like small shops and where commuters can go down to the big bus station through a tunnel crossing Settler's way.

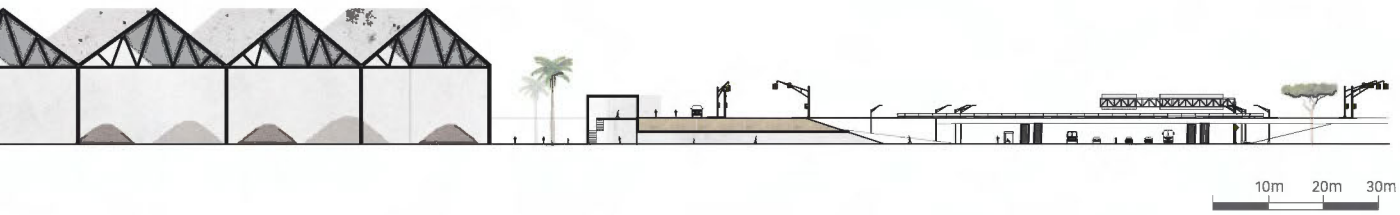
Between the big scale of the intersection and the small scale of the settlement is a wetland park, making a pleasant pedestrian connection with the big mobility station.



Transverse section through the waste factories and big mobility interchange.



Panoramic view on the wetland park and on the waste incinerator and compost factory at the Vanguard intersection, seen while driving on Settler's Way.



Reflection

The figure of the Urban Crack has a very dominant and strong form of linearity. One can wonder to what extent it is possible to break open this space. Movement will still be mainly parallel to the no man's land.
Also the specific character of the no man's land is not the same as for example the landscape character of a nature reserve. In what sense can we call this a landscape? And in what sense is there a friction between landscape and urbanity, since this type of landscape is also planned and part of urbanity. Is it really that different from urbanity? The point here lies more in the friction between open space and built space, not necessarily in natural and planned space.
Investigating the landscape of the Urban Crack, other questions come to mind. Should the no man's land stay a buffer? Doesn't the highway need this? Are we in fact breaking open this seperating space, or are we just repositioning the transition between landscape and urbanity?
The main function of a highway is transport and movement. When we make Settler's way as points of destination, we will have a major impact on traffic. It will function in another way, definitely slowing traffic down, possibly comparable with the ribbon development phenomenon in Belgium. So maybe we are converting the highway into a boulevard? Is this our aim?
Our aim was to ally dualities and to embrace their frictions. We combined the super global with the super local, the fast and the slow, the big and small. Working on the edge between urbanity and landscape, what we called in this case the no man's land, shows the potential of breaking it open.

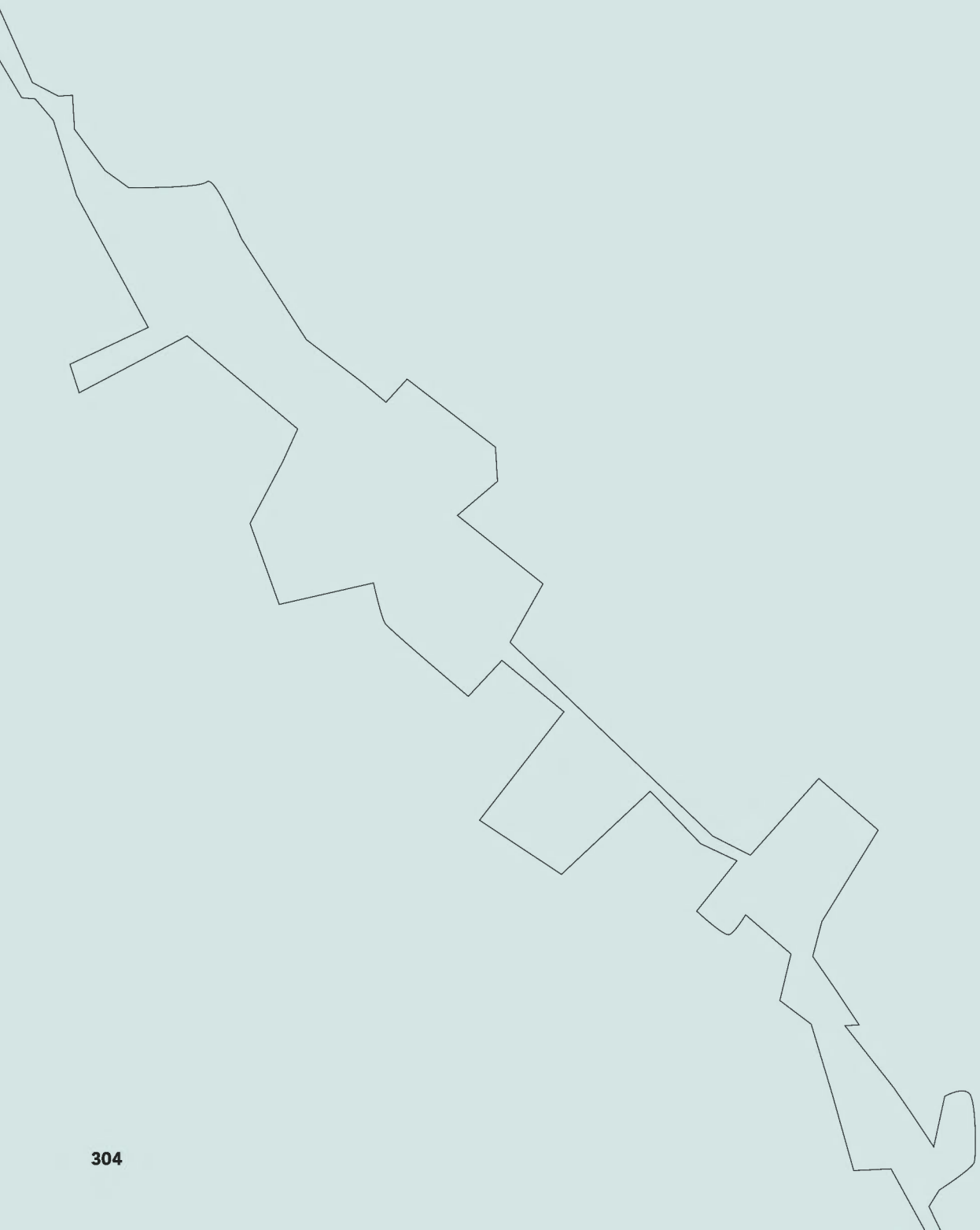
After the no man's land is given a meaning for the settlement, this results in a blooming sight along the highway. The township has opened up, making it attractive and visible towards the passing highway users. As a consequence, the no man's land will have a meaning for Settler's way. Townships will be connected, not necessarily in a physical way but in a systematic way. These systems can form a sequence along the N2, starting from the Two River Urban Park project.

The result thus also inherits a duality. The monotonuous banality of the highway is converted into a delight for the eyes, a spectacle.

'A highway designer cannot be sure that people will watch his drama from beginning until the end. Therefore it is important that the sequential form maybe has to look more like a magazine serial, in which an underlying total development depends on seperate episodes, each with a self contained form on its own. Forms may have to be symmetrical, having climaxes at both ends.' (Appleyard D., Lynch K. and Myer, J. R., 1964).

Futurescape

urban crevice



"We need to draw lines in the ground and say, 'The concrete stops here.' That forces people to build in and up, rather than out – and there's nothing wrong with high, dense urban environments as long as they're planned correctly. They can be extremely livable". [Patrick Moore, Greenpeace]

The urban crevice is a figure that is found most in the Cape Flats and can be defined as a long irregular sequence of unused space between surrounding urban tissue, sometimes so narrow that it is barely visible, sometimes articulated wide gaps. These gaps often consist of open spaces and no-mans land without any program or activity. Deviating from the surroundings' scale and form, the crevice almost stands independent in between the urban tissue, resulting in a forced connection between crevice and tissue. The connection limits itself to a few much-needed pass ways but in general is almost un-existing.

The urban crevices are a byproduct of the growing urban pressure and Apartheids regime in the past. When large new formal development was implemented to house mostly black people, it resulted therefore in large amount of surface area being paved and hardened. These crevices, that seem to be characteristic for such large new development, serve a specific purpose and are definitely not a result of a natural process. They are manmade valleys as a result of an altered natural topography.

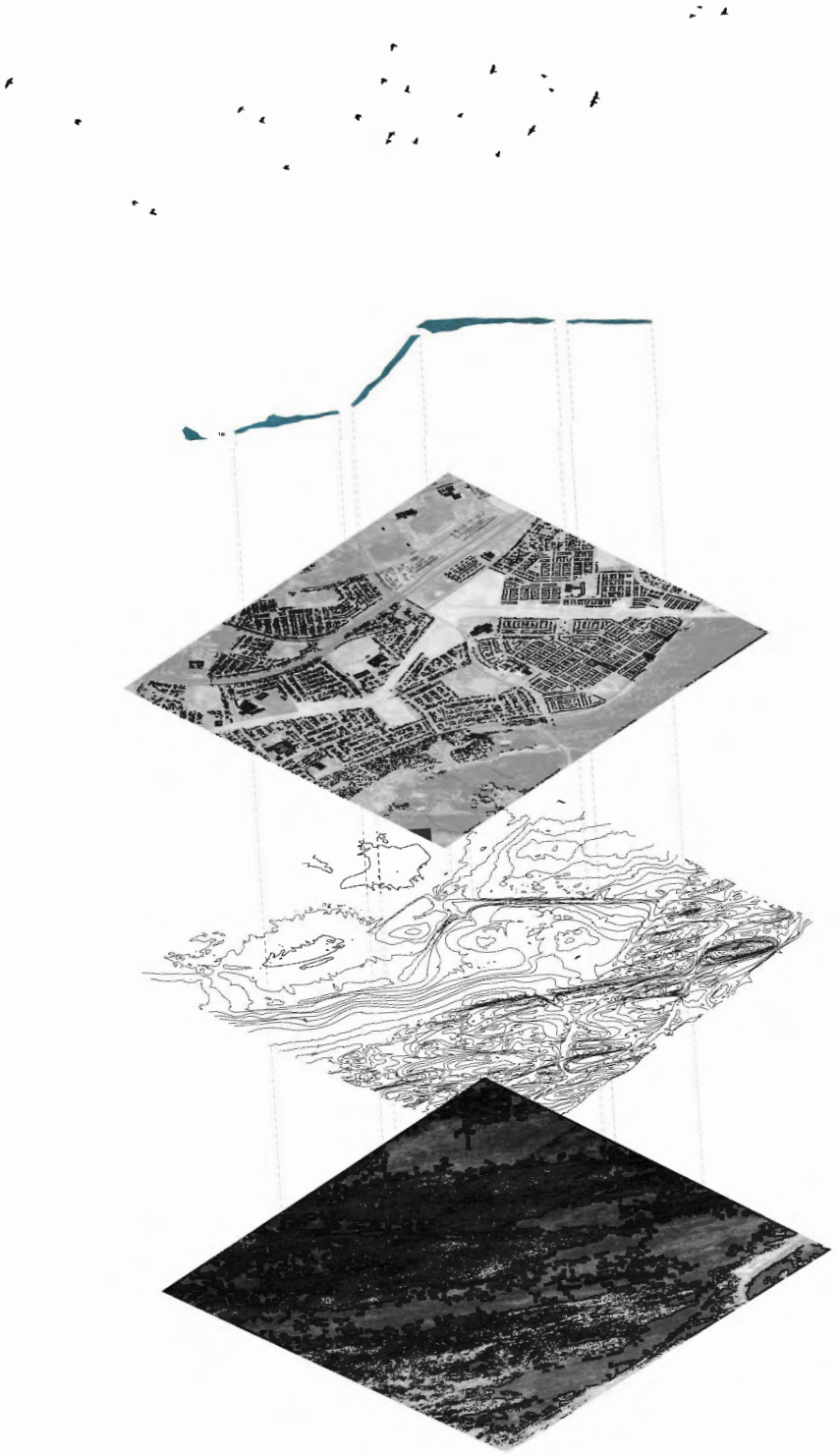
The changed topography of the new development is sloped down towards the urban crevice, so water flows naturally to the crevice, as it lies lower than the surrounding area. The long 'untouched' empty spaces give the possibility for the conducted storm water, coming from paved surfaces, to seep into the ground. Not surprisingly these same spaces, our crevices, are also flood zones in case of extreme rainfall in the winter. They buffer the water in a controlled way (and space) so it can slowly seep into the ground and prevent possible water-buildup that could harm the urban tissue.

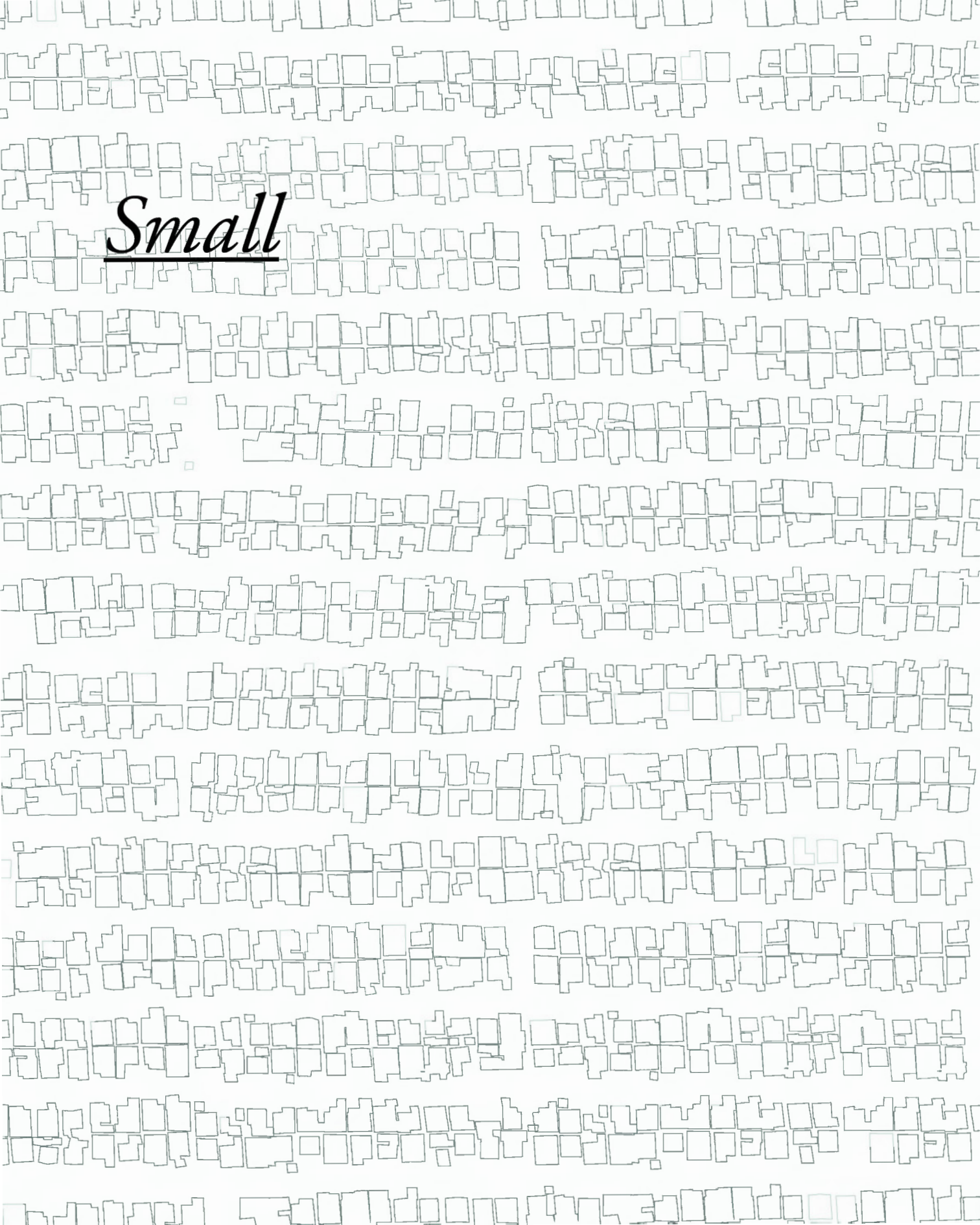
The exploration of the 'urban crevice' teaches us that it was first used as a tool to prevent problems caused by the excess of water. The landscape itself is forgotten. Yet throughout the years things have changed and the useful empty space, the no-mans land that forms the crevice has become so powerful and prominent that, however it is quite small, it separates the two neighborhoods lying opposite to each other.

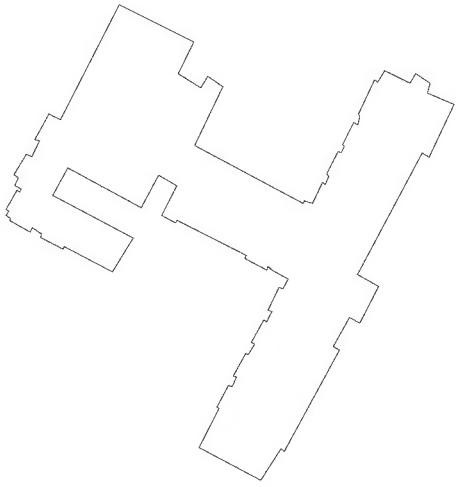
The land offers so much potential, apart from water collection, but finding programs for these kind of figures seems to be a hard task.

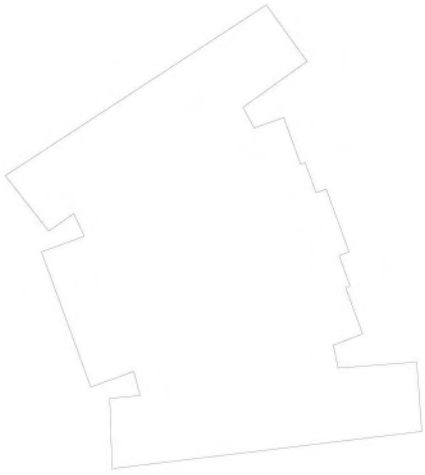
In general 'landscape' houses multiple functions at the same time, like social, economic, productive, etc. This land however only offers to little. So much potential that lies hidden in this space that could be used more efficiëntly. Finding programs for this kind of figures seems to be a hard task since they remain almost untouched till today.

Using this figure as a tool once again, but with a different program, is an opportunity we cannot evade. Turning the forgotten landscape into a landscape as an ally.




Small





Big

Introduction

In this chapter, the potentials of the urban crevice will be explored. We believe this figure can play an active role in the development of the city, by strengthening both landscape and urbanity. We will look at the landscape as an opportunity for Cape Town, as an ally to urbanity, instead of as they are two seperate entities living next to eachother.

In our design proposals, we will betake on the edge of landscape and urbanity, foster the friction between the two and tell a story on how we see a better Cape Town. These proposals are to be seen as new ideas, as possibilities to look differently, but definitely not as the solution to all problems.

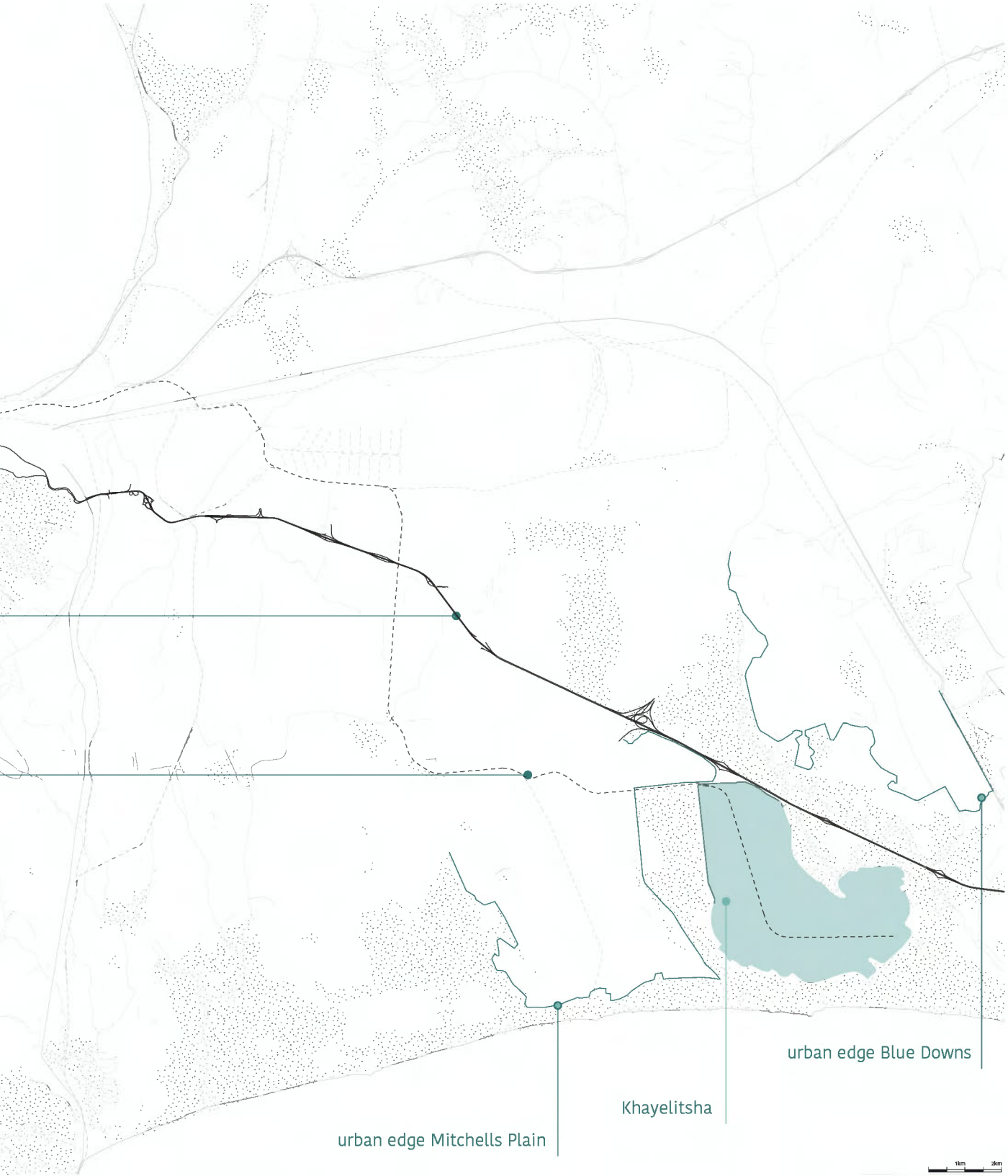

TAFEL
LAGER

Context

Khayelitsha is situated in the Cape Flats, south-east of the city of Cape Town. It is one of the biggest townships in the city, and hosts between 1 million and 3.5 million people, depending on the source.

The township is seperated from other settlements by dunes, railways and highways, making it another enclave standing on its own. The rail- and highways are the most important links between Khayelitsha and the Central Business District (CBD) in the city bowl, where most of the job opportunities are situated. Daily, thousands of people travel hours to get to their jobs, a journey they have to pay for themselves. Via the N2, bus lines connect the townships to the CBD, but the bad timetables make inhabitants look for other solutions like taxis or trains.

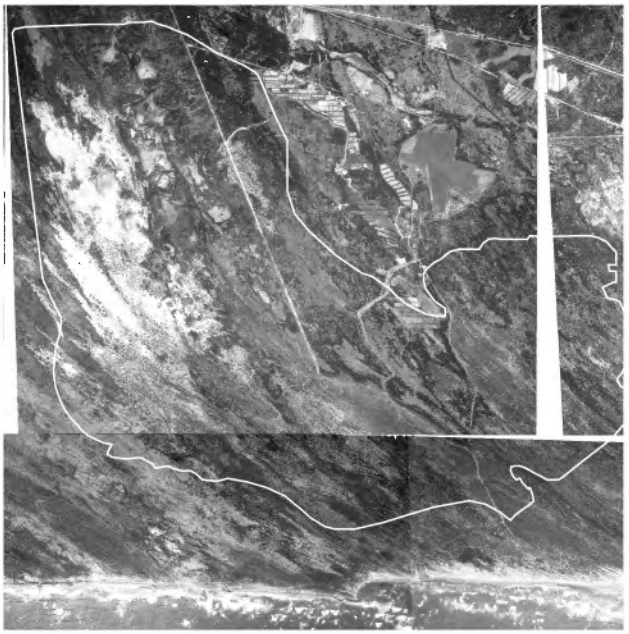
The connection with neighboring settlements like Mitchells Plain or Blue Downs is almost not present. In the border between Khayelitsha and Mitchells Plain, a dunal landscape divides the settlements and forms a barrier that can only be passed at a minimum of points. The relation with Blue Downs is even more one of separation. Not only does the Driftsands Nature Reserve form a wide rift between the two, the N2 also crosses the landscape and makes it hardly possible to cross borders.


urban edge Blue Downs
Khayelitsha
urban edge Mitchells Plain
1km
2km


COSAT


CA 840-608
CAMRY

1945

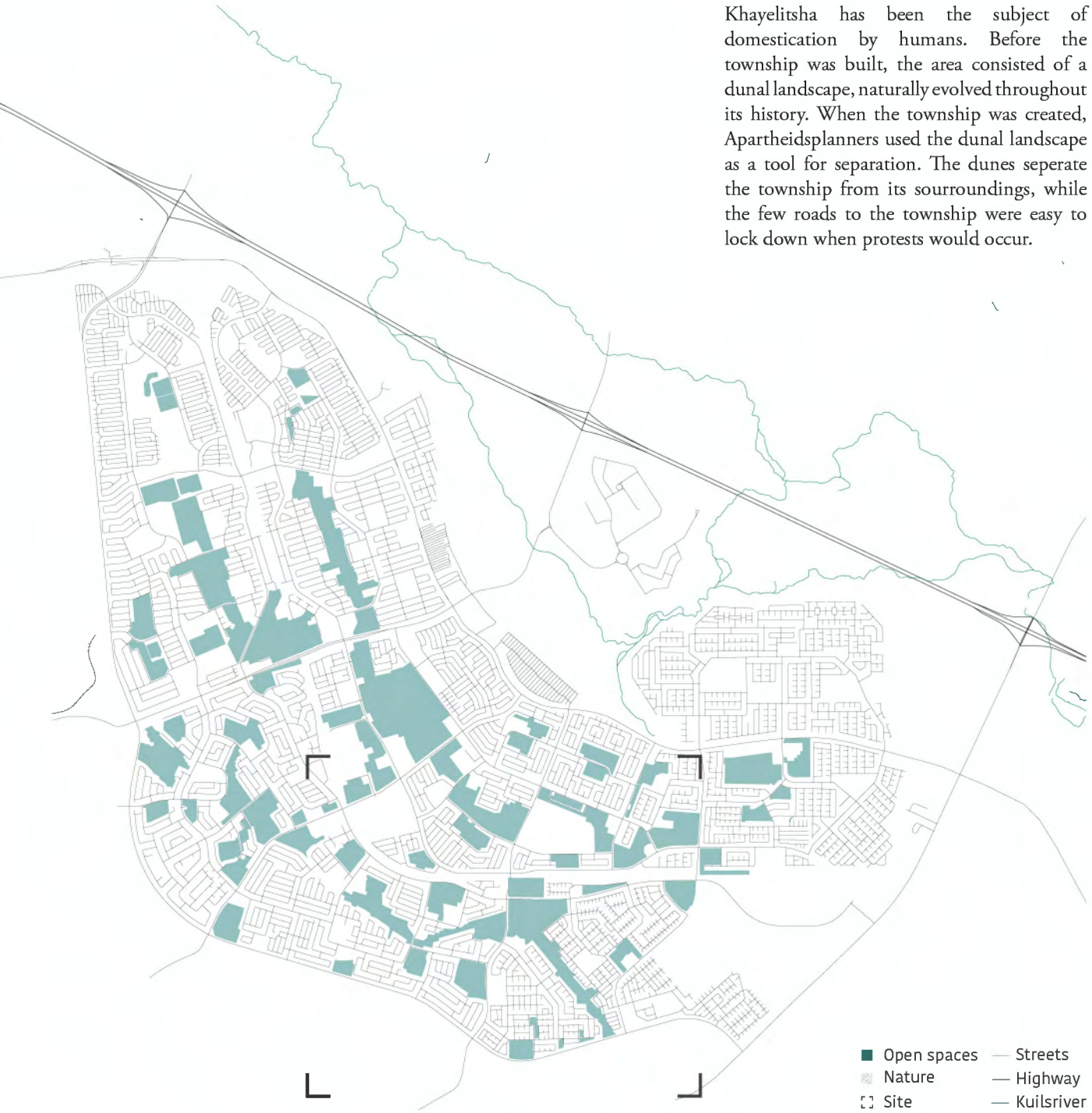


1953

1988

1998

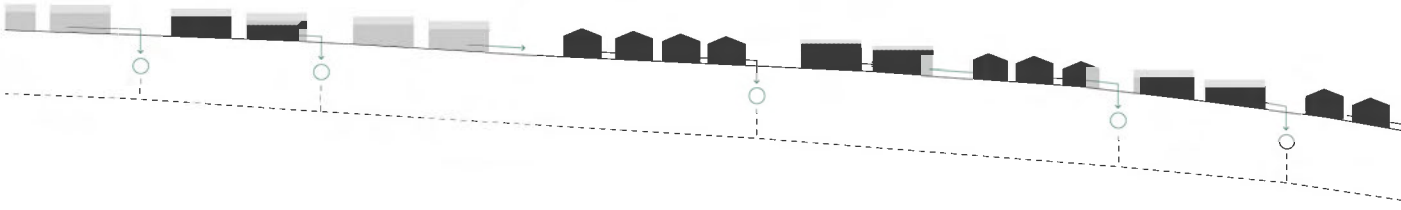
Evolution of the Khayelitsha area



Khayelitsha has been the subject of domestication by humans. Before the township was built, the area consisted of a dunal landscape, naturally evolved throughout its history. When the township was created, Apartheidsplanners used the dunal landscape as a tool for separation. The dunes seperate the township from its sourroundings, while the few roads to the township were easy to lock down when protests would occur.

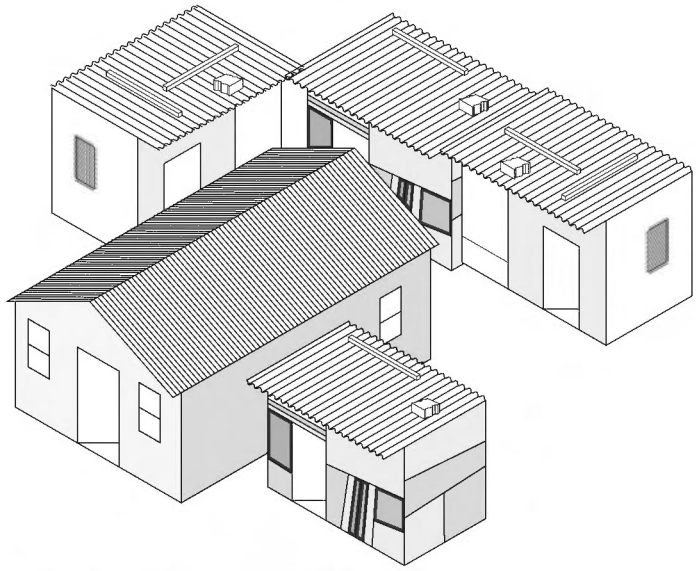
The dunal landscape was altered for the people's needs: flattened, which makes it easier to build houses in mass, with some centralised open spaces lying lower for rainwater catchment, the urban crevices. Currently, the open spaces that are left open for rainwater collection, have a pipeline system running underneath. These pipelines collect the rainwater from the surrounding houses.

The tissue of Khayelitsha is a homogenous one-storey high mass. Most of the houses in the township are RDP-houses, 40 m^2 houses provided by the government. The houses are often accompanied by shacks surrounding it, 'backyards', rented for an extra income or to provide shelter for family members.

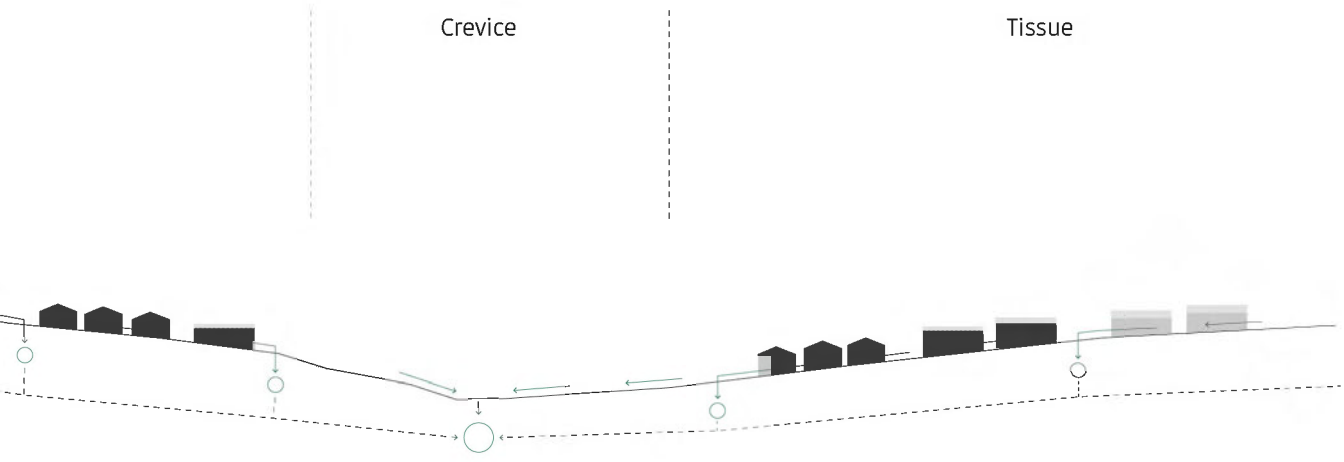


Section through a crevice with surrounding tissue

Stormwater runs of from the houses and the pavement into stormwater conduits. The pipeline under the crevice collects all this water and brings it to the edge of the settlement, where it gets directed into the sea.



Typical housing setting: RDP-house surrounded by schacks.

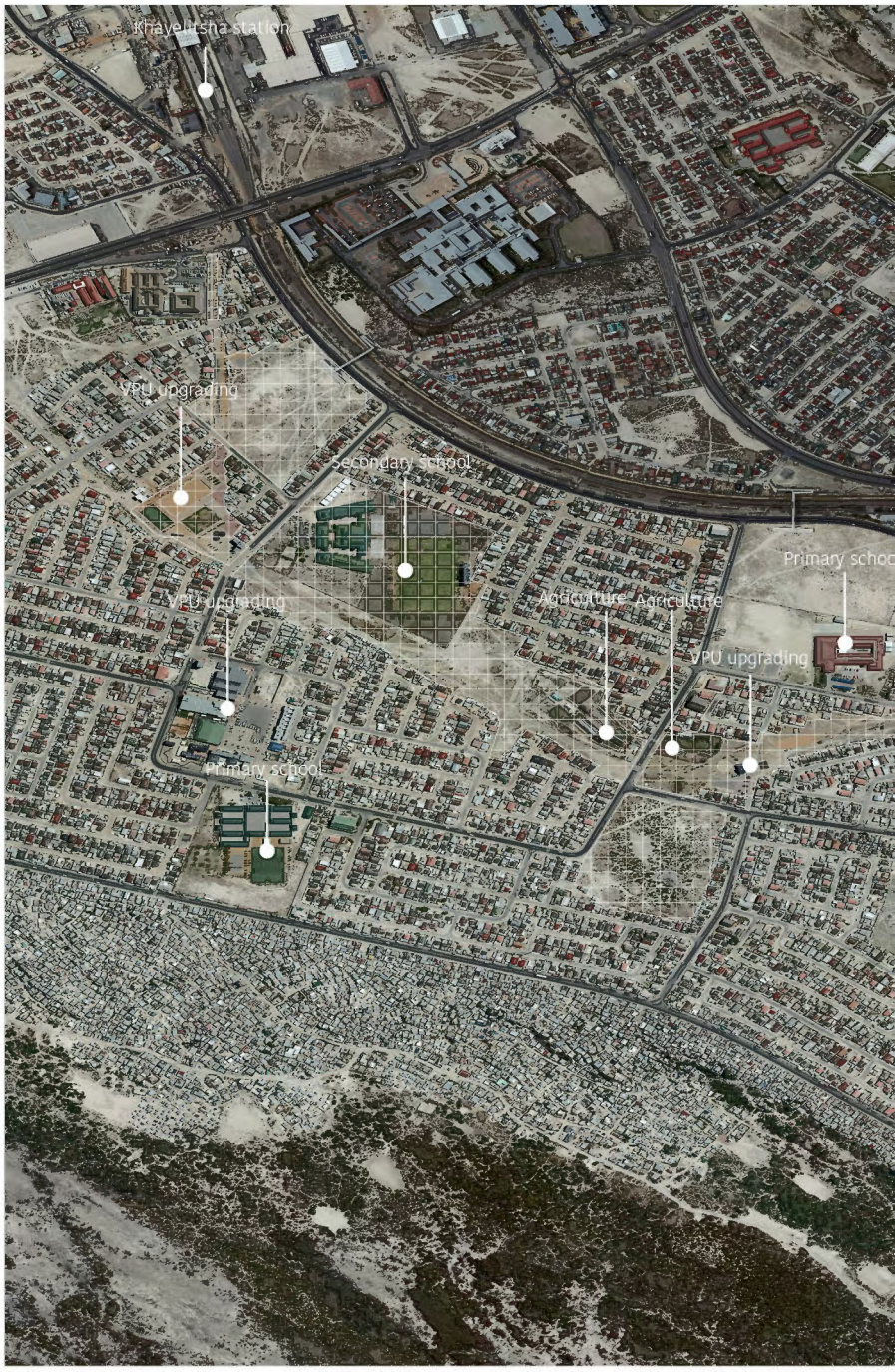


In the design proposal, we will be focussing on an urban crevice in Khayelitsha, more specifically in Harare. The crevice is surrounded by some important elements. A variety of primary and secondary schools lies next to the crevice. Together with hospital buildings, these form the most important public facilities in the neighborhood.

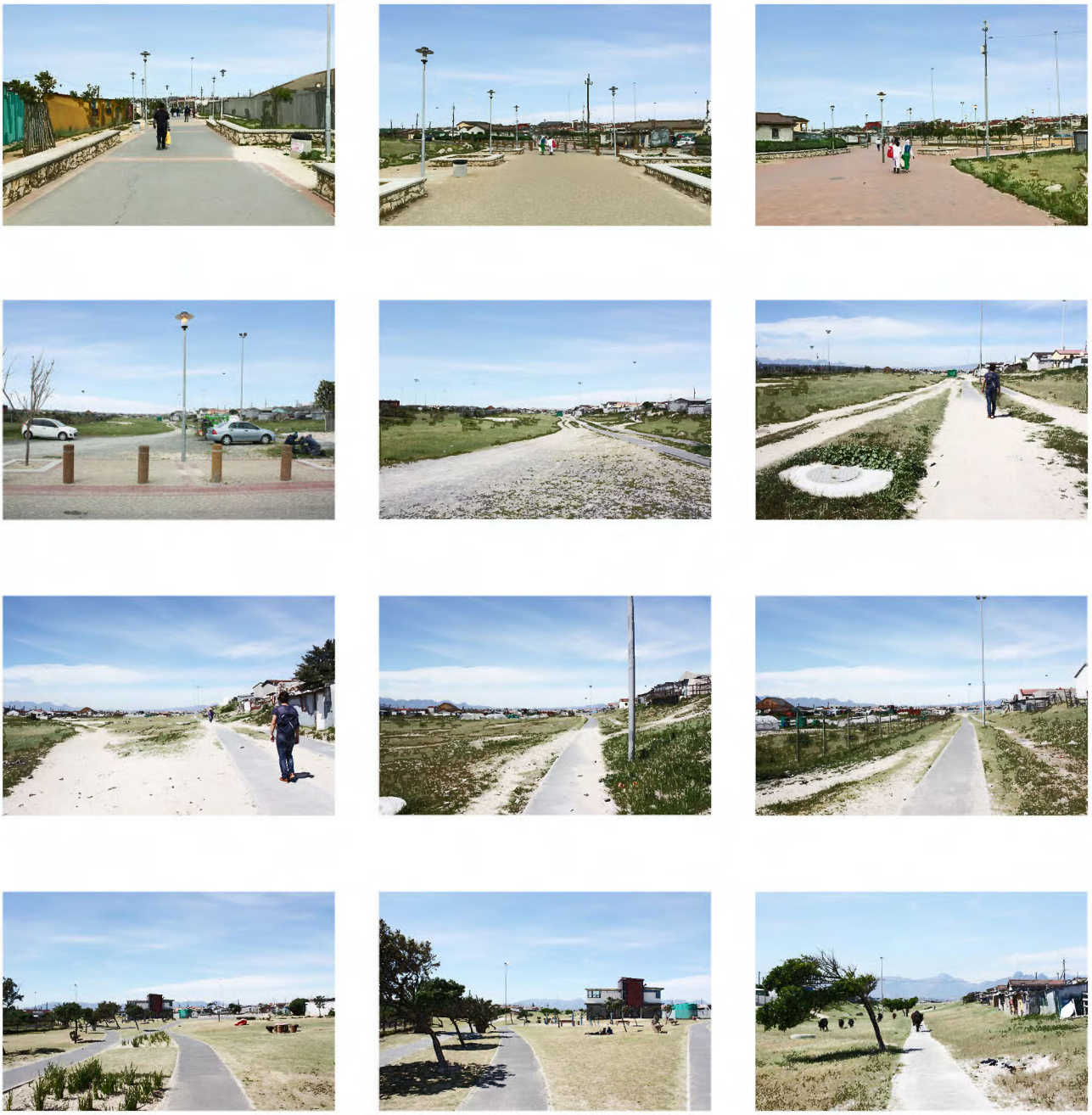
The NGO Violence Prevention through Urban Upgrading (VPUU) has been very active on the site. The first part of the crevice has been subject to upgrading project by the organisation, creating a safer environment in what used to be a rather violent community setting. Their work consists of small-scale infrastructures like lightened pathways, parks, public squares, libraries, etc.

The crevice running between all these elements is a valley created for stormwater catchment. At the end of Khayelitsha, the water collects in a pond, from which the water flows to the ocean.

This crevice is a case-study to show the possibilities that lie within the landscape. The goal is not to provide the answer to all problems, rather it is an investigation of the qualities that are already present on the site. We aim to present new ideas, new perspectives on how we could act on this figure.




Kuyasa station
Secondary school
Secondary school
Primary school
Stormwater collector



Photostudy of the site

From top left to bottom right, the evolution of the crevice is shown: the start of the route is situated near the train station of Khayelitsha, while the end of the crevice can be found at the dunal landscape at the south, close to the shore.

An evolution from urban to landscape is clearly visible: in the first picture, the pedestrian path is paved and provided with decent infrastructure. At the end of the line, the path has been taken over by the landscape.












Beneath the path, the stormwater conduit takes care of the water coming from the neighouring settlements. Often leaks can be found, causing wet zones in the crevice.
So, the crevice serves as a buffer for the stormwater of the tissue surounding it.

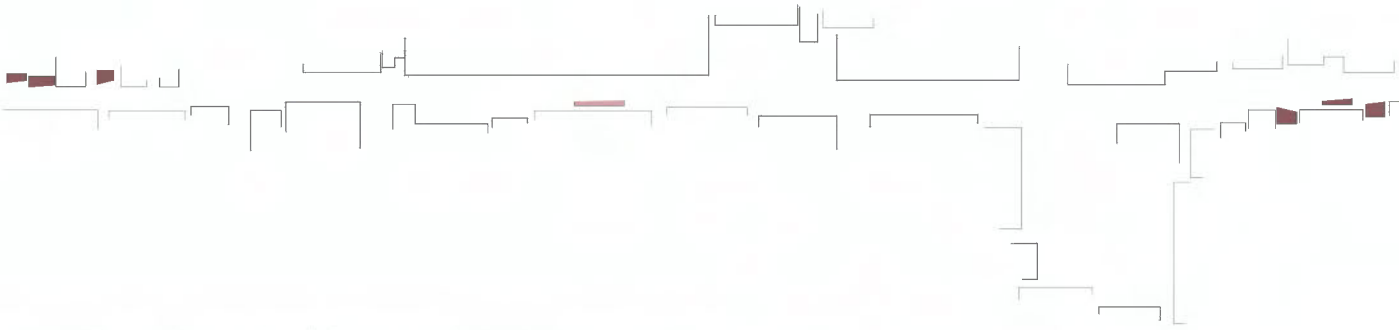
Accumulation of garbarge due to bad waste collection services pollutes this water and the nature surrounding it, making the valley a place where nobody wants to be, unless highly necessary.

back

Frontsides and backsides strongly define the edges of the open space in between. Most of the houses turn their backs to the crevice due to the lack of programs or benefits. In these places the edge becomes even stronger resulting in a harder seperation of tissue and open space.

Occasionally some houses do turn their frontside facing the open space. The reason is often a cross connection over the crevice in close vicinity or the softer typology that allows a certain interaction.

A zone with a more natural appearance, softer typology and cattle grazing, like the one at the end in the scheme below, makes people more prone to face their frontside towards the open space.



Schematic representation of front- and backsides in the crevice

front

The tissue around the crevice consists of two types of buildings: big pixels and small pixels. This duality is strongly present and makes the tissue monotonous: it is one or the other.

The big pixels are spread out over the township and form large open spaces in the tissue of the small pixel. They consist of schools and hospital buildings and stand strongly in contrast to the small houses.

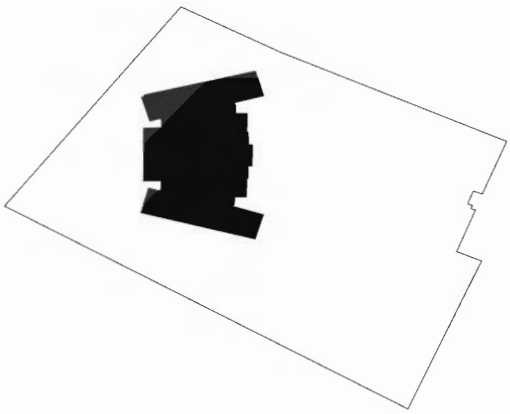
Duality: big pixels (dark grey) stand randomly in the tissue (light grey)

big

The big pixels dispersed over Khayelitsha territory are mostly public facilities like schools, hospitals etc. They stand prominently in the middle of much smaller urban tissue. Identifying, reading and analyzing them is easy due to their generic appearance and characteristics. By combining three elements: mass, void and boundary the typology of the big pixel can be achieved.

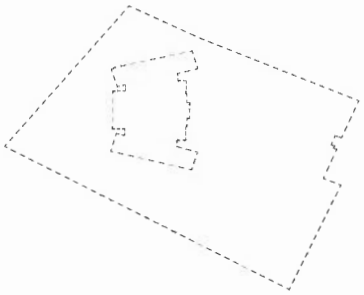
The mass always consist of the building itself. The void around it partly offers complementary functions like parking space, sport fields and playgrounds. Nevertheless in most cases the void also contains much fallow land that is left unused. The third element is the boundary that encloses the previous elements from the surroundings. Razor wired fences are used to harshly keep people in and/ or out of the property.

Lacking efforts to seek connection with smaller pixel or surrounding, the big pixel is experienced as an isolated element in the tissue. It makes them detached but at the same time perfectly implementably in a wide variety of conditions and places.

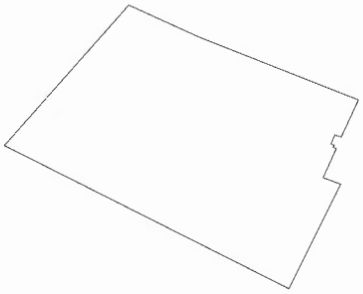


the mass

the void



the boundary



small

Houses placed in a rather structured way in combination with seemingly randomly placed shacks are the basis for the small pixelated urban tissue.

The mass is not a single block but a sum of a miscellaneous collection of houses, shacks, shops, garages and smaller public facilities. Each with their own function, owner and specific place in the tissue. Compared to the big pixel this mass functions in a much more precise and comprehensive way . Construction restrictions, community rules and social interactions between residents makes the mass so much more than a tedious piece of infrastructure.

The void is again not a single patch surrounding the small pixel but an intricate interplay of smaller patches of open space, semi-private pass ways and community owned public places. Sport fields sometimes are part of these public places but are not always present in every community. To create a certain sense of safety, washing lines, home made barriers and other tools are used to make soft boundaries where necessary. For example to screen the community public space from a busy road.

the mass

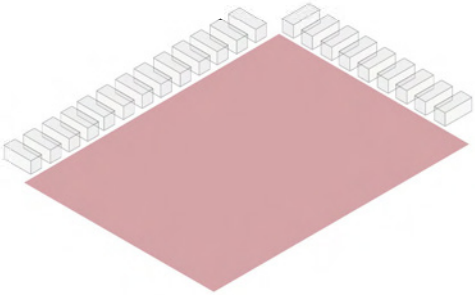
the void

the boundary

Secondary schools, seperated from the landscape and the tissue by a fence.

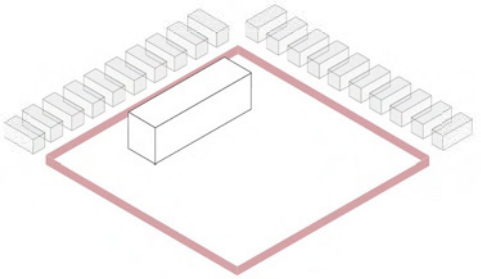
RDP house: a small path next to the house connects the tissue to the crevice.

RDP houses form the core tissue of Khayelitsha



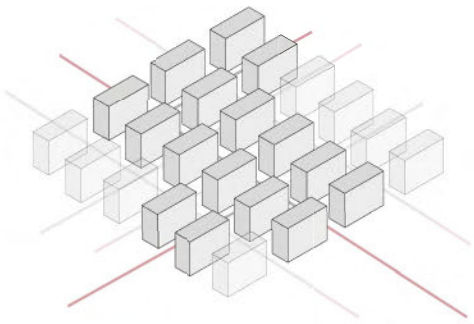
Inefficiently used open space

There are a lot of unused open spaces inside the tissue. These are left open, without a program and mostly serve as passage between neighborhoods. The edges of the open space are formed by houses who often turn their back to it.



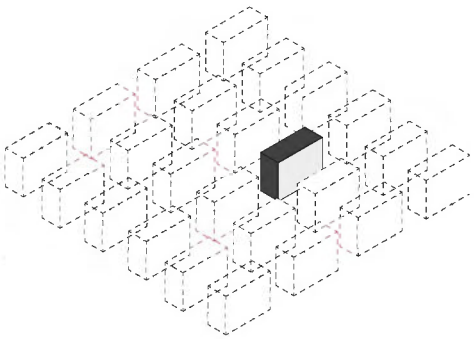
No connection with tissue

Big pixels inside the tissue have no connection with the surrounding houses as they are separated by fences. When school ends, no activities are taking place on the terrain, but this could perfectly be possible if the open spaces surrounding the big blocks were polyvalent.



Too high permeability

The tissue of Khayelitsha is too permeable. The permeability causes a lack in social security and safety as every street is accessible for all with almost no hiërarchy.

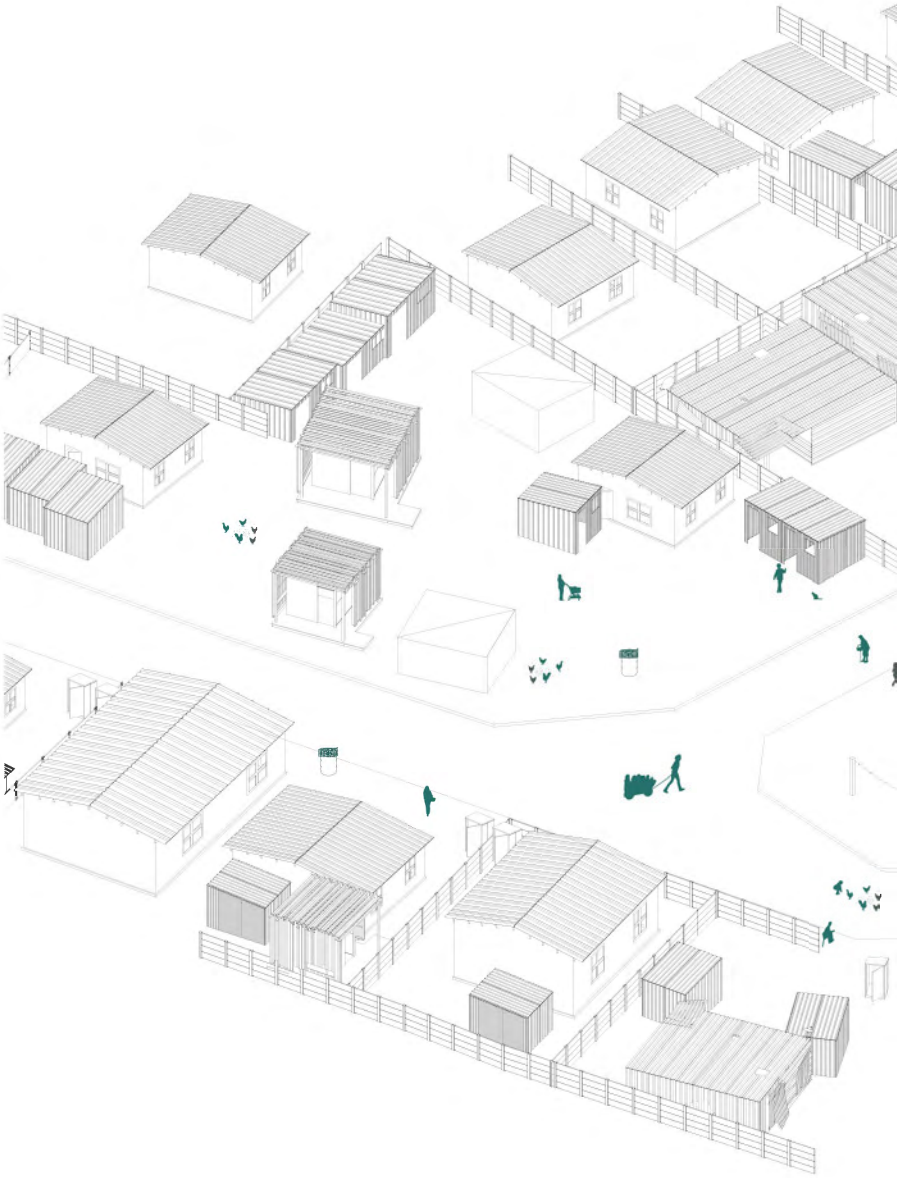


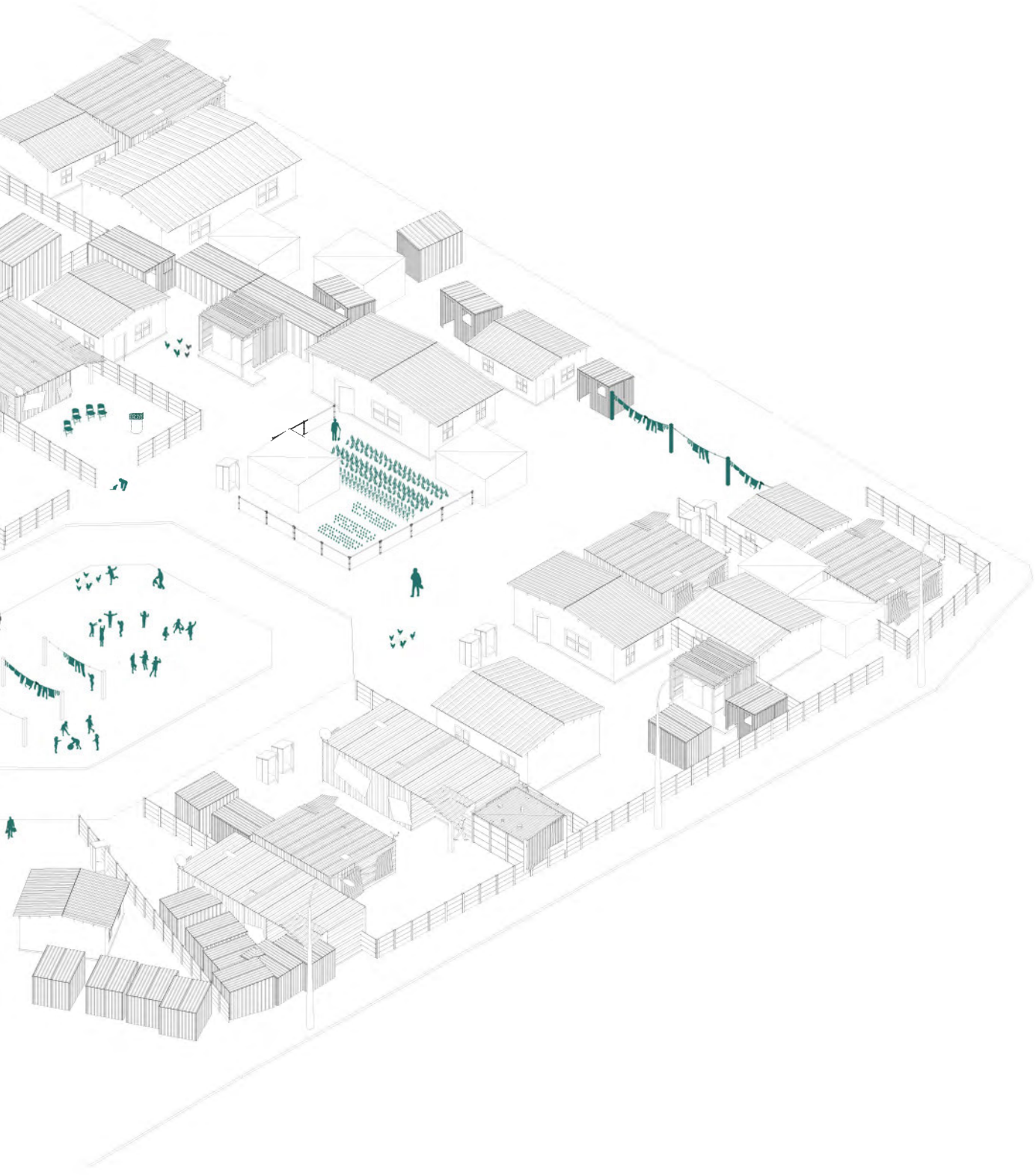
Too little diversity

Every street and house looks the same, no differentiation can be found in the homogenous tissue. The little diversity is problematic for quality open spaces. Public life can be found on the streets, but without structural qualitative entities to make it work.

In the tissue surrounding the crevice, we already see some initiatives by inhabitants to tackle the problems of permeability and diversity. Laundry lines are used to block passage ways and create community life on the street. Kids play in the self-created public space, with social security by people sitting on the street. Little activities are taking place like braais, small agriculture, little shops etc.

The community is taking control over some decisions made by the governments, giving identity to their neighborhood. These bottom-up initiatives are a first step in the right direction. On the scale of the big pixel, we see no evolution occuring into a more qualitative and polyvalent use of open spaces. While in the tissue initiatives come from residents, board members or governments should take action to hybridise these big pixels.

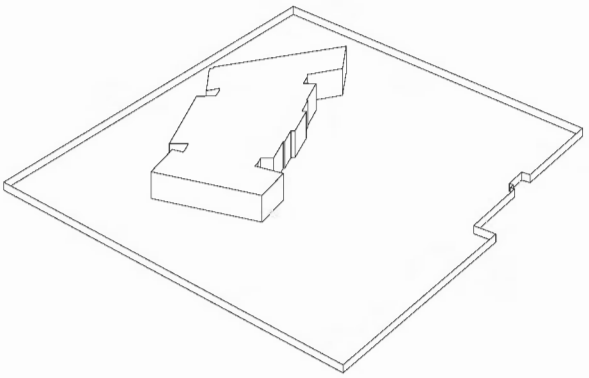


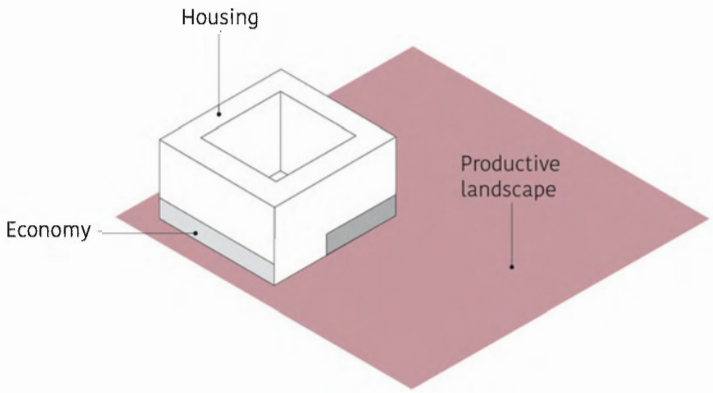


Strategy

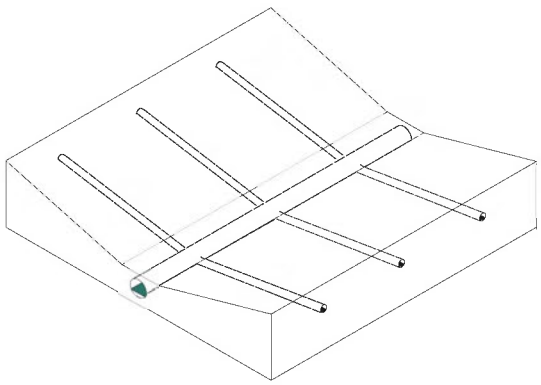
We advocate for a double strategy: using new urban typologies to strengthen the landscape figure. We believe the crevice is a figure that should be used as a structuring element for urban growth, while the urban implementations can guard the crevice.

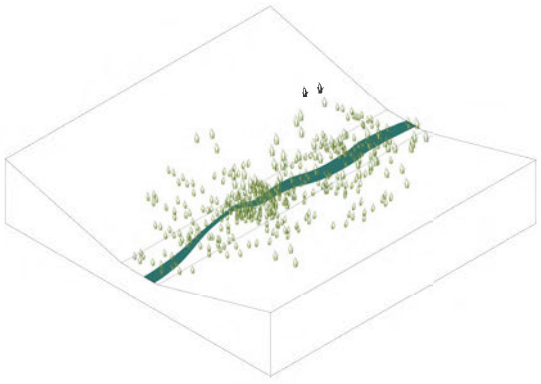
We propose a new typology based on the big pixel that is already present in the tissue of Khayelitsha. The scale of the building is comparable to the one of the big pixel, but the program is different: a combination of housing, productive landscape and economic units. The housing provides higher density in the homogenous one-storey mass of the township. The productive landscape provides the inhabitants of the houses with food to live or to sell on local markets. The economic units give the possibility to the inhabitants to sell their goods and start a local business.





To strengthen the crevice as an important landscape element, we promote the rethinking of the stormwater system. By bringing the water to the surface, the crevice keeps its buffering status, but in a natural way. The figure will evolve into a more biodiverse valley, changing along with climate conditions.

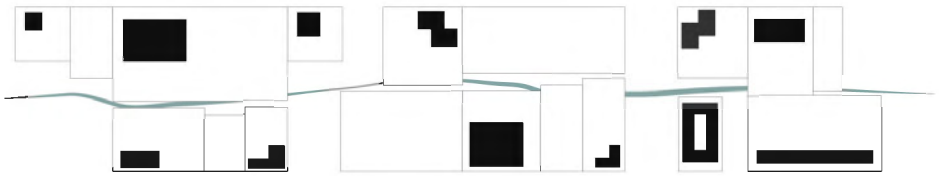




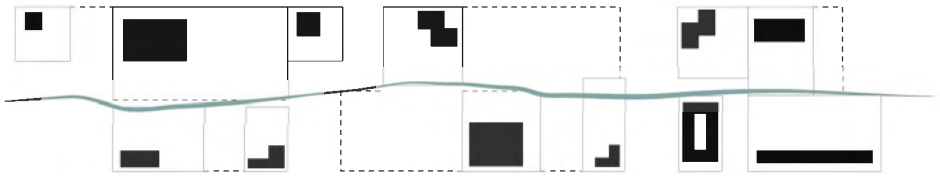
The combination of the urban typology of the big pixel and the natural crevice gives an interesting figure in the existing tissue.

Organizing the new big pixels around and in the crevice, the landscape serves as a structural element for future urban growth, while the pixels guard the landscape and protect it from future urban pressure. The crevice, which is currently underused, is implemented with a combination of housing blocks and their programs, connections and borders to give the existing landscape a dynamic character. It serves as a connector and separator at the same time.

Implementing the big pixels on the edge of landscape and urbanity is a way to deal with front- and backsides surrounding the crevice. The new added elements and the existing tissue will work together in order to create interesting relations and improve the urban quality.
The interplay between the elements in the crevice itself and the existing tissue creates interesting situations.



reorganisation and implementation of new typology in combination with empty zones and passage ways



removing or transforming hard edges to softer edges creates new kinds of relations

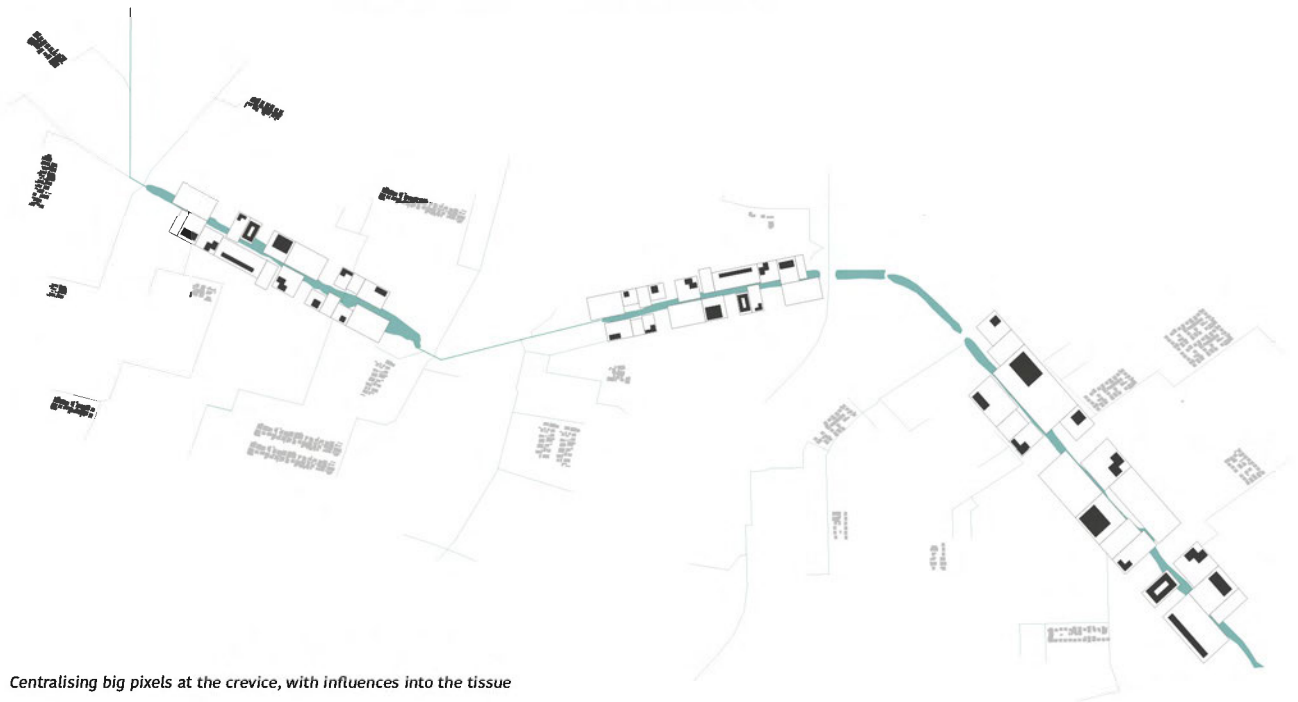
In addition to the new typology a process is introduced that will gradually transform the existing tissue in Khayelitsha. Using the big pixel as a catalyst, the process will densify the monotonous one-story high tissue while at the same time creating higher quality open spaces.

The first step is to build the big pixel in the crevice. When a block is built, smaller neighborhoods can move into the block. The incentive to do this and get the process started lies in a couple of benefits, on which we will elaborate later on.

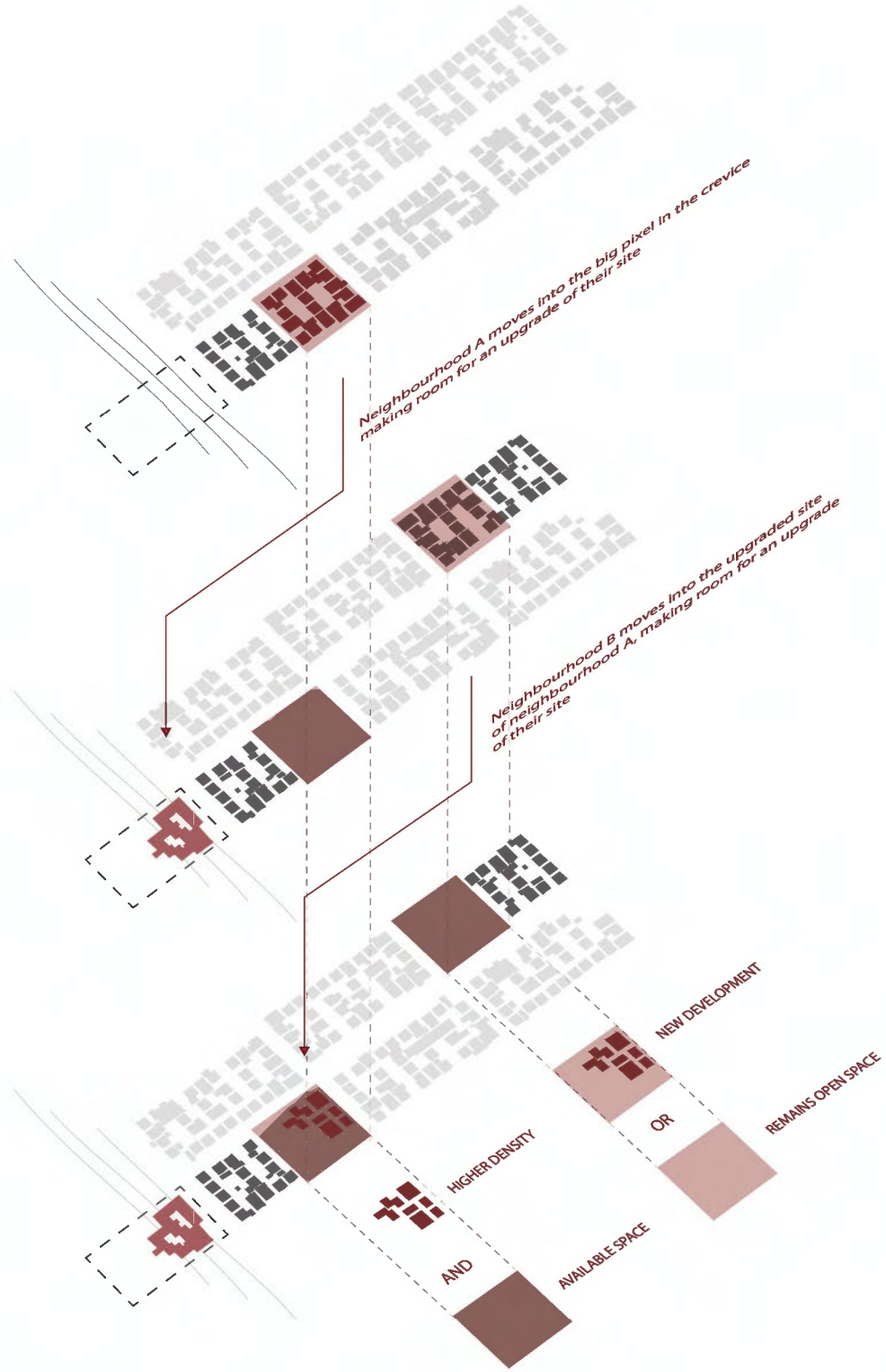
After the movement of the smaller neighborhoods into the big pixels, the houses these people are coming from are left open an unused. The next step in the proces would be to upgrade these neighborhoods with quality open spaces and higher density housing on the scale of the tissue.

Once these neighborhoods are developed, the system can keep on going each time by the movement of neighborhoods into other patches.

By implementing this system, we thus get centralised development in the crevice, with influences going beyond the edges of the figure into the tissue.



Centralising big pixels at the crevice, with influences into the tissue

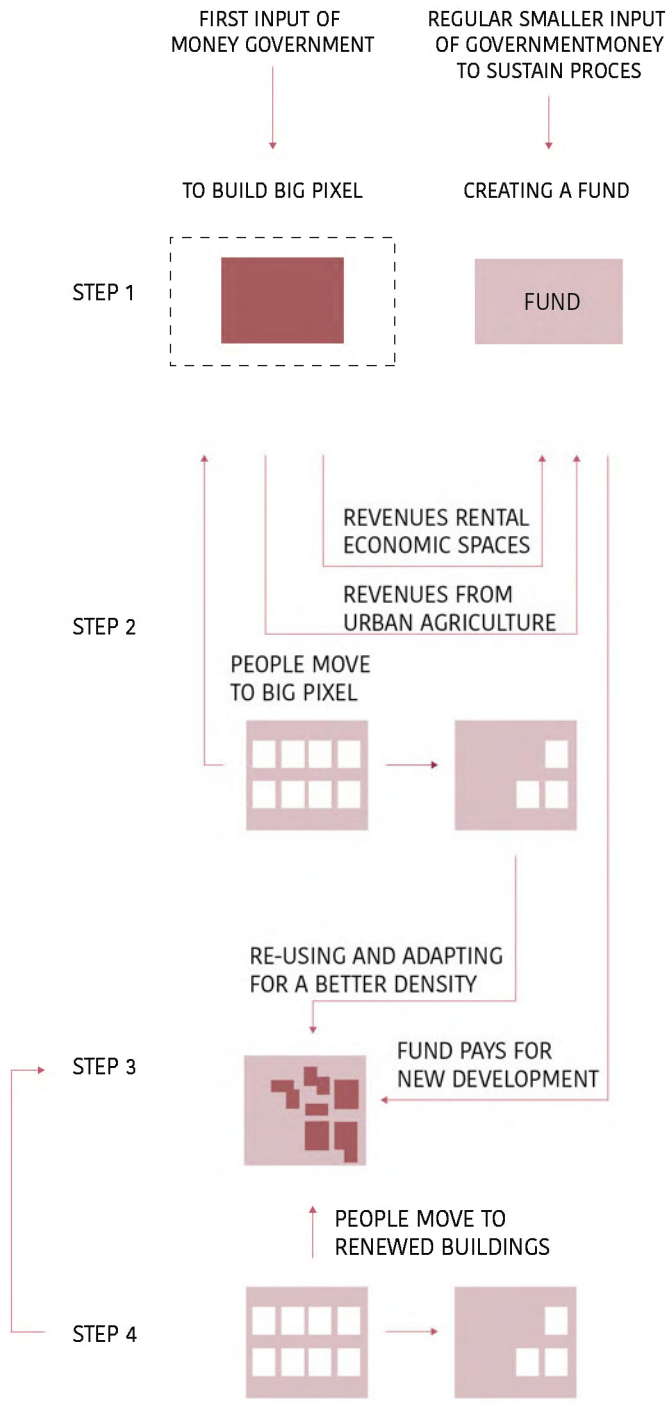


Housing movement scheme

To make this proces possible, a money flow system is needed.

The first input is the one by the government, to build the big pixel in the crevice. Together with this block, a fund is created, which will keep the upgrading process going. The money going into the fund is threewise: rent of economic units in the block, revenues from sales of goods from the productive landscape and a regular input of government money to sustain the proces.

The money collected in the fund is then used to upgrade the plots that are empty because of the movement of people into the big pixels. Keeping the existing structure of these patches of tissue will lower upgrading costs. Then again, new people can move to the upgraded patch, and so on.


FIRST INPUT OF
MONEY GOVERNMENT
REGULAR SMALLER INPUT
OF GOVERNMENTMONEY
TO SUSTAIN PROCES
TO BUILD BIG PIXEL
CREATING A FUND
STEP 1
FUND
STEP 2
REVENUES RENTAL
ECONOMIC SPACES
REVENUES FROM
URBAN AGRICULTURE
PEOPLE MOVE
TO BIG PIXEL
RE-USING AND ADAPTING
FOR A BETTER DENSITY
STEP 3
FUND PAYS FOR
NEW DEVELOPMENT
PEOPLE MOVE TO
RENEWED BUILDINGS
STEP 4

Implementation

The strategy results in a transformed crevice that is no longer a underused empty space, but slowly transforms into a strong value for the neighborhood.
An analysis of the site, with its current relation or non-relation with the crevice, allowed us to implement a strategical sequence of three urban typologies; the new big pixel, nature and public open space. The sequence as a whole creates (new) relations adapted to the surrounding tissue and maximizes the potential of existing edges.

Each typology carries in itself a main characteristic but can differentiate in the elaboration and its appearance. Appearance changes overtime due to different climate- and weather conditions and different ways of using the public space.
This ensures the proposed design is not rigidly dictated but rather an ever fluctuating and semi-adaptabel development in the neighborhood.

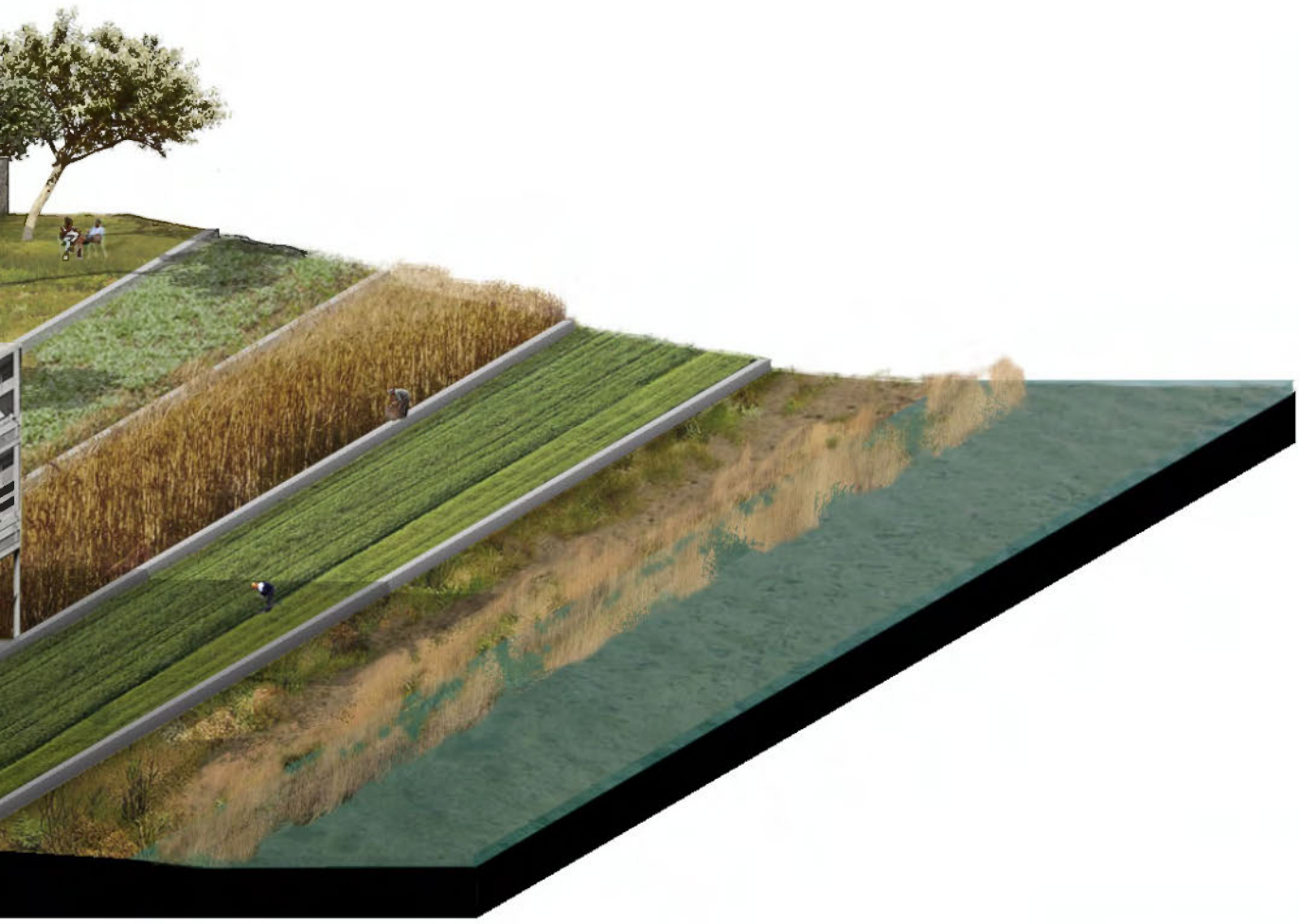
To show how these ideas are implemented, we focus on one part of the crevice, at the end of Khayelitsha.

Big Pixel

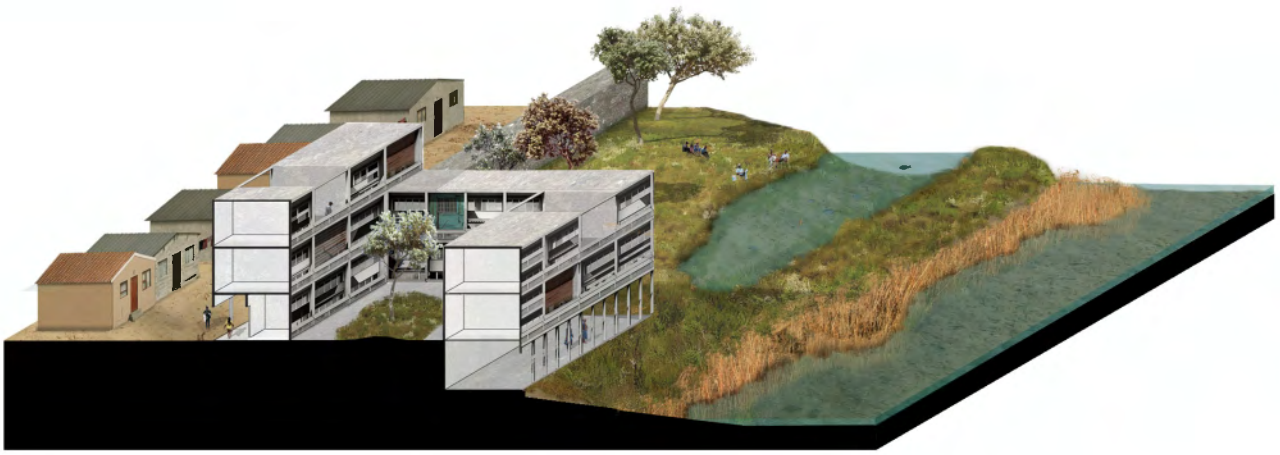
The big pixel is characterised by three elements: housing, economy and productivity. Economic units at the level of the tissue connect the building with the surrounding houses. These units can be hired by inhabitants of the block to sell vegetables, open a barber shop, sell construction materials etc. The rent for these units goes directly into the fund.
Where the building and thus the economic units stop, a gallery at the street side visually defines the border of the big pixel. The gallery serves as a structuring element next to the tissue.

On top of the economic units, housing elements form the core of the big pixel. The scale of the schools and hospitals in the neighborhood is combined with the program of the surrounding tissue, creating a new typology that is recognisable in Khayelitsha.
The block consists of multiple units, partly incremental, partly built, leading to a housing block where everyone can grow at his own speed. The units are collected around inner gardens, providing semi-private space for the inhabitants.

The productive landscape coming together with the block provides the people with food they can use to sell or eat. In the example below, agriculture stripes are implemented. Part of the revenues from the productive landscape flows into the fund, guaranteeing the continuity of the development proces.



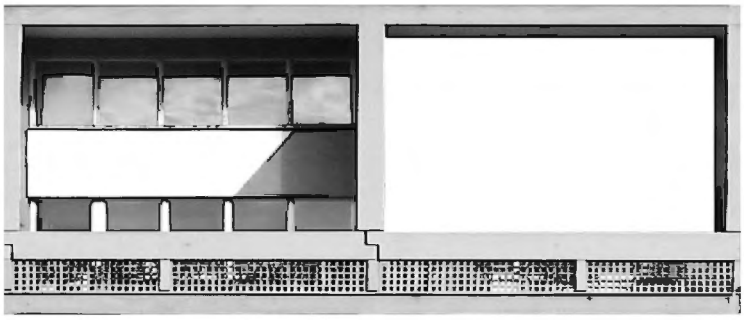
The productive area of the big pixel depends on the needs of the inhabitants and seasonal climate shifts. For example, a fishing pond or cattle grazing area could be implemented instead of agriculture.

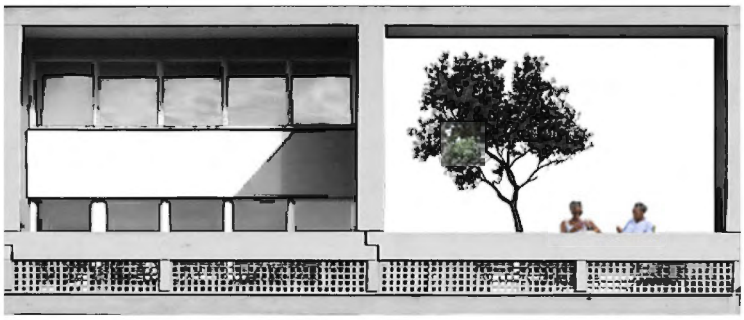


When houses turn their backside to the crevice, the typology can adapt by changing sides. In the example below, the economic units are directed towards the open space lying next to it and by doing so creating a possible crossing over the crevice.

The housing units provided for each houshold consists of two parts. One part is built, while the other is left open for the people to fill in to their own needs and wishes. Sometimes, a terrace is implemented, while other families need an extra shack to live, to shelter family members or to rent on the market.

The facade will evolve gradually over time, shifting with demographics. By the use of this incremental system, elements from shacks, braais and so on will characterise the building, causing the housing block to blend into the tissue of Khayelitsha.

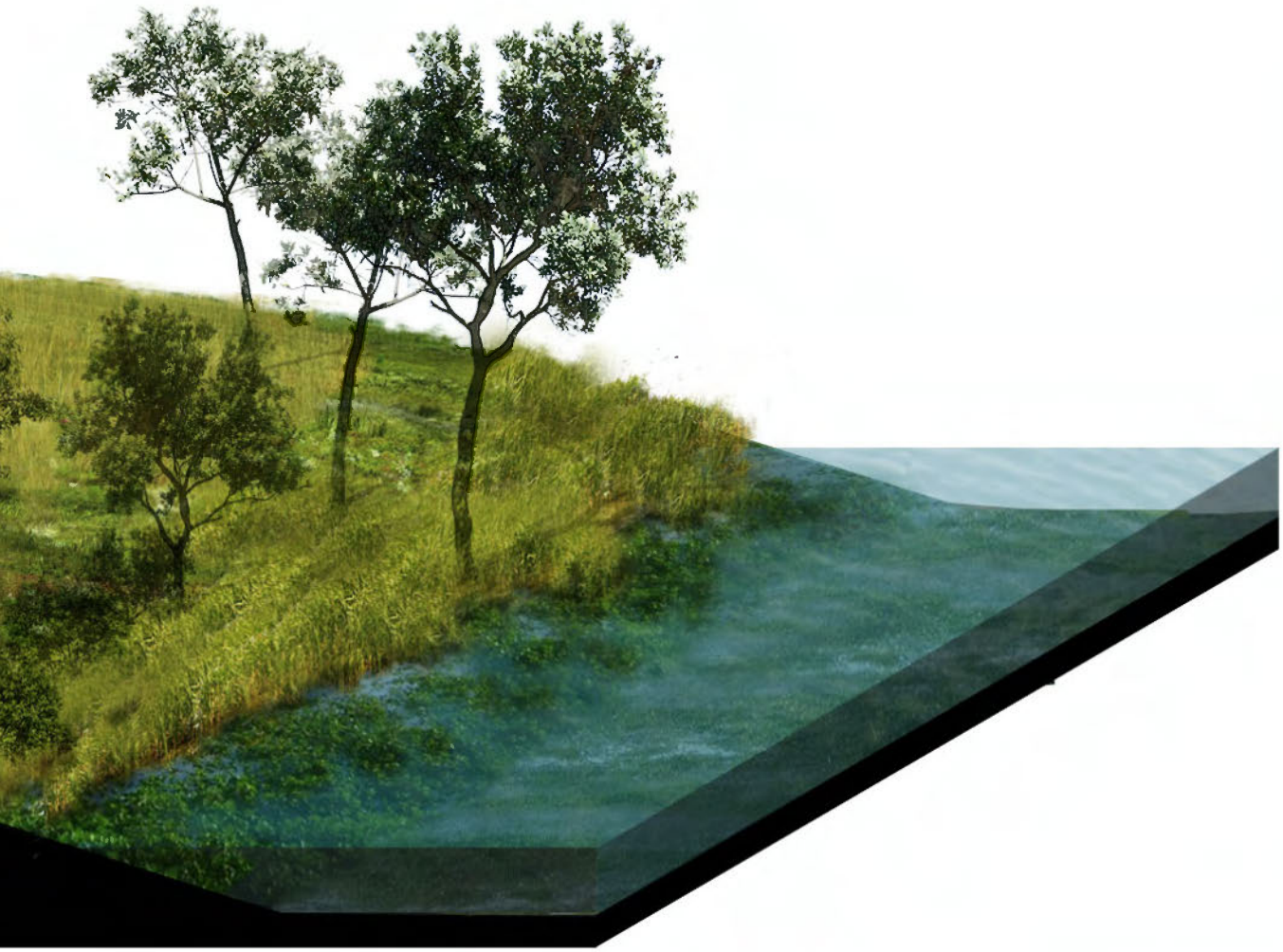




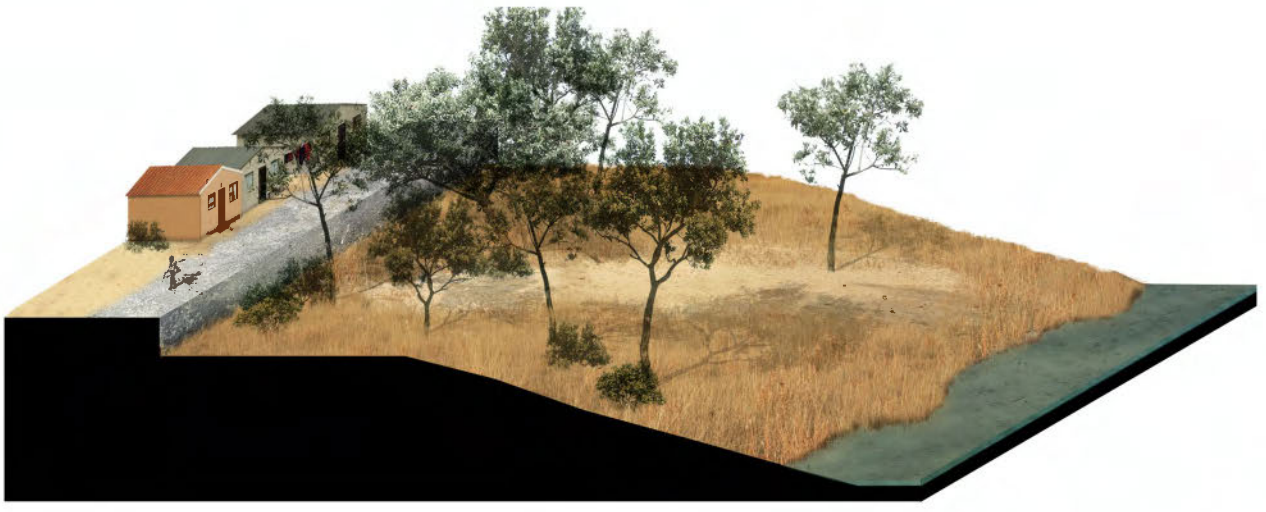
Nature

The nature typology is a way to protect the natural parts of the crevice from future urban pressure. By redefining the edges, we let the nature evolve and breath at seasonal paces. In winter, the water level will be higher, giving the natural elements more possibilities to grow.

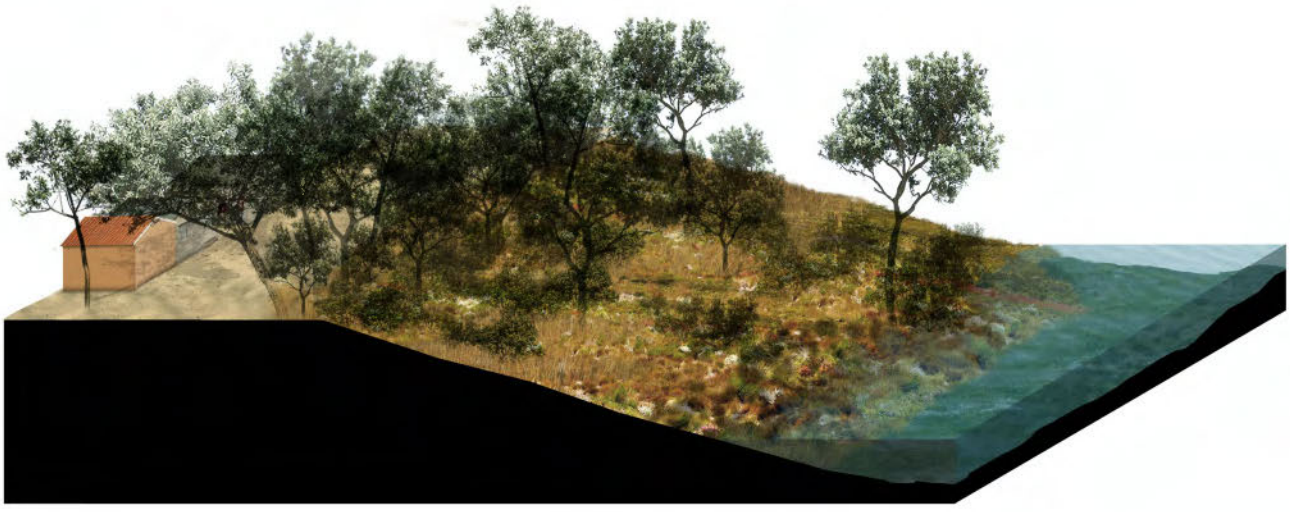
When houses are directed towards the crevice, we use an extended retaining wall as a pathway to connect the frontsides to the different typologies in the crevice.



The retaining wall is used to seperate landscape and urbanity while keeping a visual connection between the two.



When houses turn their backside to the crevice, the typology can adapt by changing sides. In the example below, the nature itself is used as a tool to protect the landscape figure inside. Dense vegetation makes it impossible for intruders to go into the crevice.



Open space

Some spaces are left open for the people to go into the crevice and have direct contact with the nature. In this way, a connection is made between crevice and tissue, and bridges may be formed between the tissues at either side of the crevice.

The people use this open spaces for public activities like sport fields, meeting spaces or just as a place to hang out.

With seasonal changes, the open space will adapt, as well as the public program. While the valley in the first example was used as a soccer field, it is impossible in the example below due to the water level being higher. The program will be changed by the inhabitants to the moment of the year

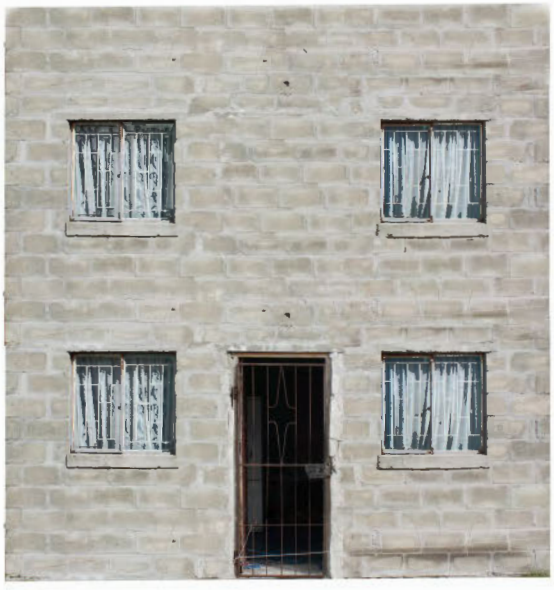
Another example of a program that could be implemented, is a church. These churches are formed with old circus tents, and may be moved to another place with changes in the crevice natural status.


dense vegetation shields
nature from public space
and crevice from tissue
backsides of houses
creates edge between
agriculture and tissue
connection created by linked
open public spaces


an elevated accessible
border separates tissue
and agriculture
nature next to bix pixel
requires no special edge
merging open spaces
in tissue and crevice
creates new public space
an elevated accessible
border separates
tissue and nature
backsides of houses in combination
with dense vegatation create edge
between nature and tissue

The transformation in the existing tissue is on a smaller scale but has as much impact as the transformation in the crevice. Plots and houses that are empty due to the migration to the big pixels (or previously developed plots in the tissue) are altered to create higher density while more open space is created in between the blocks. Variation is promoted to start changing the monotonous tissue and a more livable space in-between houses is achieved.

Existing houses on the plots can be preserved as is, can be densified by building an extra story or can be (partially) demolished and transformed into a defined open space, a private garden etc.



Reflection

The figure of the urban crevice has been our way of looking at Cape Town. We believe the city should actively use this figure to promote a new way of looking at its future development. The landscape has always been obliged to watch from the side, never having the possibility to play along. This idea should shift, turning the landscape to an ally of urban growth.

For this fiction to become reality, we need to form strong ideas to present to decisionmakers. We believe we do this by investigating the frictions between landscape and urbanity. The importance of this friction lies in the interesting interaction it generates between its two counterparts. The one can not live without the other and vice versa, so we should find new ways of dealing with them both.

In the urban crevice, the edges of urbanity and landscape are shifted, creating an interweaving of both in a structuring figure for urban and natural growth. An interaction is created between humans and landscape, while still keeping important characterictics of the figure alive. The crevice is still a buffer for stormwater, but on a new level where engineering qualities are combined with well-being of the people. The crevice still seperates, sometimes even stronger than before, sometimes far less, but everytime in the specific context it serves. The crevice is strengthened to tackle future urban growth, with stronger landscape and urban elements to guard it.

We did not give the city a masterplan or solution to its problems, but rather a new way of looking at itself.

urban rift

This vast open breathing space guarded by ever-changing water bodies, holds several concealed urban havens safely within the city's reach. All while enclaves at its frayed edges slowly nibble parts of it away.

Currently, urban rifts fulfill the role of internal city buffers. The term 'urban rift' refers to a gap or an opening that results from large entities splitting apart. The latter is reminiscent of the apartheid separation that severely cut through Cape Town's social, racial and mental fabric. However, aren't just large gaping open spaces. It is here that a multitude of water bodies and remnants of endangered species find refuge from the oppressive city forces. Their presence starkly contrasts with the heavy urban programmes implanted in the more remote parts of the urban rift figure. Thus, the components that shape the urban rift are the combination of gaps between enclaves, unique natural landscape elements and isolated heavy urban programs. Each one of these building blocks of the urban rift will be further elaborated on.

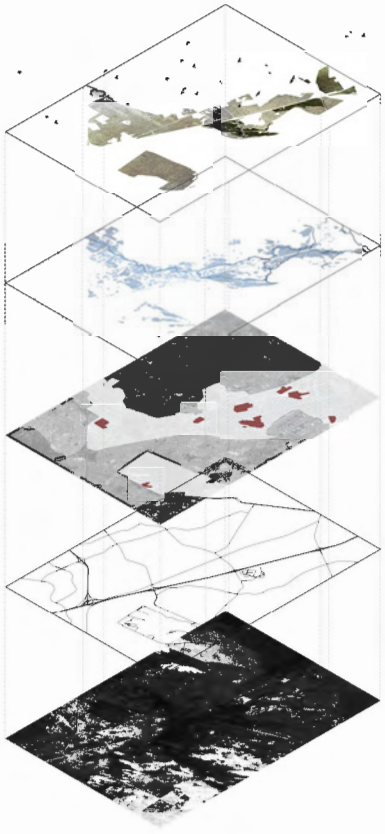
Urban rifts are extensive gaps in-between large urban enclaves. These are open spaces that form physical barriers and thus act as separators of the larger city enclaves. This segregation in urban tissues is rooted in the social engineering of apartheid, which came down to a rigorous model of spatial engineering (Edgar Pieterse). Besides manmade infrastructure (highways and rail lines), natural landscape features were also employed to keep the different racial and cultural communities as isolated as possible.

"*Cape Town was conceived with a white-only centre, surrounded by contained settlements for the black and coloured labour forces to the east, each hemmed in by highways and rail lines, rivers and valleys, and separated from the affluent white suburbs by protective buffer zones of scrubland*" (Edgar Pieterse, 2014).

Urban rifts harbour multiple natural landscape elements. The backbone of an urban rift is formed by various water-bodies such as rivers, creeks, ponds and wetlands, in combination with comprehensive biodiversity. During the apartheid era, water was used as a major separating tool between different communities, because of its spatial defining character which often led to strong physical barriers. The rising urbanisation caused an increased surface runoff of rainwater, as impervious surfaces such as roads and sidewalks, prevent the water to percolate through soil. The greater amount of urban rainwater runoff increased the floods during winter and created vaster wetlands. These flood zones and wetlands originally

played a major role in keeping the area free from urbanisation. Today, however, as urban space has become scarce due to a continuous urban growth, these water-bodies no longer succeed in preventing the sprouting of new settlements. Consequently, various kinds of bio-diversities that are associated with this network of water-bodies, are increasingly endangered, and face the risk of total extinction in the end. As a result these urban rifts constitute grounds for nature reserves due to the presence of comprehensive biodiversity networks.

Urban rifts draw the attention of heavy urban programs. Their buffer capacity and scale make urban rifts very attractive to heavy urban programs. These profit from the absence of the city, without being fully separated from it. Several urban programs need such conditions to thrive, and therefore they tend to settle in buffer areas like urban rifts. Examples of heavy programs are military training bases, film studios, caravan parks, industrial sites and so on.



Hard

Soft

Introduction

An urban rift provides unique opportunities in a city as it holds a variety of entities. The softcape is an ideal incubator for programs and activities that can not really find their place in the city. However, this haven is endangered as it is slightly consumed by further development of the urban hardscape. A new kind of development is needed that finds a balance between hard and soft. More specifically, a development which forms a platform for friction between the non-urban, urban and heavy urban.

Context

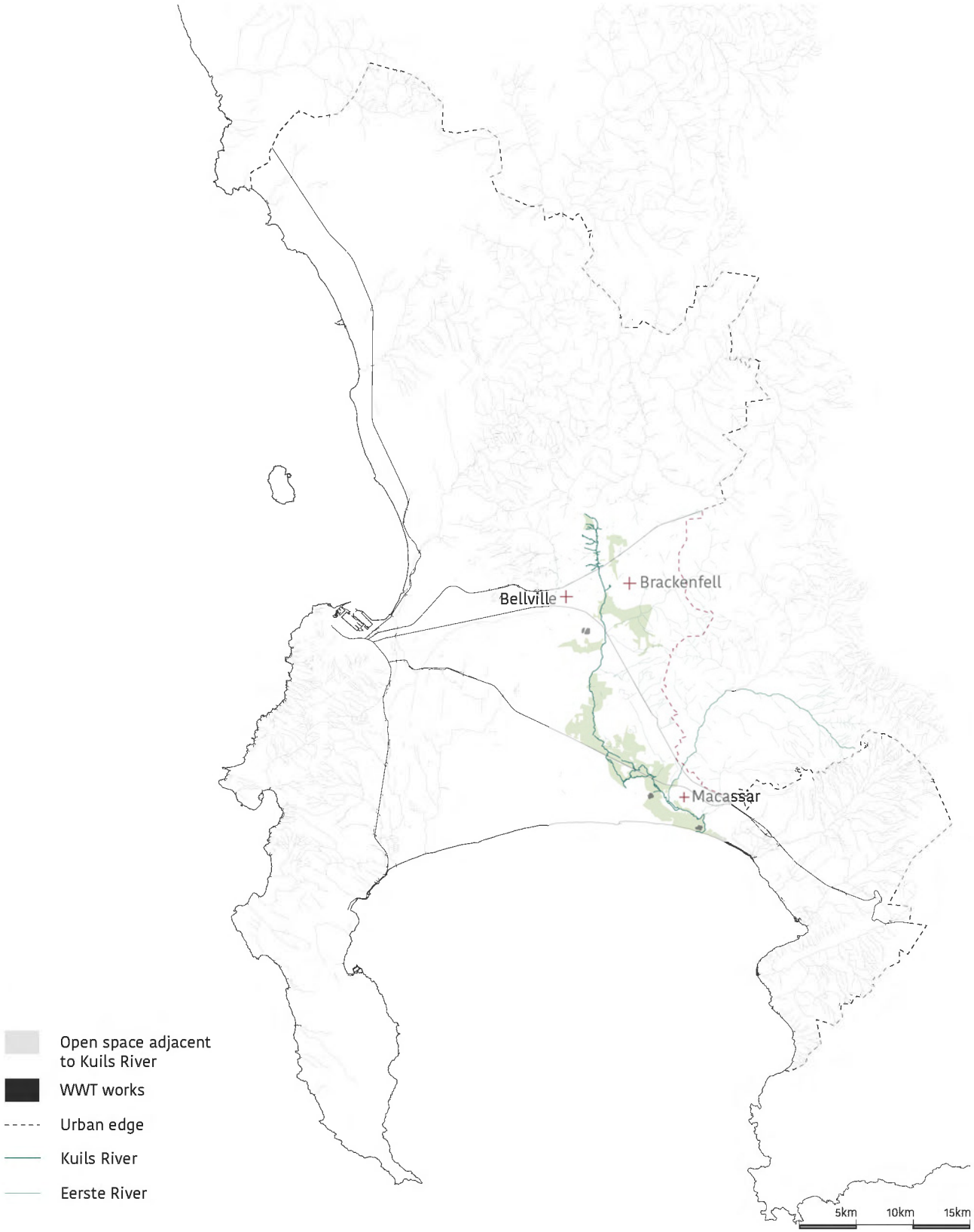
The Kuils River corridor

The Kuils River rises in the Kanonkop area, located north of Bellville and Brackenfell, and runs within the city throughout its full length. In its upper reaches, it flows as a small stream through a mixture of urban and residential areas where it receives flow from several small tributaries and waste water treatment works. Downstream of the confluence with its main tributary river (Bottelary River), the river enters the Kuilsrivier urban area. In this area, the river is either chanalised or canalised and again receives more treated effluent from other wastewater treatment works. In addition, it is supplemented with runoff from various canalised tributaries and storm water drains. Further downstream, before passing through Driftsands Nature Reserve, the Kuils River flows through agricultural land, edged by burgeoning high density formal and informal settlements such as Delft and Mfuleni. Further downstream, the Kuils River crosses the N2 and meanders across an extensive area of Typha capensis wetlands in a criss-crossing series of channels, receiving more run-off from the Khayelitsha urban area. Approximately 30 kilometers from its source, the Kuils River joins the Eerste River on its way to the False bay. Four kilometres downstream of the confluence, the river enters False Bay, via the Eerste River estuary, east of Macassar (Kuils River Forum Water Quality Report, 2014).

Prior to the effects of antropogenic influences, the Kuils River was seasonal. While it dried up during summer into a series of small pools, or 'kuils', it flowed in torrents during the winter rains (Luger, 1994).

"Extensive seasonal wetlands were once a feature of the lower reaches of the river. Such features have however largely been lost from the Kuils River, as a result of extensive disturbance and development throughout its reaches" (Kuils River forum Water Quality Report, 2014).

In the early 1980s, the Kuils River valley was selected for low-cost development due to an escalated demand for formal housing in Cape Town. On relatively high grounds, extensive townships such as Mfuleni, kleinvlei, Blue Downs and Delft were built. Some informal development, however, inevitably sprang up in the floodplain. More specifically, the floodplain itself was widened considerably by the change in water runoff, which occured as a result of hardened surfaces due to urban development. The growth of towns such as Belville and Brackenfell led to the establishment of new industrial sites and the construction of new and larger wastewater treatment works.

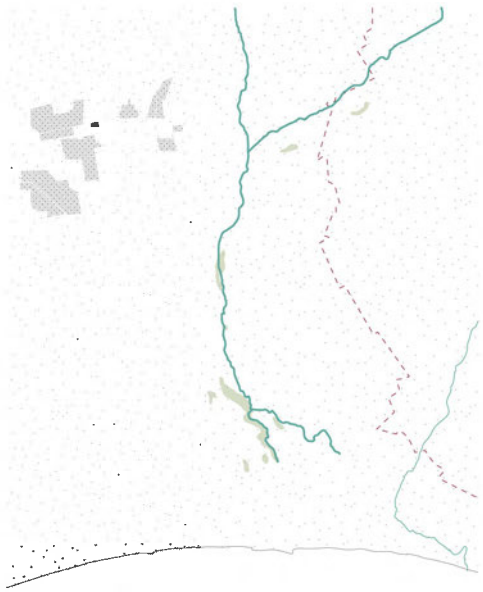

Bellville
Brackenfell
Macassar
Open space adjacent to Kuils River
WWT works
Urban edge
Kuils River
Eerste River
5km
10km
15km

"*As these new areas were built, the vastly increased runoff and the outflow from the wastewater treatment works added further to the problems of a stream that was never intended to be the important urban waterway it has become*" (Brown et al., 2009).

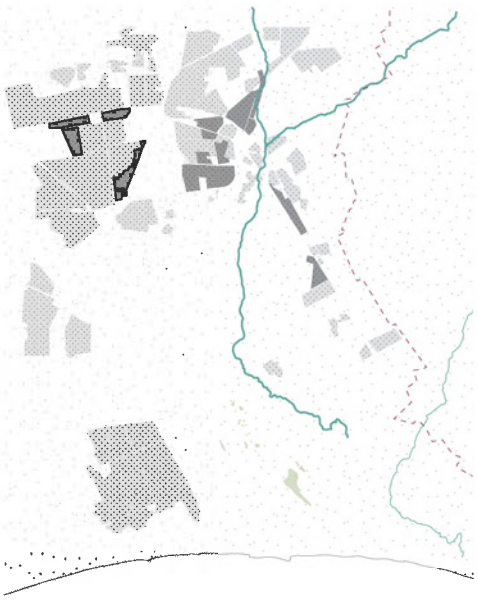
Consequently, a permanent connection to the Eerste River was formed to accomodate the increased flow. Along this new path of the river, new wetlands were formed in areas that initially were destined for farming.

By the mid-1980s, urban development in the floodplain led to a serious lack of capacity to drain flood waters away. Flooding became rife and the river regularly overtopped its banks in several urban areas downstream. "The new conditions imposed by the perennial link to the Eerste River resulted in periodic flooding of the Macassar - Zandvliet farming area and parts of the newer housing estate of Macassar" (Brown et al., 2009).

▼ 1940



▼ 1980



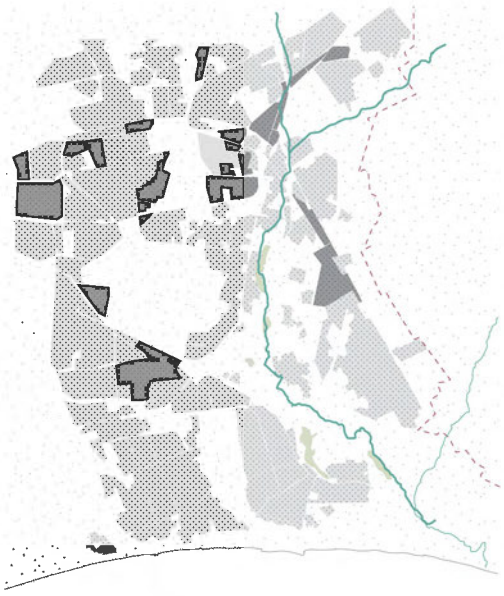
Urban development
Industrial sites
Wetlands

Kuils River
Eerste River
Coastline

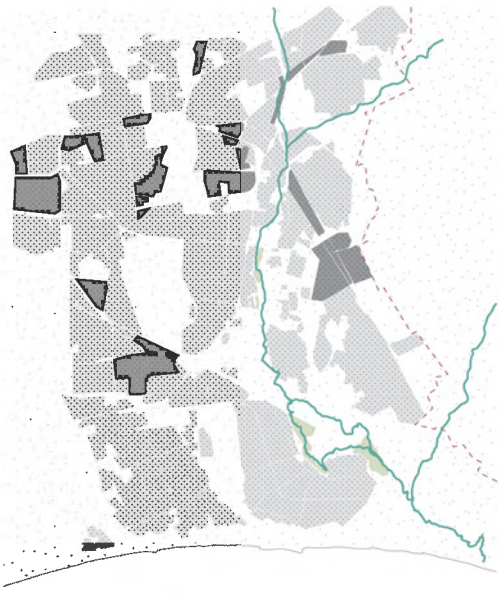
Furthermore, the banks of the lower Eerste river were leveed in order to prevent back-flow from the Kuils River in times of high runoff. This, however, led to an effective cut off of several riperan wetlands which resulted in a further reduced flood retention capacity.

In 1988, the establishment of the township Khayelitsha marked the beginning of the end for the original Kuils River dune-slack wetlands system. Most of these wetlands were destroyed to flatten the area and the ones that remained are fundamentally changed due to pollution and an elevated water table. The overal extent of the wetlands, however, did not change, because the water displaced by the infilling had to go somewhere. As a result, "new, less diverse and less stable, wetlands formed in pockets around the Khayelitsha settlement. Despite the altered status, these "new" wetlands still have value as a habitat for aquatic animals, for water purification and for the recharge of the Cape Flats Aquifer." (Brown et al., 2009)

▼ 2000



▼ 2010



Biodiversity

Thousands of plant species are indigenous to Cape Town, of which 190 are known to be endemic, meaning that they occur nowhere else in the world. Three of the 19 vegetation types in the city occur in the Kuils River Corridor. Two of them are endemic to the Cape Flats, but only as remnants of the original biodiversity. Currently, a lot of these vegetation types has been lost due to urbanisation, agriculture and invasive species.

The largest area in the Kuilsriver corridor is covered with Dune Strandveld. This vegetation type is endemic to Cape Town and grows on sand dunes near the sea. It is listed as endangered, with 51 percent lost due to urbanisation and beach resorts. Furthermore, only 14 percent is actually conserved. This unique vegetation type covers and stabilizes dunes on beaches in Cape Town. It supports a high biomass of browsing animals and bursts into incredibly colourful flowers in spring. Originally dense forests of large Milkwood trees covered the area, together with tall, evergreen shrubs, grasses, and annual flowers used. People used the areas with Dune Strandveld to graze large herds of cattle.

Cape Flats Sand Fynbos is also endemic vegetation type, that only occurs in Cape Town. It grows on older, leached, deep, white acidic sands. It is the richest and most diverse Sand Fynbos type with the highest number of threatened plant species. This vegetation type is critically endangered, with only 14 percent remaining and 1 percent conserved. Half of the remaining vegetation is degraded by alien plants. In winter, mists cover the landscape and seasonal wetlands appear. Some of the original species are extinct in the wild.

The Cape Lowland Freshwater Wetlands appear along the lower stretches of rivers, and around seasonal vleis and estuaries. The vegetation grows on a flat, rich and silty soil. The Cape Flats used to have a lot of wetlands, rivers and seasonal vleis. Freshwater wetlands used to be the major ecosystem, but they got drained and built over for housing purposes. Moreover, they got transformed for agriculture and development and are threatened by invasive alien plants. This vegetation type is endangered and protected by national legislation. Plant cover is very high, not particularly rich in endemics but incredibly extensive. The wetlands are the breeding ground of water birds and frogs, including the endangered Western Leopard Toad.

▲ Remnants of native vegetation (in color)

- Cape Flats Dune Strandveld
- Cape Flats Sand Fynbos
- Cape Lowland Freshwater Wetlands
- Swartland Shale Renosterveld
- Boland Granite
- Kuils River

▲ Cape Flats Dune Strandveld
> endangered
> endemic to Cape Town
> 49% remains
> 14% conserved

▲ Cape Flats Sand Fynbos
> critically endangered
> endemic to Cape Town
> 14% remains
> 1% conserved

▲ Cape Lowland Freshwater wetlands
> endangered
> not endemic to Cape Town

▲ Biodiversity in the Cape Flats

▲ African Sacred Ibis (Threskiornis aethiopicus)

▲ Cape Lowland Freshwater Wetlands in the Cape Flats

▲ Southern Red Bishop bird

▲ Water basin close to Faure

▲ Flamingos near sewage works close to False Bay

▲ Water basin near sewage works in False Bay

Urban Pressure

Urban growth exerts severe pressure on the open space of the Kuils River Corridor. Only a few remnants of the original biodiversity are existent. They are, however, increasingly threatened to extinction. If the expansion continues in the same way, the urban rift will disappear in the future, taken over by the urban tissue. The urban sprawl that is happening is not efficient, and consumes too much space. The housing densities are very low, which is not common in cities, and not sustainable. Everything else has to make room for the small, one storey high houses that are spread across the city. As we discourage this, we advocate to deal with the urban growth in a different way. Higher densities should be reached inside the enclaves to safeguard the urban rift and other open spaces with large biodiversity value.

We observed three models of urban growth in the Kuils River corridor. The first system consists of large programs, emerging as islands inside the corridor. The large open space provides opportunities for programs that need solitude. They often have a private road connecting to the highway, which is built first, followed by the hardened surface on which the buildings are later constructed. These programs often grow through time, only restrained by the elements of the landscape that are at full power. As water collects in the corridor, it is one of the elements that most strongly restricts the urban growth.

The second type of urban growth is the formal construction of low-cost housing by the government in the open spaces at the edge of the enclaves. Large plots are flattened and hardened, followed by the construction of roads. The most common housing type that appears in these areas are RDP houses. As they have only one floor level, they consume a lot of space and are not efficient nor sustainable.

The third type of urban growth is informal growth at the borders of the open space. Shacks are built without considering spatial planning. Water is often the only border that forms a barrier to block the expansion. As the government is obliged by law to provide adequate housing for all the citizens, they have to replace the shacks with decent housing. While the municipalities remove the shacks, the residents temporarily live in TAV's. Roads are constructed in a grid and the area is divided into plots. Most often RDP houses are build, sometimes in larger building blocks, but often in 40m^2 one-storey houses.

open space
existing settlements
new settlements
existing heavy urban programs
new heavy urban programs

The establishment of Film Studios

▼ 2007

▼ 2009

Formal expansion at the edge of Bluedowns

▼ 2005

▼ 2012

From informal to formal growth at the edge of Khayelitsha

▼ 2005

▼ 2007

▼ 2010

▼ 2016

▼ 2013

▼ 2016

▼ 2011

▼ 2015

▲ Informal settlement at the border of Khayelitsha

▲ Sikhumbule, a settlement in Drift Sands Nature Reserve

▲ Informal settlement at the border of Khayelitsha

▲ Billboard in the north of Rietvlei, at the urban edge of Cape Town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Activities at the edge

Due to the adjacency of urbanity and nature, various activities take place, both at the fringes and in the core of the urban rift.

At the fringes, where the rift touches great urban enclaves, we have noticed a lot of places of worship of different religions. Most residents of the Cape Flats have a relatively low income. Additionally, very little public facilities are provided by the government. As a result, a lot of these places of worship occur in large tents,

Furthermore, a lot of informal settlements occur at the edges of the urban rift. The waste collection in these areas happens in green containers, located at the edges of the enclave. However, people that live too far from a green container, often have no other option than dumping their waste directly in the nature. The latter, unfortunately, leads to sever pollution of the environment.

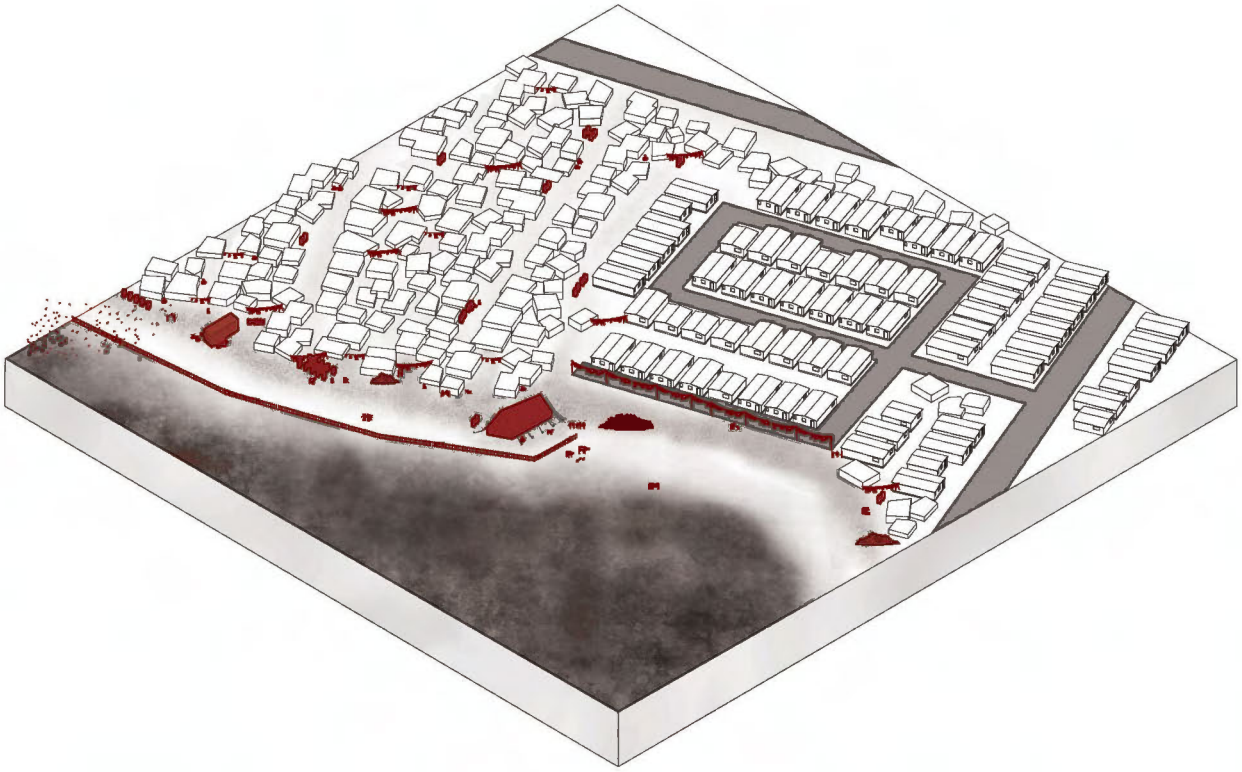
Often, as the core of informal settlements is very dense, the government has no other option than providing water taps and sanitary facilities at the edges of settlement.

The availability of water together with plenty of open space provides an ideal opportunity for women to to their laundry while they can keep an eye on their playing children. Moreover, large open spaces and natural elements such as sand dunes for example form image stadiums and, thus ideal playgrounds for children.

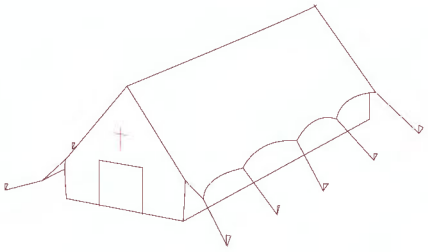
In addition, large open space in the nature often are ideal grazing grounds for animal farms. Raising livestock in Cape Town does not only have nutritional importance, but it also plays an important role in the Xhosa tradition. Historically, cattle was used for lobola, also known as 'bride price', a property offered by the prospective husband or head of his family to the head of a prospective wife's family. Currently, this tradition has evolved to offering a combination of cattle and money. Marriage in the Xhosa tradition is perceived as more than just a union between two individuals. Therefore, the main purpose of lobola is to build relations between the respective families.

▼ sanitation

▼ waste

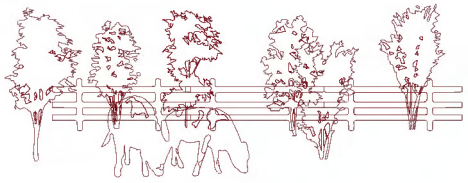


▼ place of worship



▼ waste container

▼ animal farms



▼ laundry and playing children

▲ Animal farming at the edge of Khayelitsha

▲ The Southern edge of Mfuleni, close to Faure Road

▲ Animal farms at the Southern edge of Mfuleni, close to Faure Road

▲ The Southeastern edge of Khayelitsha, close to Govan Mbeki Road

▲ Playing children at the southeastern edge of Khayelitsha, near Govi Mbeki Road

▲ Informal shops along the road in Khayelitsha

▲ Playgound at the edge of Khayelitsha near Silvertown

▲ Informal shops along the road at the edge of Khayelitsha

Activities in the core

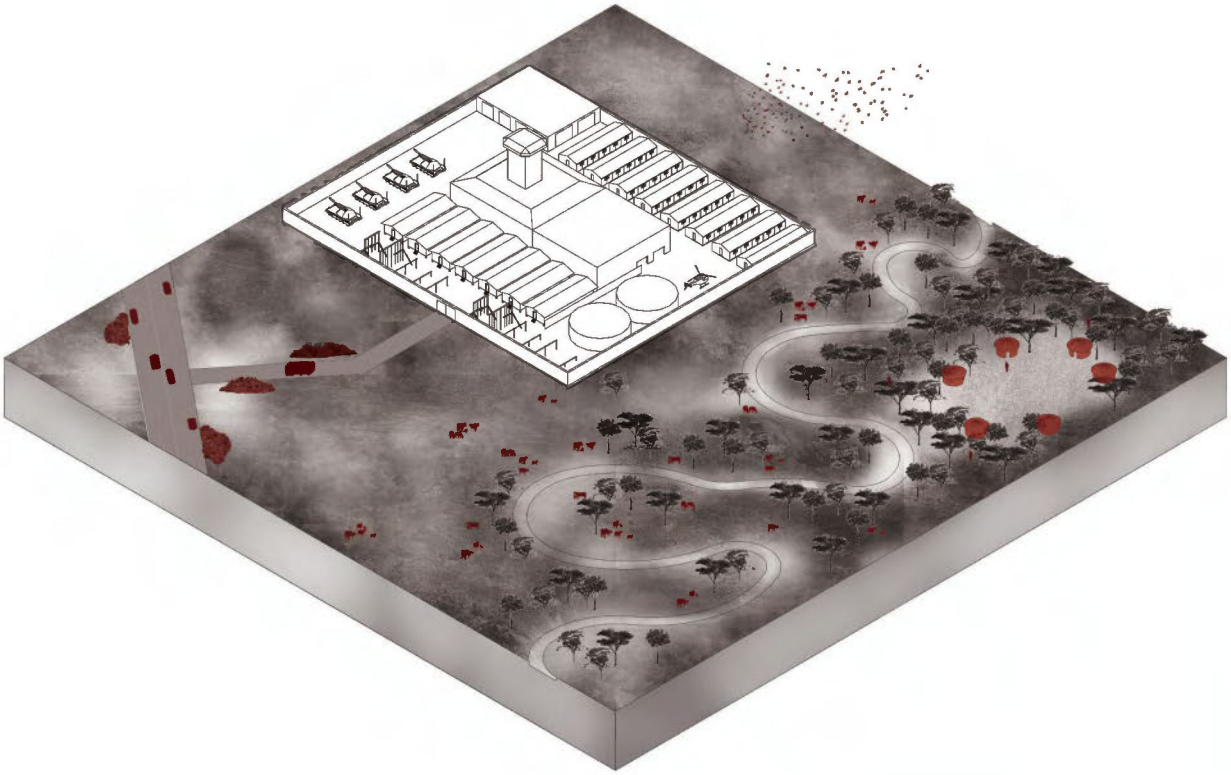
The core of the urban rift also forms a breeding ground for various activities. However, these activities are quit different from the ones at the fringes. The core areas of urban rifts often provide a certain isolation as they are located relatively far from, yet close enough to urbanity.

Places where main roads reach the natural landscape, often become ideal destinations for illigal waste dumping. Certain big industries hire companies to bring their waste to landfills as they seek to avoid the costs of the landfill fees and therefore dump the waste into the nature. As there is no supervision in these areas, it enables illegl activities.

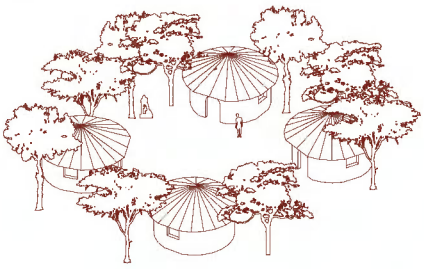
On the other hand, the isolation character of the urban rift's core enables initiation ritual, that traditionally take place far away from the eyes of the public, to take place in a metropolitan city.

"The male initiation ceremony of the Xhosa people of South Africa, Ulwaluko, is an age-old tradition. It's a mystical, secretive ritual that occurs far away from the eyes of the public, and virtually the only information non-participants and non-family members ever have about it is the disturbing death toll from what the newspapers call botched circumcisions" [Bullock, 2015].

After a circumcision, the guys have to spend one month in the bush, living in domed dwellings called iboma made out of wood. After the ritual, the huts get burned. There are traditional guidelines that are not written and change through time. The Xhosa communities are very close and every member of the family group and friends are involved in the ritual. The ritual most often happens in the winter, because it is the coldest and wettest season. The suffering, pain and seclusion represent the trials of life, as a test of character and fortitude.



▼ initiation village



▼ grazing livestock

▼ illegal waste dumping

Urban programs in the core

The presence of biodiversity remnants in the core forms a great reason for the existence of nature reserves. As the Kuils River corridor lies within the Cape Floral kingdom, it consists of rare and endangered vegetation types. For example, the reserve contains some of the last remnants of extensive Fynbos. The Driftsands Nature Reserve covers an area of 900ha, which is maintained by Cape Nature in cooperation with the City of Cape Town. Although the reserve protects endangered biodiversity, it has to deal with significant economic and social challenges as it borders a squatter and low income settlements.

Furthormore, the Kuils River corridor forms an attraction point for urban programs that search for seclusion and privacy. As islands with almost no interaction with their environment, they emerge in the landscape. There are several heavy urban programs lying in the corridor today.

The iThemba LABS are multi-disciplinary laboratories for accelerator-based research. They are managed by the National Research Foundation and call themselves 'the leading African organisation for research, training and expertise in accelerator based science and technologies', and 'the largest facility of its kind on the African continent and the Southern Hemisphere'. They also have radionuclide production programmes, and collaborate with local and international universities, science agencies and other laboratories across the globe. They bring scientists together from the physical, medical and biological sciences and provide opportunities for modern research, education and the production of unique radiotopes that are used in the medical sector. The training programmes want to grow skills that are required for a successful economy that eradicates poverty and transforms the South African and African technology.

▲ Athlone Power Station

▼ The Ark, City of Refuge at the Old Faure Road

The Ark City of Refuge is a Christian, non-profit organisation that provides a temporary home to homeless, abused, abandoned or unemployed men, women and children. It opened its doors in 1992 in response to the extremely high rates of homelessness and unemployment. It is the largest organisation of its kind with 35.000 people that have been helped and about 800 people on site at all time. As a start up, the organisation received land and some old buildings from the government. They built everything else from donations, sponsorship, volunteering and fundraising. Supermarkets give them expired food, to feed the people, they also have an own vegetable garden. They provide people with shelter, food, clothing and spiritual restoration. Besides taking care of the physical needs of clients, the ark gives counselling, education, leisure activities, health care, transportation and day care, and facilitates re-introduction into their community. The people that live there have no alternative options. The ark profits from the location because of the beautiful and peaceful environment in which those people can recharge before going back to their community.

▼ Cape Town Film Studios

In 2010 the Cape Town Film Studios opened their doors. Local, provincial and national governments gave support and private shareholdings paid for it. The studios not only consist of movie sets but also contain costume design, set building, and in the future possibly a film school. It is the first 'custom-built Hollywood-style' film studio complex in Africa and offers a lot of unique opportunities due to its location. Cape Town has a temperate climate, suburb expertise, state-of-the-art facilities and an amazing variety of locations and conditions close by. Furthermore, filmmaking at the CTFS costs only a friction of the traditional expense.

Strategy

Double system

The Kuilsriver corridor is characterised by a strong duality between the urban hardscape and the natural softscape. Both have their own logic, characteristics and elements and are in constant interaction with each other. The terms 'hardscape' and 'softscape' originally derive from landscape design. The term hardscape refers to rigid and often artificial elements, such as driveways and rocks. Softscape on the other hand refers to the more organic elements, like permeable soil and plants. Hardscapes often prevent the absorption of water, complicate plant growth, clearly define borders, and have clearer impacts on the shape of a landscape as a whole. Softscapes are the living part of the landscape. They follow dynamic systems as they change between seasons.

"[...] For Landscape, the objective is to combine both hardscape and softscape features to give it the right balance. [...] No landscape is complete without elements from both categories, but there are pros and cons to think about as you find harmony in your space" [http://www.molzons.com/blog/what-difference-between-hardscape-and-softscape]

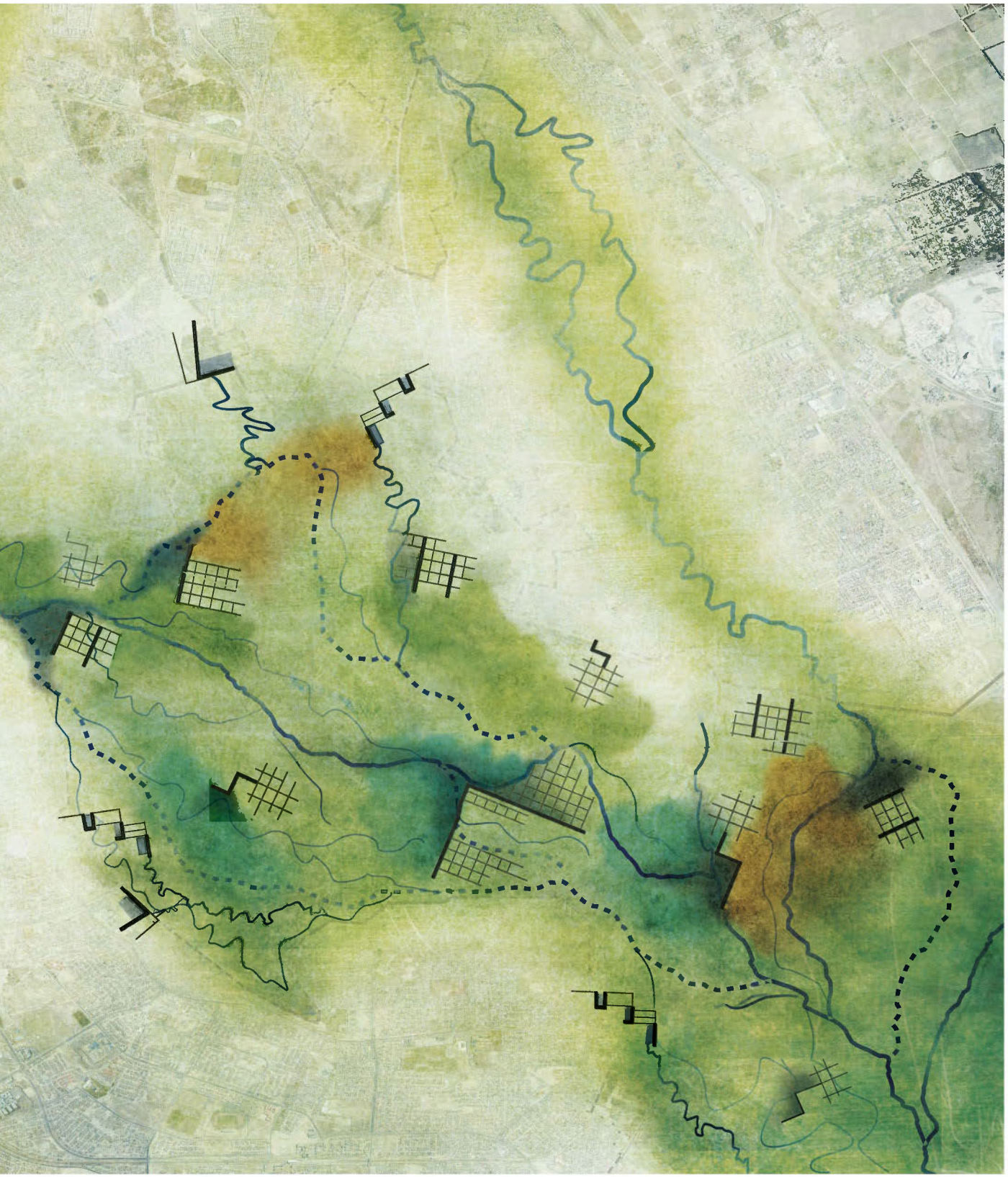
Although an urban centre is the home to a variety of elements, developing cities tend to transform everything into hardscapes. Natural soil, plants and animal life are systematically replaced, through the construction of roads, railways, squares and buildings. These urban hardscapes tend to cause high economic costs, ecological problems and changes in water systems.

Because of their rigid permanence the impact on their surroundings is difficult to undo. Some natural elements persist but are in danger, as they are being cornered by the pressure of urbanity. Urban softscapes are flexible and adaptable, a strong quality that fosters resilience. However, many of its ecosystems are very susceptible to human induced changes. These changes are often more oppressing and rigid, and leave no room for further dynamic changes. Human adaptations tend to pretend permanency. This causes some softscapes to collapse under the pressure of the urban, as people have invented tools to domesticate their systems. Urban softscapes lose their dynamic character, and some eventually disappear entirely.

A city needs both, the hard and the soft, the urban elements and the natural elements, the fast and the slow, the static and the dynamic. However, the right balance between opposing elements is vital. In our designs, we explore how these conflicting systems can live in harmony, offer advantages to each other, become more dependent on each other, and maybe eventually in some places even hybridize into a new kind of urban landscape.

Softscape

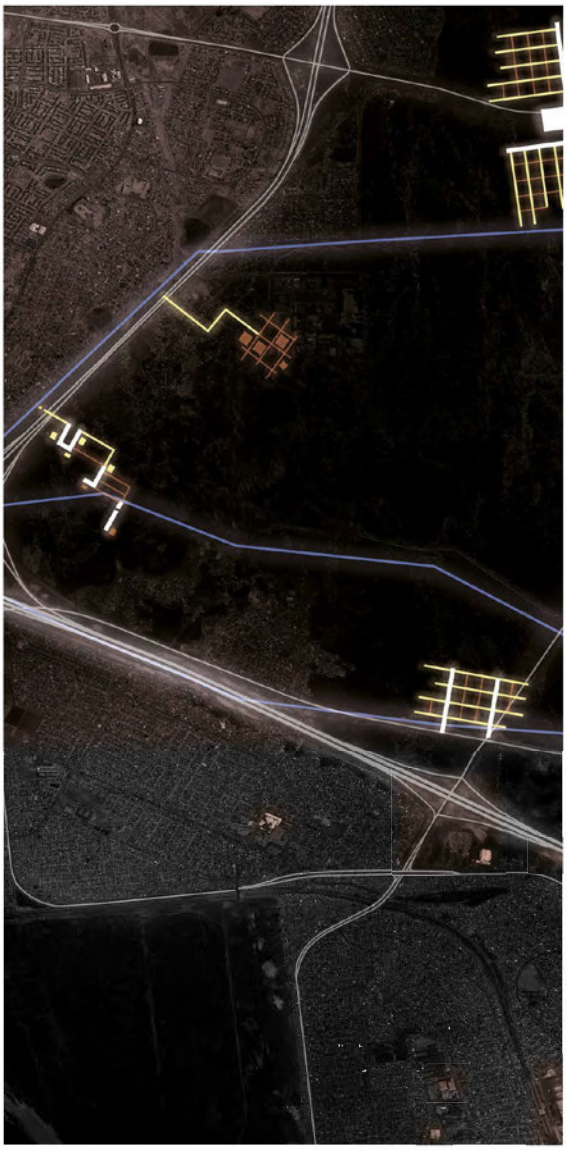
The softscape consists of all that is natural. These are all the elements that are untamed by man and still follow the rhythm of ecological processes. Nature is at full power. The ecosystems hold a rich variety of fauna and flora, that is strongly linked to the natural water systems. The urban rift as a whole is interlaced by different water bodies: rivers, wetlands, vleis, estuaries and floodplains. Because the flows of water systems are difficult to predict they guard the open spaces of the urban rift from shrinking caused by urban expansion. Water in the softscape thus takes on the role of a spirited backbone structure. People however experience water as a nuisance. Natural water systems could become beneficial for both soft and hard. Adding water to the water systems could strengthen the hold of the water systems on the urban rift, to fully protect it from urban growth. But more water also means more possibilities to enhance the relation between humans and the water. New interactions become possible as the capacity of the softscape increases. This could help to give it an active role in the city, while keeping its wild and untamed character.



Hardscape

The hardscape is human-made and strongly coordinated. It is driven by the urban metabolism of the city, that beats to the needs of the urban population. Different energy flows cut through the large open space of the urban rift and are characterised by efficiency and speed. The hard system not only consists of infrastructural elements such as roads, highways, pipelines and electricity lines, but it also entails heavy urban programs and new development. The creation of hardscapes often leaves no place for the development of other systems, as it is strongly controlled. One example is how impermeable surfaces result in water related problems.

In our designs, we don't want to erase the growth of the urban hardscape, but we want to contain it instead. This by providing new kinds of expansion and development that have much more relation with the natural softscape.



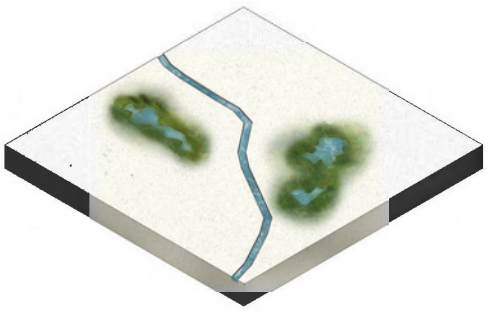
▲ Animal farming at the edge of Khayelitsha

▲ Railway line near Acacia Park

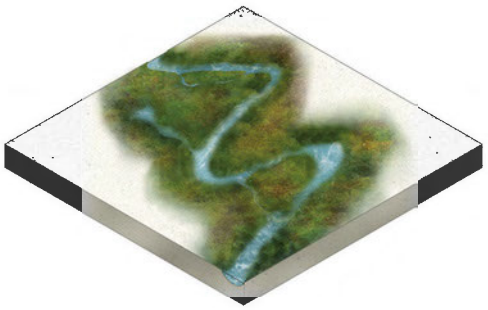
▲ The edge of Driftsands at the intersection of Mew Way and Old Faure Road

▲ Flamingos near Acacia Park

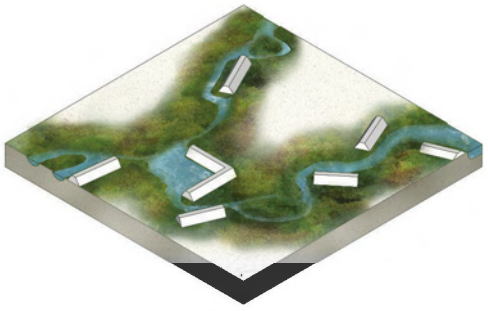
▼ canalised river



▼ decanalised river



▼ dikes



Tools

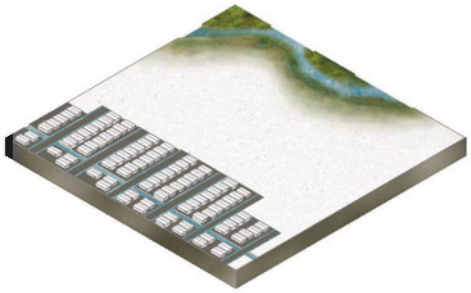
Slower water

To reinforce the natural system, we use different tools. Firstly, there are tools that influence the water system. The first goal is to give water more space in order to slow it down and thus, keep it longer in the rift. When water stays longer on site, opportunities are created.

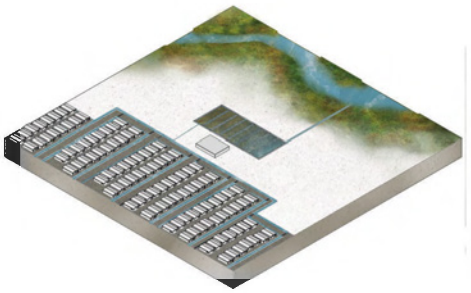
De-canalisation and the widening of the river banks are the tools we use to achieve this goal. De-canalisation gives the river freedom to choose its main flow path and meander more naturally. In addition, more tributary streams and wetlands are created. The deepening and broadening of the river on the other hand, lead to a more constant water level and more infiltration in the ground and thus recharging the aquifer. Moreover, providing more space to the river has an additional positive influence on biodiversity. Fast flowing water in canals or channels does not create a lot of habitats, but wetlands and smaller rivers and streams create a wide variety of biodiversity.

Deepening as well as deepening the river, result in excavated material which is used to construct dikes and dams. In this way, a cut-and-fill balance is retained. These dikes and dams influence and guide the flow in a profitable way, both for biodiversity and humans. A variety of conditions is created, which stimulates an increased and more diversified amount of fauna and flora.

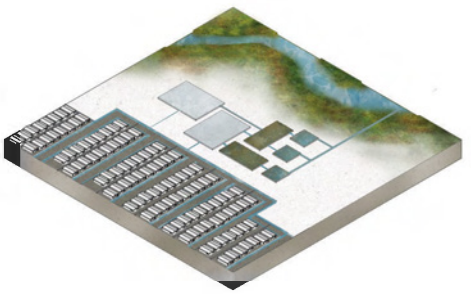
▼ no active connection



▼ adding stormwater to the corridor



▼ adding purified wastewater to the corridor



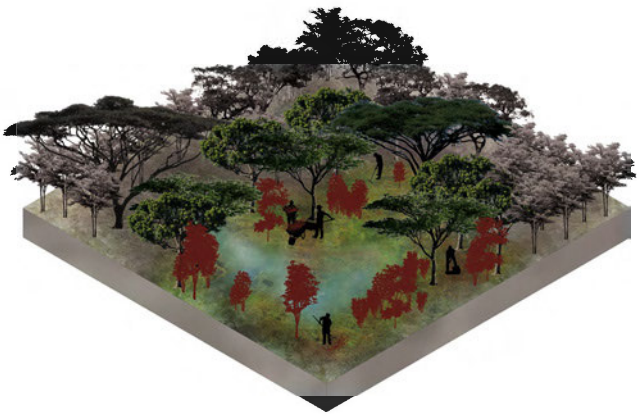
More water

The second goal is to add more water to the system. The combination of various water bodies such as the main river (Kuils River) together with its little tributary streams and multiple wetlands, form the backbone structure of the urban rift. Adding more water to the corridor will reinforce this vital backbone structure of the corridor. This is mainly achieved through adding treated waste and storm water to the natural system.

Currently, both storm and waste water are directed to waste water treatment work near estuaries through underground pipes. After the sewage water is purified, it is deposited in the sea. Thus, re-utilization of purified waste and/or storm water is un-existent. Our goal is to change this perspective. Instead of letting the storm water run straight to the sea, it will be directed to the urban rift. First, waste and storm water will be cleaned in constructed wetlands at the fringes of the enclave, where it touches the natural landscape. After, the purified water will be navigated into the natural, slow system. The treatment of both storm and waste water provide various opportunities, and therefore they are linked to urban programs.

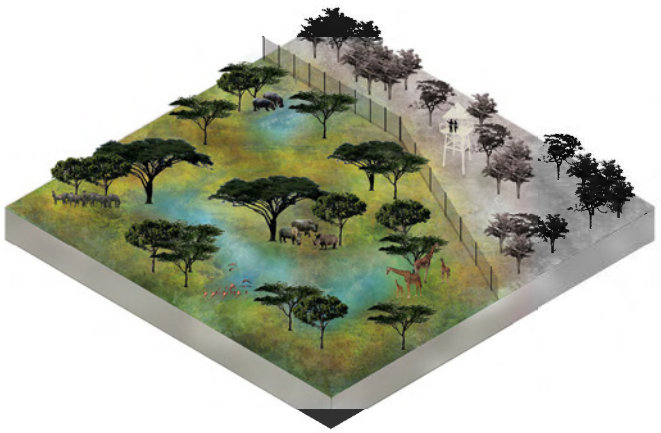
Biodiversity

▼ invasive species removal



For the preservation and strengthening of biodiversity, different tools can be used. First of all biospots will be created. These are the core areas of endangered biodiversity where the main focus lies on the protection. Invasive species will be removed to give the natural fauna and flora the opportunity to flourish. In nurseries, endemic and endangered species will be cultivated to re-introduce them and strengthen the biospot. Nature reserves could work together with the community and urban programs in the area to safe the biodiversity and simultaneously create jobs. Park rangers will have observation towers to overlook the area, as a starting point of their action.

▼ game reintroduction

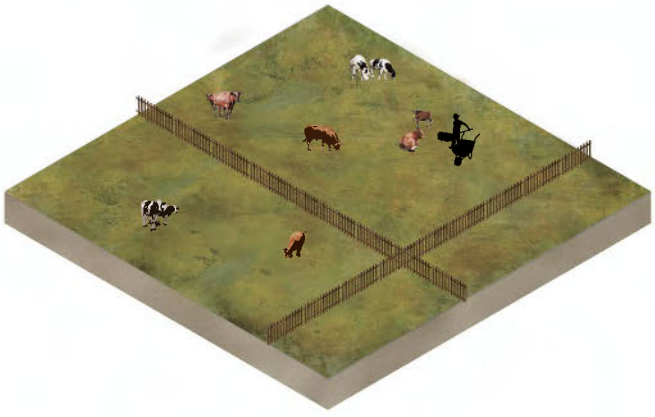


Our aim is not only to reinforce the biodiversity in the urban rift, but we also to make it productive for the local people. The re-introduction of game is a way to protect biodiversity from urban growth. This could be used as a tourist attraction, or as a nursery for endangered wildlife. Giving nature a function makes it more likely that it will be preserved. With the same argument, we want to introduce or enforce productive landscapes. Making areas at the edge productive and important for people's income, ensures the conservation of the open space and nature lying behind it.

Productive landscape

▼ agroforestry

▼ animal farming



Agroforestry plots and livestock farms will be used as a protective buffer zone. Not only to protect the biodiversity, but also to create jobs, food, and construction materials that can be used for densification. In addition, the opportunity for the different cultures to maintain their traditions, such as lobola and initiation, remains. Originally, large herds used to graze in the area. The tradition of lobola, and the need for large grazing areas, makes cultivating cows ideal for the Kuilsriver corridor. Instead of the traditional intensive grazing, rotational grazing would be practiced, which has a beneficial effect on the biodiversity of the grazing zones. A larger area is needed for this type of grazing and farmers would again live a more nomadic life, like their ancestors.

As the Cape Flats Dune Strandveld vegetation used to contain a lot of dense forests, agroforestry seems a good opportunity to re-intensify the local biodiversity in a manner beneficial for the local communities. Besides trees, other types of vegetation would be cultivated in the same plot. This makes it productive both in long and short term.

Urban programs

Besides tools considering water and biodiversity, we also want to implement new urban programs in the urban rift. There are already large urban programs on site, that benefit the community economically and by job creation. We want to keep these types of programs on site because they can support the urban growth. In addition, we want to add other programs to strengthen the ties with the landscape.

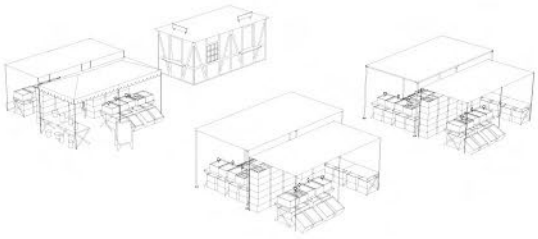
In our designs, we will work with the existing program of the film studios and add industrial programs that are linked to the productive landscapes. These programs are a dairy farm, and a vertical multi-factory where various products such as milk, wood and crops are processed.

Furthermore, a range of programs at the edge that are linked to the water system, biodiversity and the local community are introduced. Depending on the distance from the edge, other activities occur. More social programs such as playgrounds and laundry stations, are located closest to the edge. Moreover, the playgrounds for children, are used in winter as storm water reservoirs. Laundry stations at the edge of the community forms a social place where people can meet and make use of the purified water.

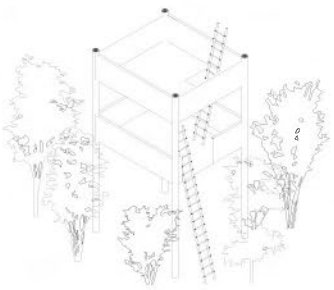
For the accommodation of urban growth, medium density housing will be implemented at the edge, to form a boundary. This would provide different types of housing for several price classes and age groups. The building blocks can for example include social, RDP and GAP housing. These blocks would be a new kind of housing, that could have a stronger bond with nature than the townships today.

Stables would be built in the central zone of the buffer area, where the fields for the cows are located.

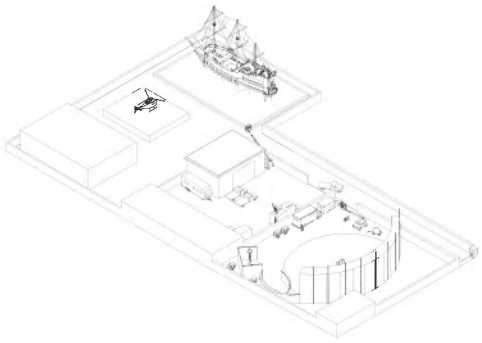
A garden centre is connected to community gardens. Almost completely surrounded by nature, are the buildings for the nature reserve, from where they operate and train people close to the actual biodiversity.



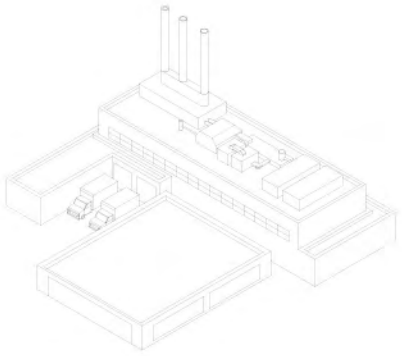
▲ market



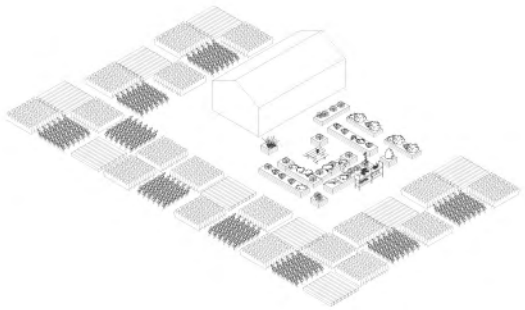
▲ park ranger watch tower



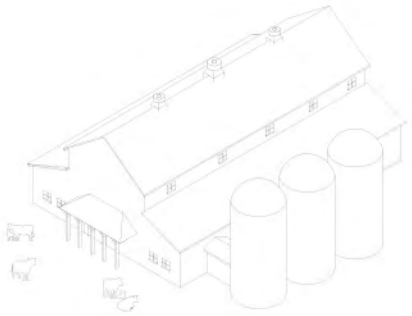
▲ film studios



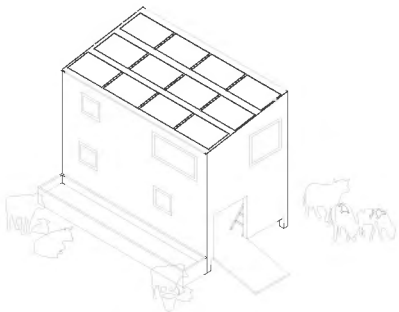
▲ factory



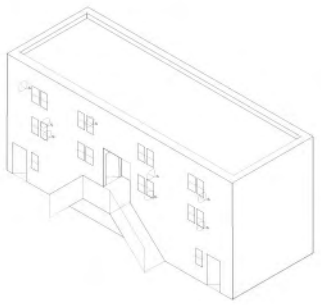
▲ community garden



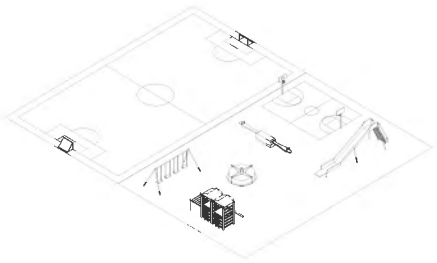
▲ dairy farm



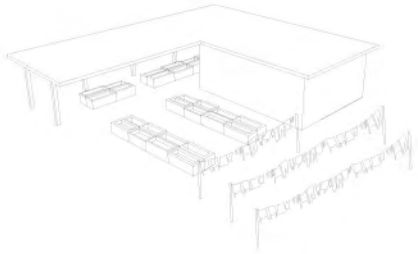
▲ stable + farmer's house



▲ social housing



▲ playground



▲ laundry station

Implementation

We focused on four different sites in the urban rift, which leads to four general situations. Although others could be selected, we consciously choose these four. We selected the sites based on their general character, meaning, potential and presence in other urban rifts in the city. Although a lot of places in an urban rift can be assigned to one of the types, each site is still unique and needs a customized approach.

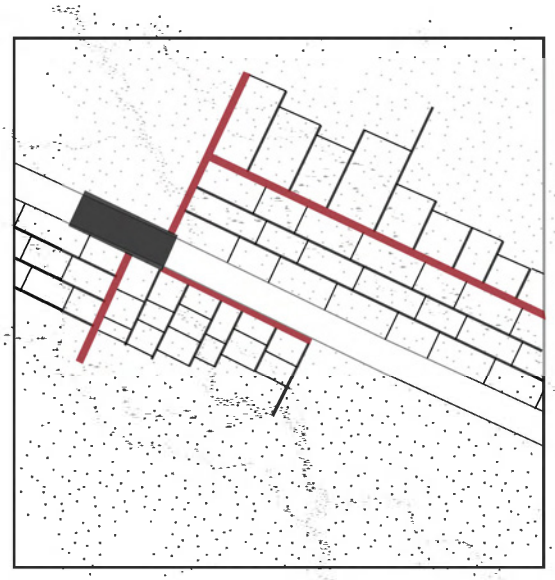
We've chosen to work on a site connected to the N2, that lies between the townships of Khayelitsha and Blue Downs. Our second site is focused on the existing film studio complex. We also investigated the important access point where the Spine Road (M32) enters Khayelitsha. This is the only main road that directly connects the township with other enclaves to the north of the Kuils River corridor such as Mfuleni and Bluedowns. The last site is a piece of the edge of khayelitsha, that lies to the northwest of the Spine Road entrance. This site compromises both informal and formal urban fabric.

As mentioned before, these specific sites lead to four general situations. The first two can be found at the core of an urban rift. The first are sites pinned along large highways that cut through the natural landcape.

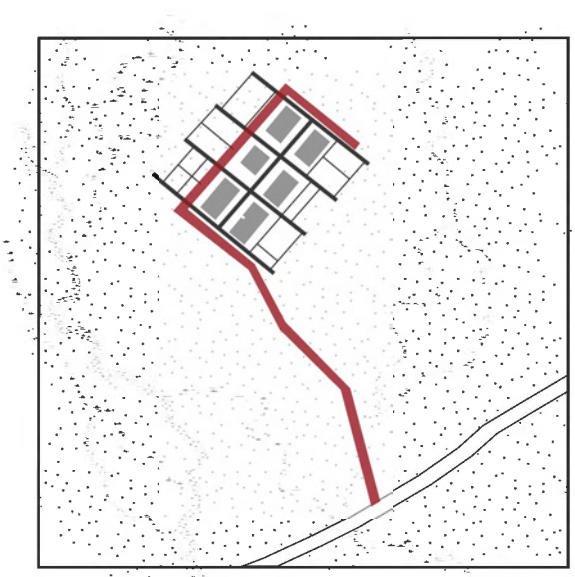
The second situation focuses on existing urban islands in the corridor. The remaining two situations consider sites situated along the border of the urban rift.

The third type focuses on the few main entrance points of the enclaves. The last one focuses on places where the smaller urban fabric edges to the natural corridor.

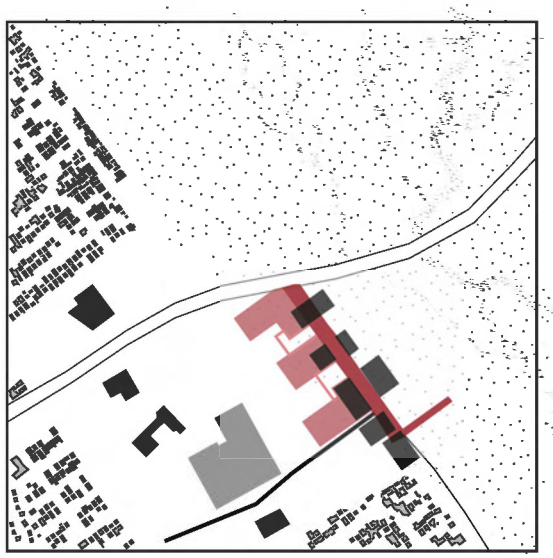
At each of the four sites, we have tried to design different friction figures. These are new forms of urban development that are connected to both the hard- and softscape. The main intervention of each of these figures is an anchor that connects it to both systems. This anchor reinforces the natural system by adding water or slowing it down. It also functions as an armature for new urban programs. Anchors thus separate and connect at the same time. They clearly define the edge between divers elements, and simultanuously provide a platform for them to interact, since both benefit from the anchors.



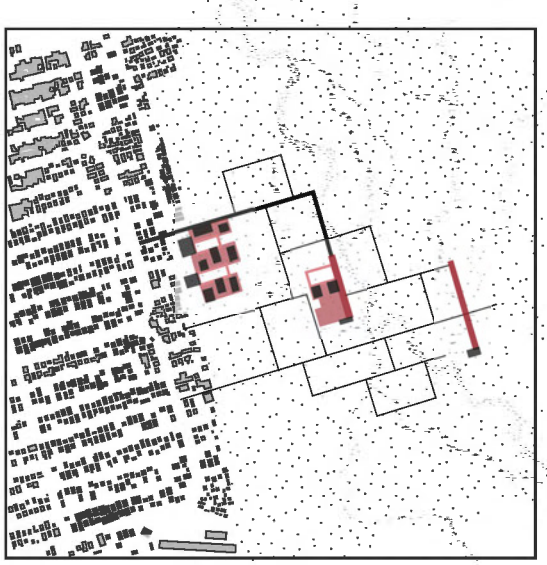
▲ along the highway



▲ urban islands



▲ enclave entrance



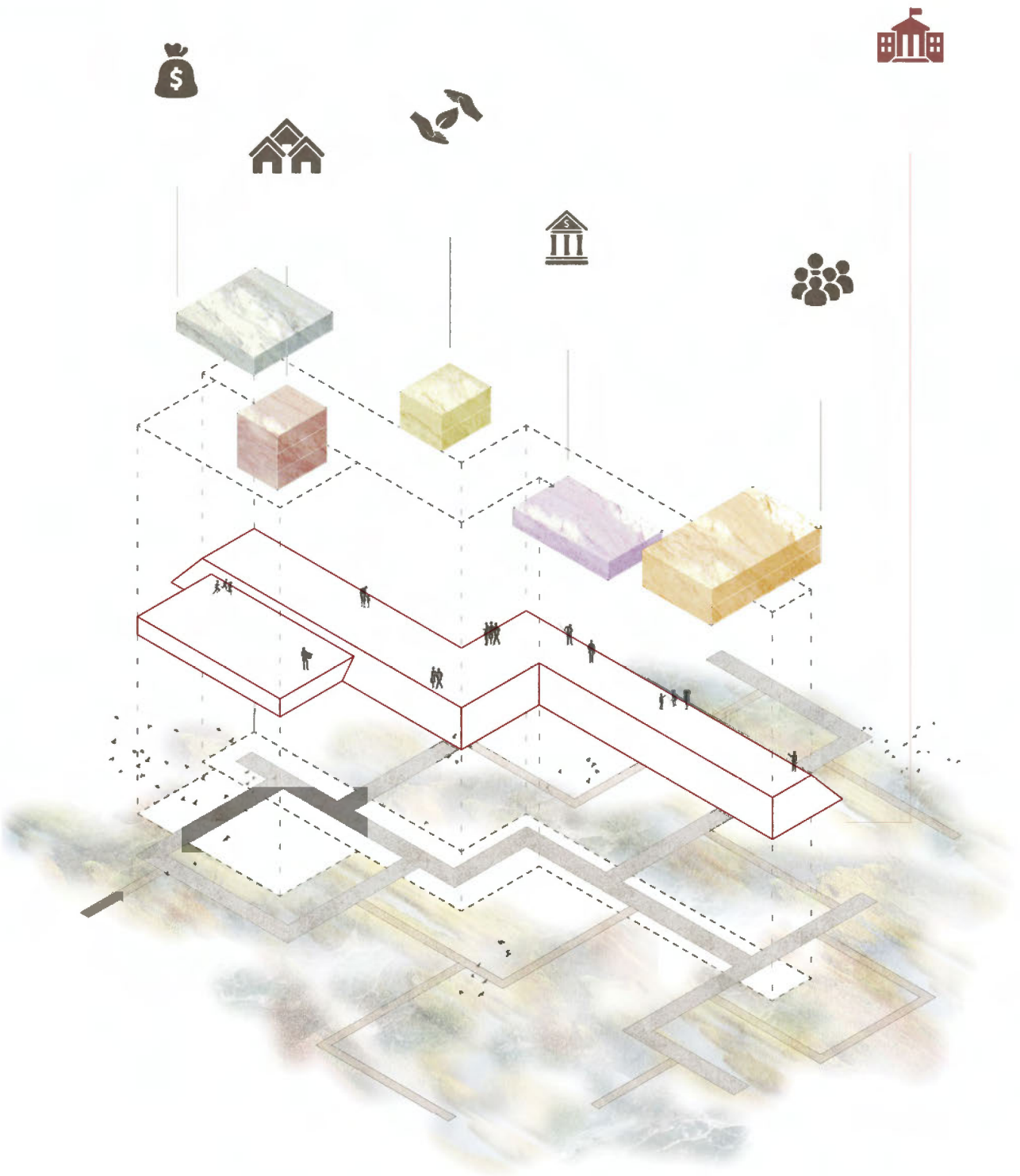
▲ enclave edge

The first step in the implementation of our strategy consist of the construction of the anchor structures. These form the foundation for the other programs and are thus realized with the help of the government. As soon as they are being build, different programs can arise. There is a multitude of possible programs that could benefit from the anchor, therefore several actors would have to work together. Different actors will lead to different compositions of programs.

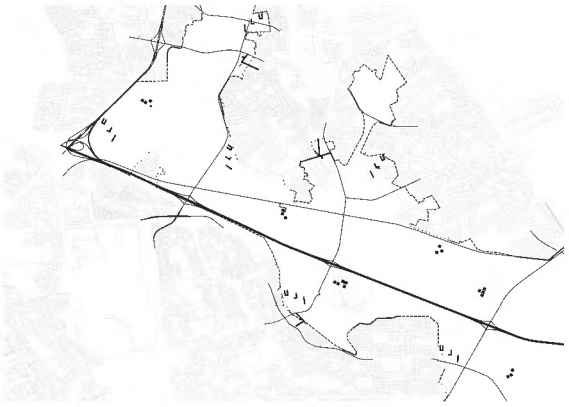
A first group of actors stimulates community oriented programs. Possible actors are members of the community itself, NGO's and educational institutions. Another group strives for the maintenance and preservation of natural ecosystems. This includes organisations like 'Working for Water' (who work on the elimination of invasive species) and the Driftsands nature reserve. People and companies that provide housing can be seen as a third group of actors. This includes institutions that provide social housing. Furthermore, there are both informal and formal small economical activities, such as animal farming and small-scale trading, that could benefit from the anchor. Lastly, there are larger economic players such as private investors and private developers.

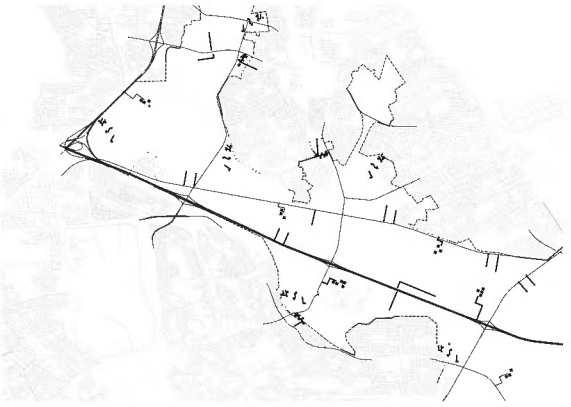
The anchors dictate how programs grow, as they provide the needed infrastructure. In this way, we try to ensure that growth does not occur in an uncontrolled way. Other linear infrastructure is connected to the anchor. These soft lines are used by programs for productive purposes, and for cultivating parts of the natural system. This new cultural and productive landscape is connected to the anchor, but also follows the rhythm of the ecosystems. New urban programs could thus never fully take over the softscape, because it would affect them in a negative way. Both hardscape and softscape have become dependent on each other.

▼ scheme of actors

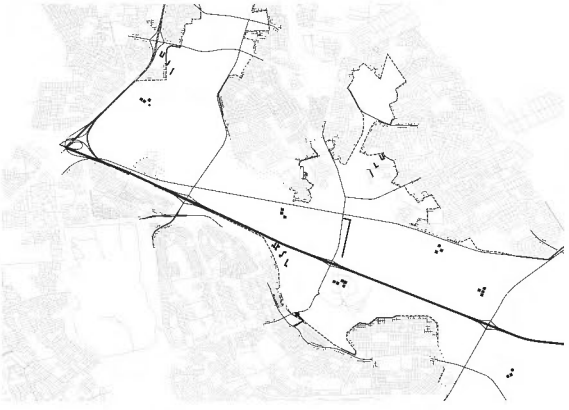


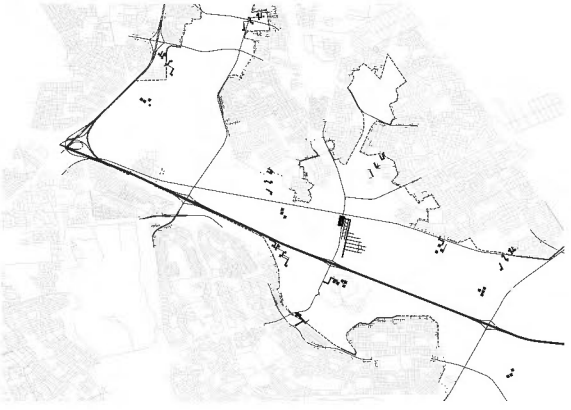
▼ fictional growth scenario 1

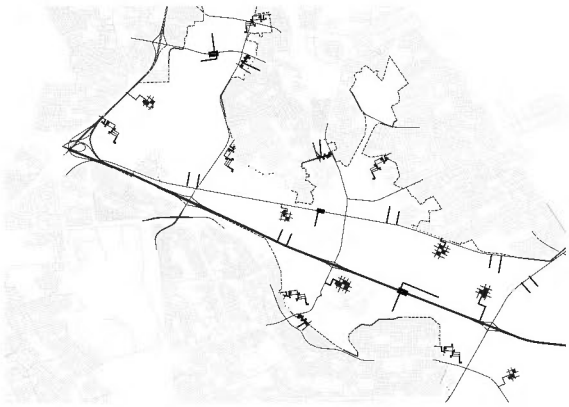


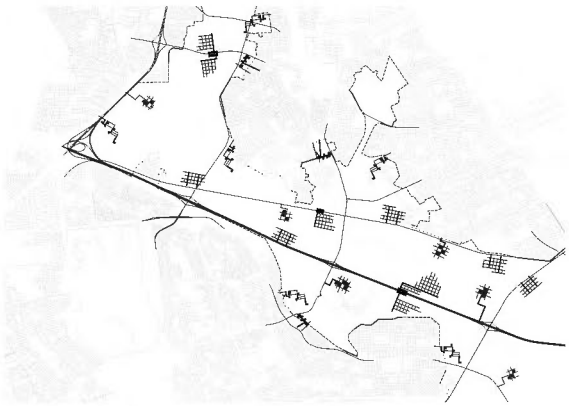


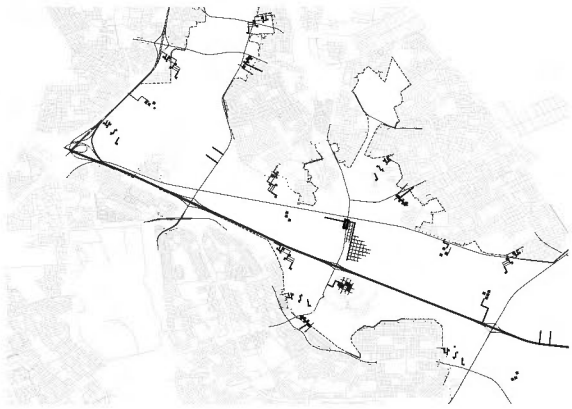
▼ fictional growth scenario 2

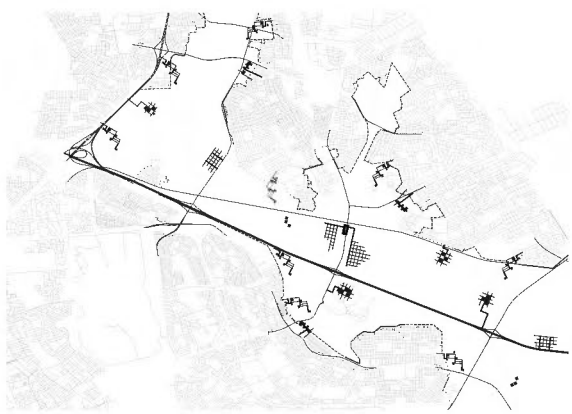




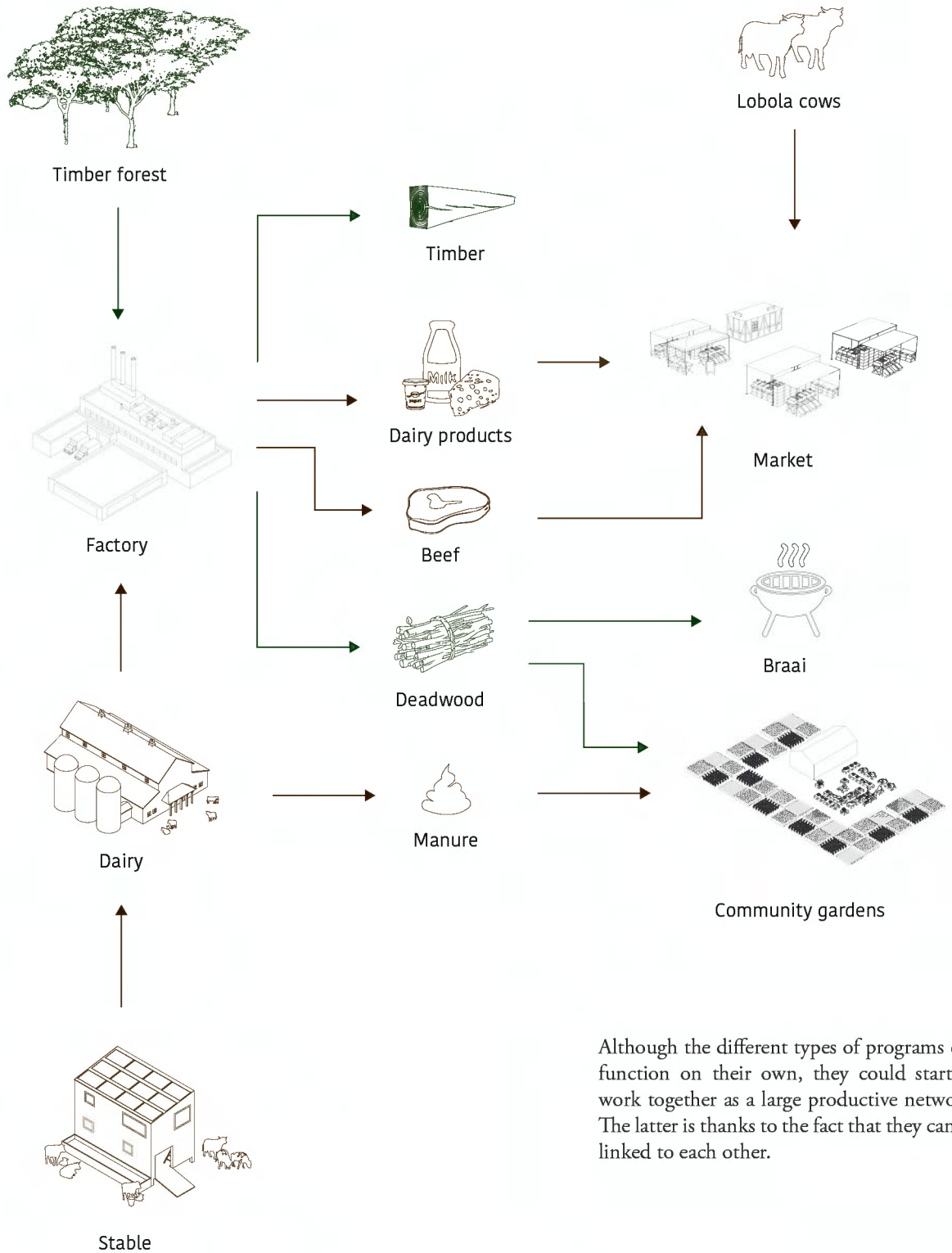






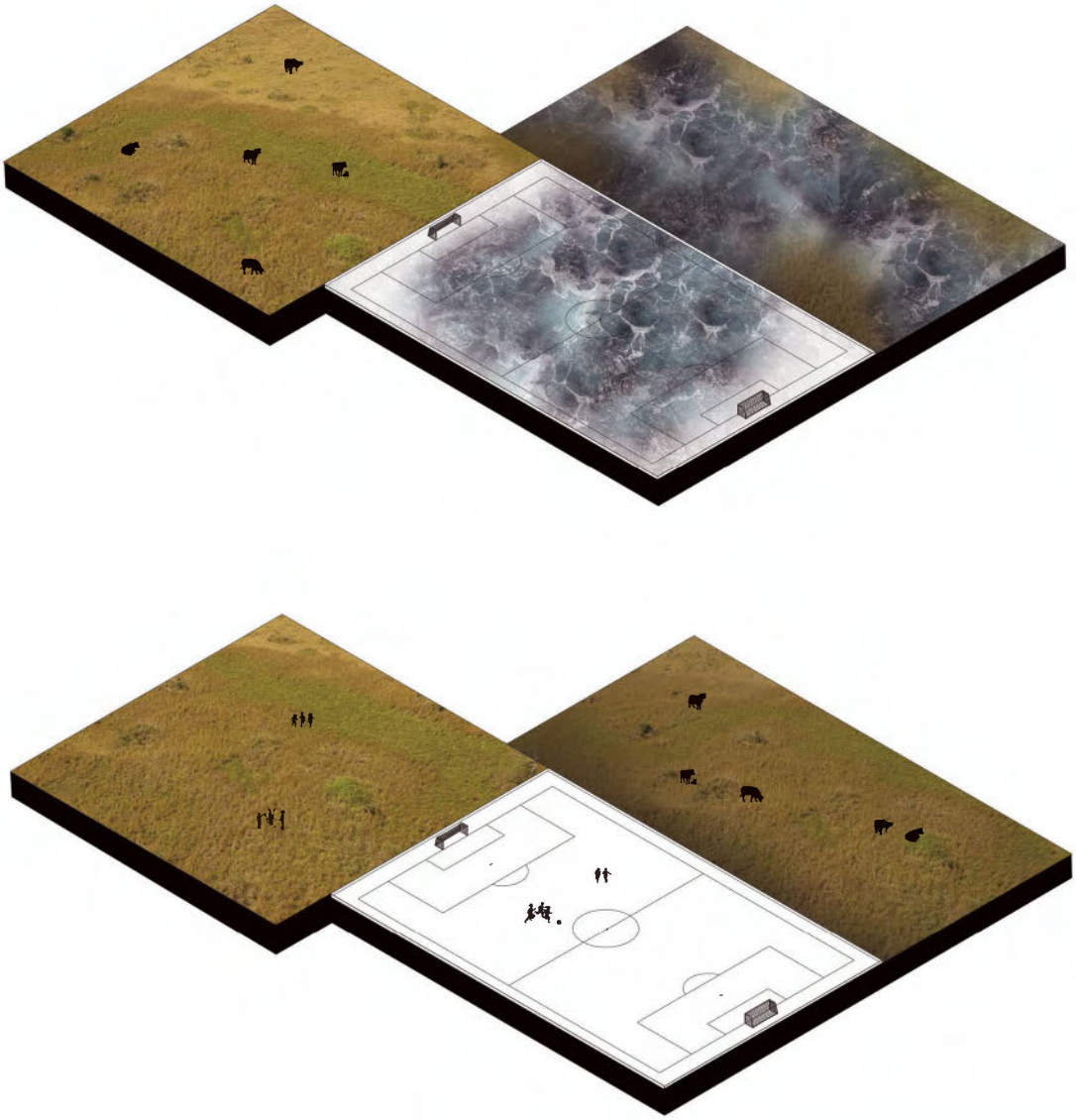


▼ Process diagram



Although the different types of programs can function on their own, they could start to work together as a large productive network. The latter is thanks to the fact that they can be linked to each other.

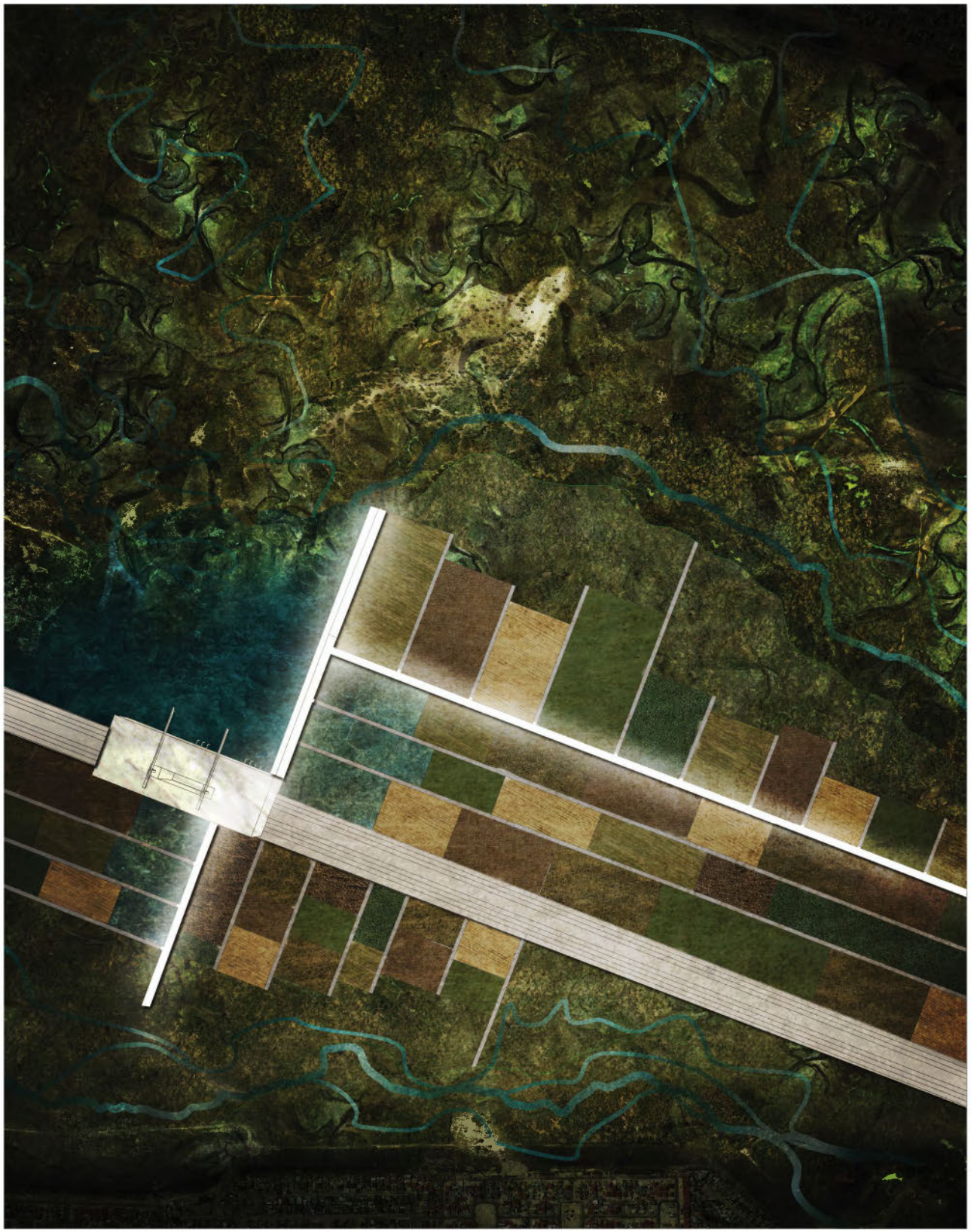
▼ winter (above) versus summer (below) situations



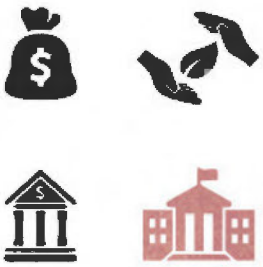
Furthermore, the programs do not only benefit from the natural landscape elements such as water, but also from its vegetation and animal life. Harvesting cycles, the incorporation of flooding in the rotational grazing system of cattle and floodable programs are examples.

Vertical factory

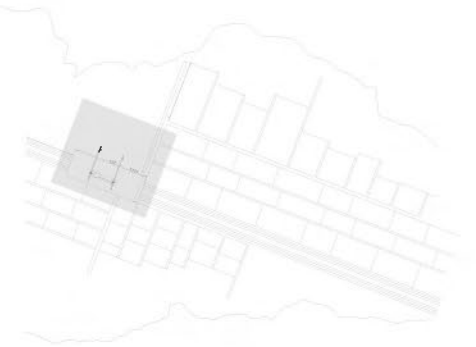
The vertical factory is an example of a heavy urban program that can occur in the core area of the urban rift. It is able to fulfil an important step in the large productive network of the corridor. Multiple resources harvested from the productive and cultural landscapes can be processed in the factory, such as wood, crops and dairy products.



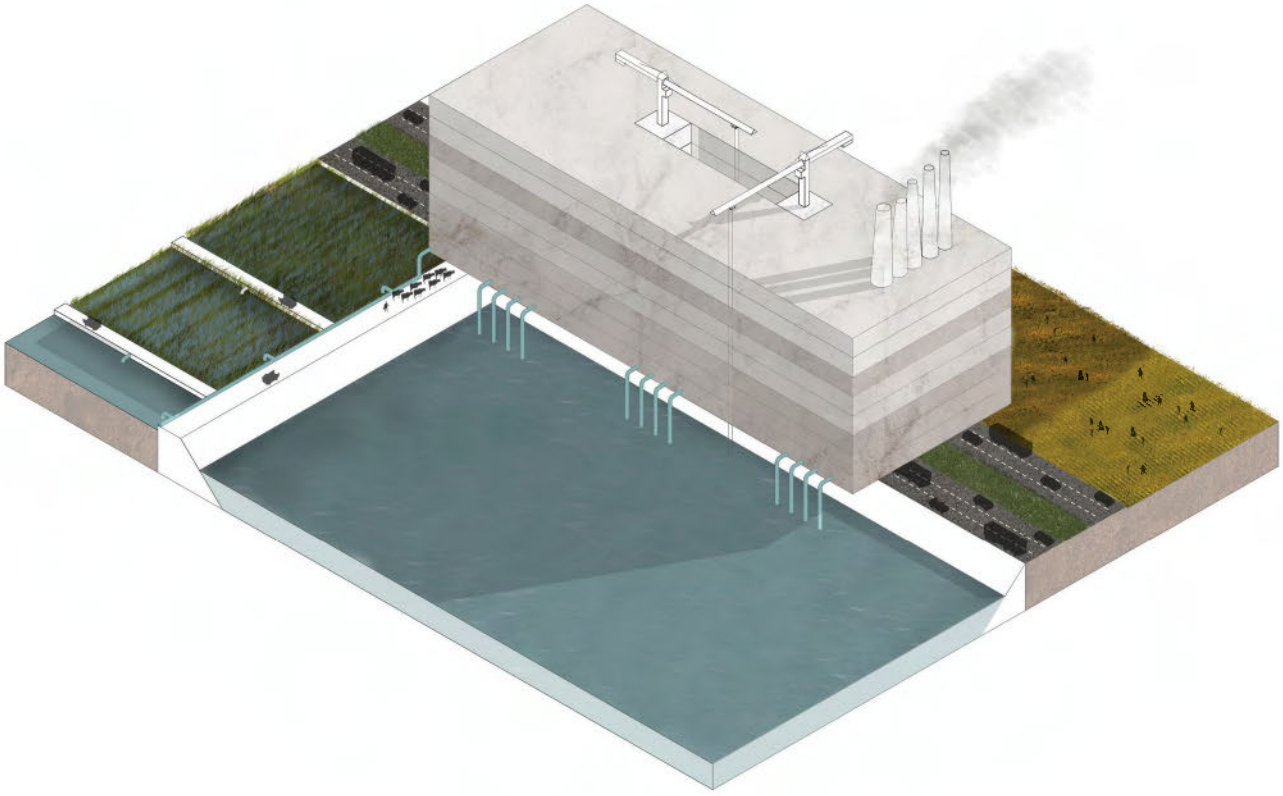
▼ possible actors involved

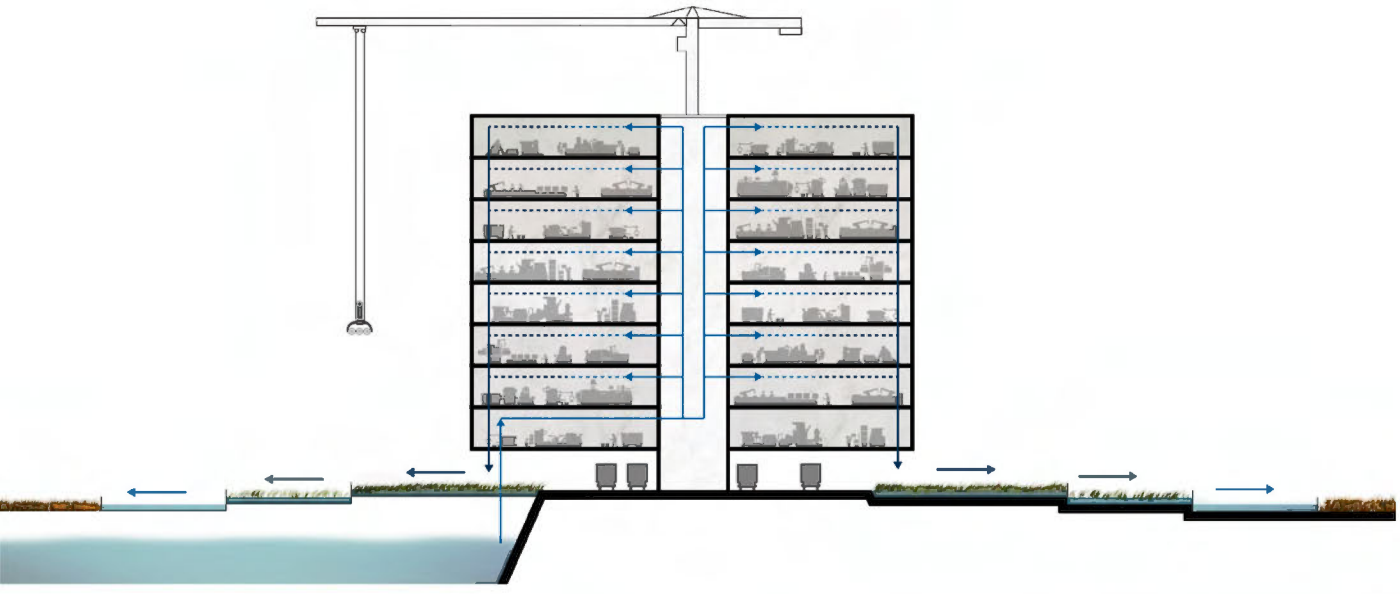


▼ location of the zoom

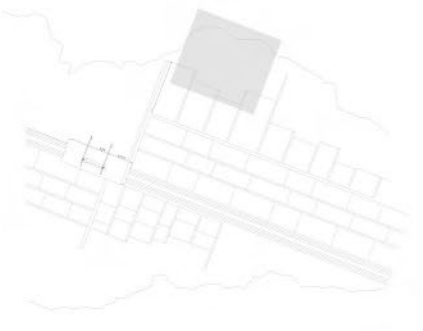


Large infrastructure is vital for the factory. This is why the building is plugged onto an important highway, in this case the N2. Its anchor connects the factory both with its productive landscapes and the high way. Excavated material from the broadening and deepening of the Kuils River is utilized for the realisation of the structure. An important part of it functions as a dike, togehter with the already heightened highway. As the anchor thus forms an obstacle for the river, water accumulates in front of the factory. This water is pumped up and utilized for production processes. In the end, the waste water is treated by constructed wetlands and then re-used for the irrigation of terraced agricultural croplands.

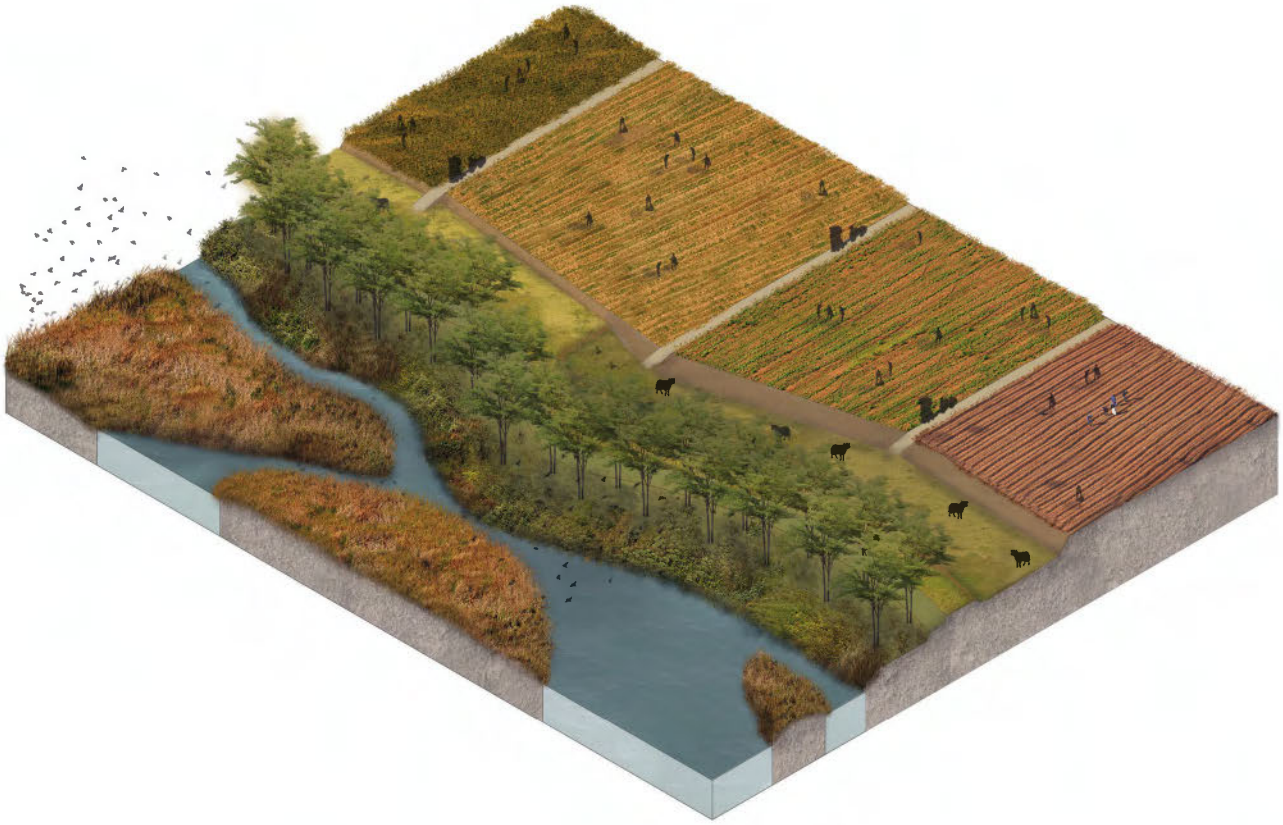


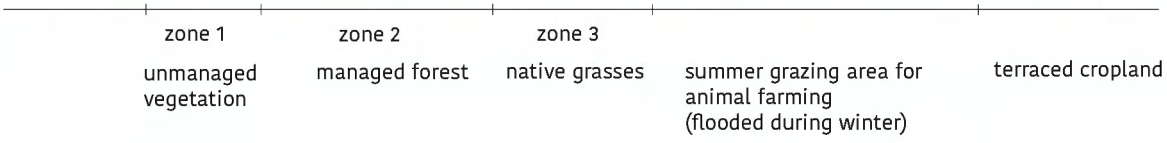


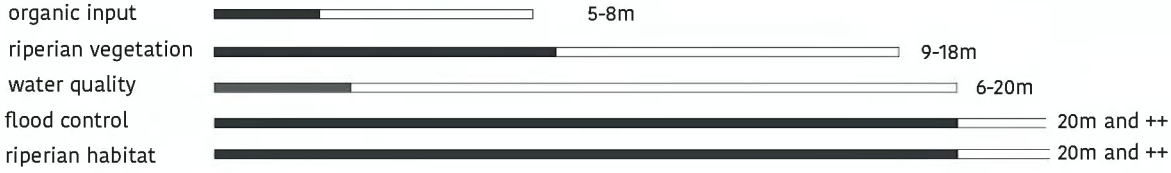
▼ location of the zoom



The various smaller infrastructure lines connected to the are used to reach the furthest parts of the productive lands. At its edges the productive landscape slowly transitions into the uncontrolled softscape. This transition is made by a riparian buffer system. The latter is a vital element of watershed mainly because it protects the surface and ground water quality from impacts related to human land use. Grazing areas for bulls are located between the riparian buffer and the terraced croplands. Levees, which are the result of cut-and-fill interventions, form natural barriers for the cattle. They obstruct their access to both croplands and the riparian buffer. Parts of the grazing area's for the cattle are prone to flooding during winter, which ensures rotational grazing.

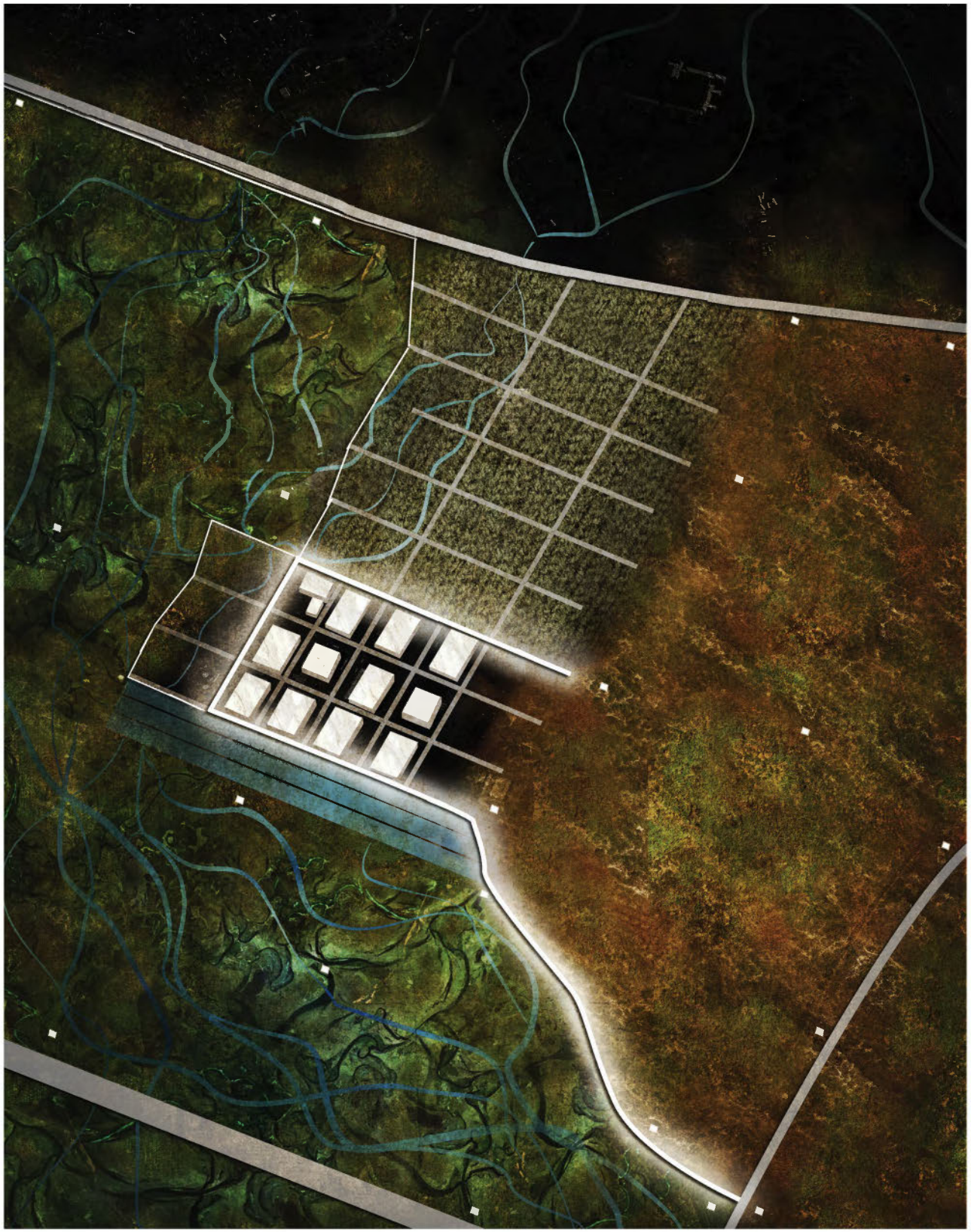



zone 1
unmanaged vegetation
zone 2
managed forest
zone 3
native grasses
summer grazing area for animal farming (flooded during winter)
terraced cropland


organic input
5-8m
riperian vegetation
9-18m
water quality
6-20m
flood control
20m and ++
riperian habitat
20m and ++

Urban island

The film studios are situated where two completely different types of biodiversity come together. On the Western side, there are Cape Lowland Freshwater wetlands, which consist of a very wet system. On the eastern side they border to a very dry system of Cape Flats sand Fynbos. As other friction figures elsewhere guide water away from the dry area and to the wetter vegetation, existing conditions are enhanced.

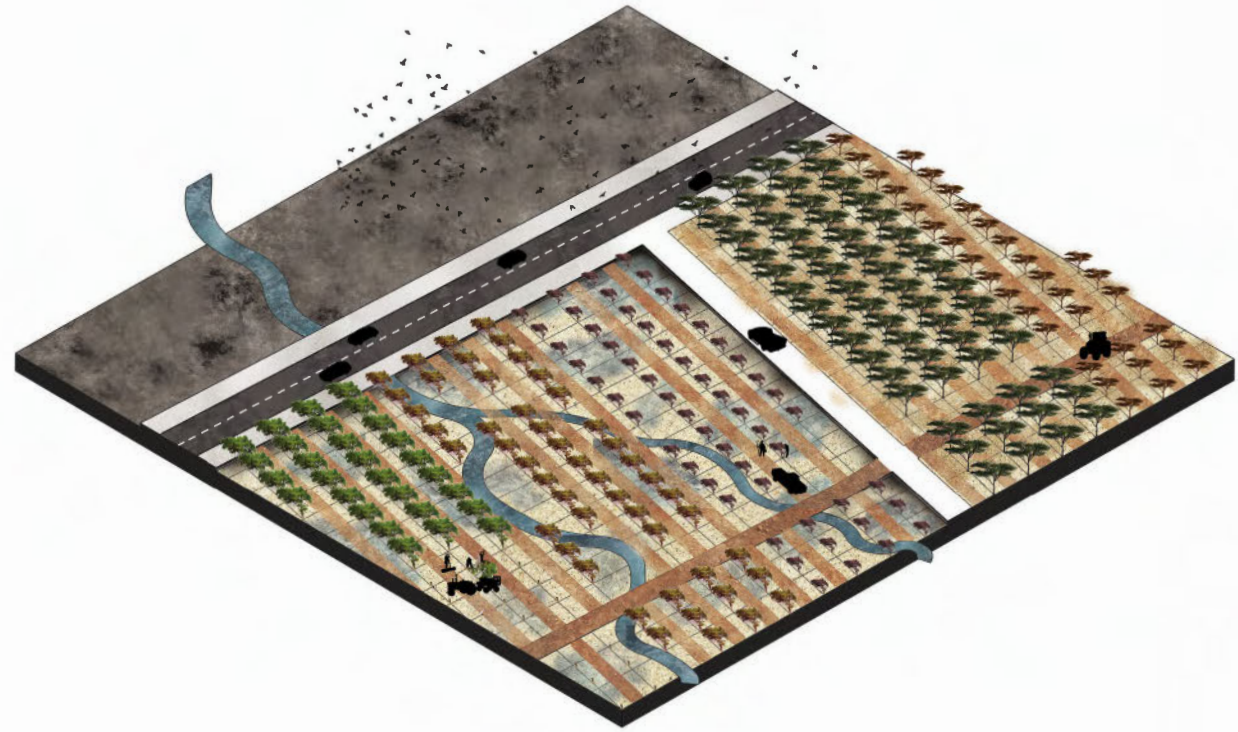


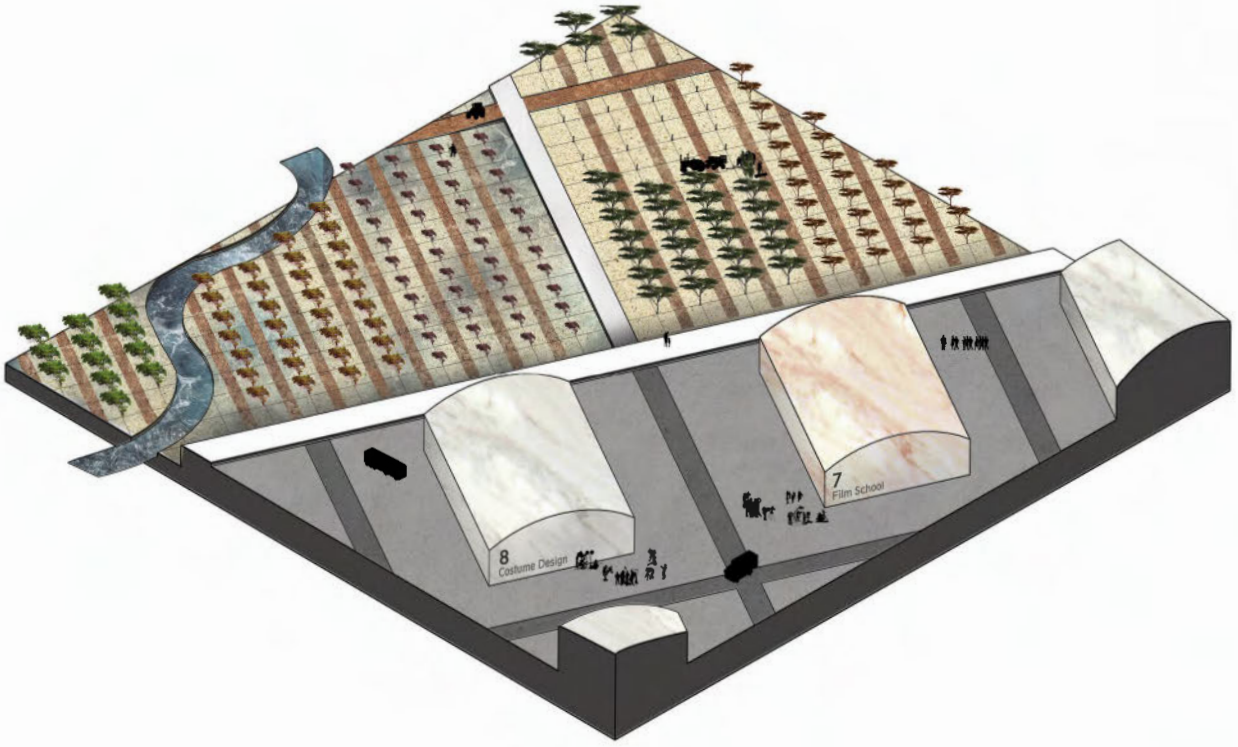
▼ possible actors involved

▼ location of the zoom

▼ location of the zoom

The figure to the north of the studio's is an example where agroforestry is implemented. This could become a timber forest. It is located relatively far away from the factory that processes the wood, because the trees that will be cultivated grow more slowly. These need to be harvested less often than the crops grown closer to the factory.



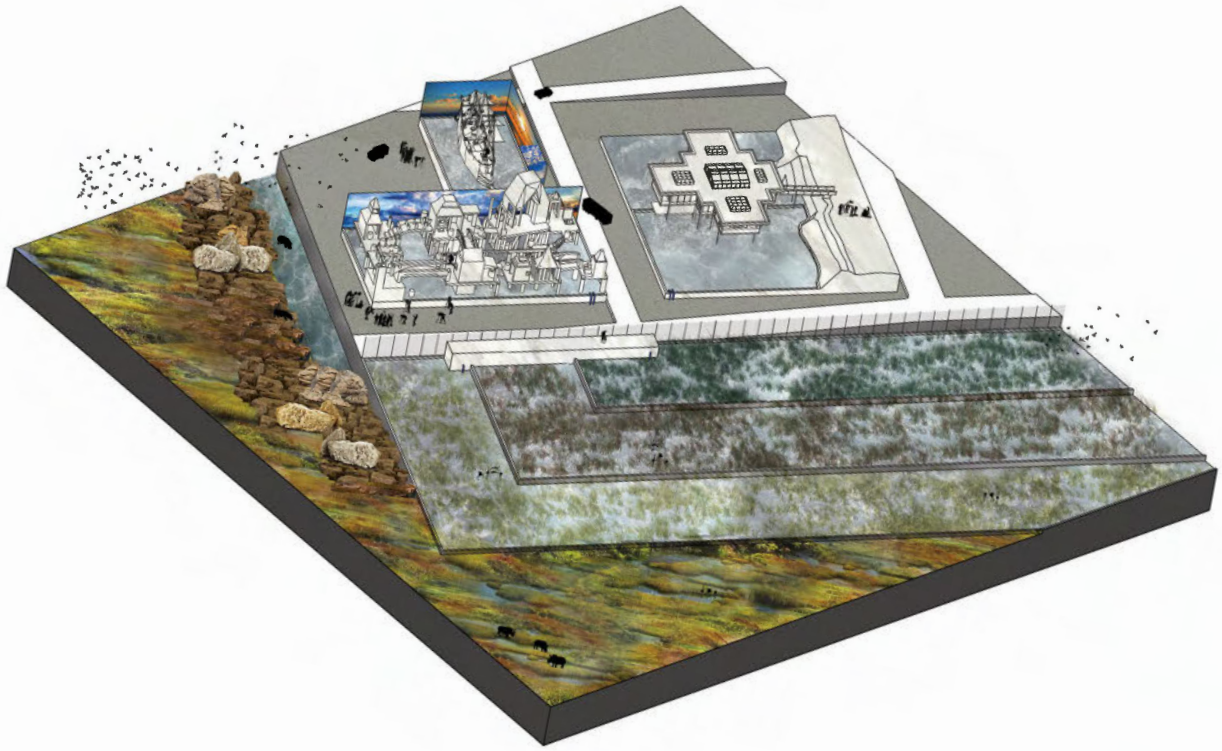

8
Costume Design
7
Film School

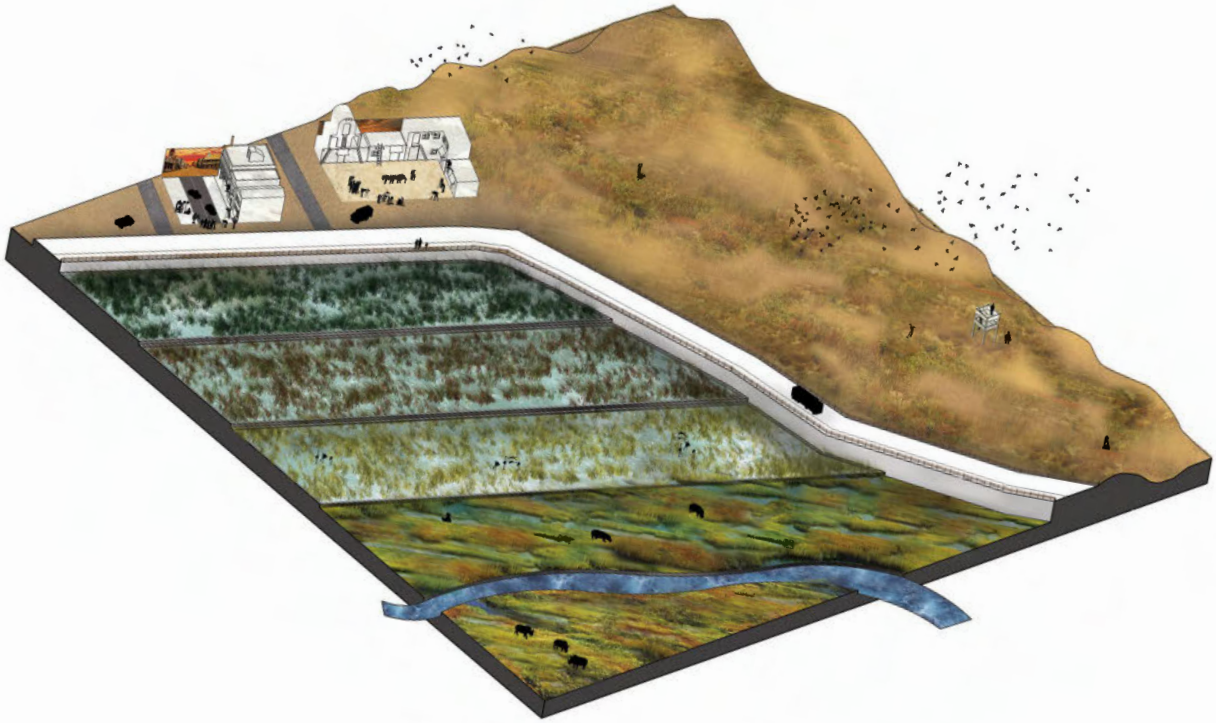
▼ location of the zoom

As the film studio's need different conditions for filming they benefit from their rich natural surroundings. The outdoor filmsets are linked to different biodiversity types. Sets that need water are linked to the wetland, and sets that don't need water are closer to the drier natural area. The water that is used in the wet sets, gets cleaned in constructed wetlands before it re-enters the natural system. Though a collaboration with driftsands, game is also re-introduced in the biotopes.

▼ location of the zoom

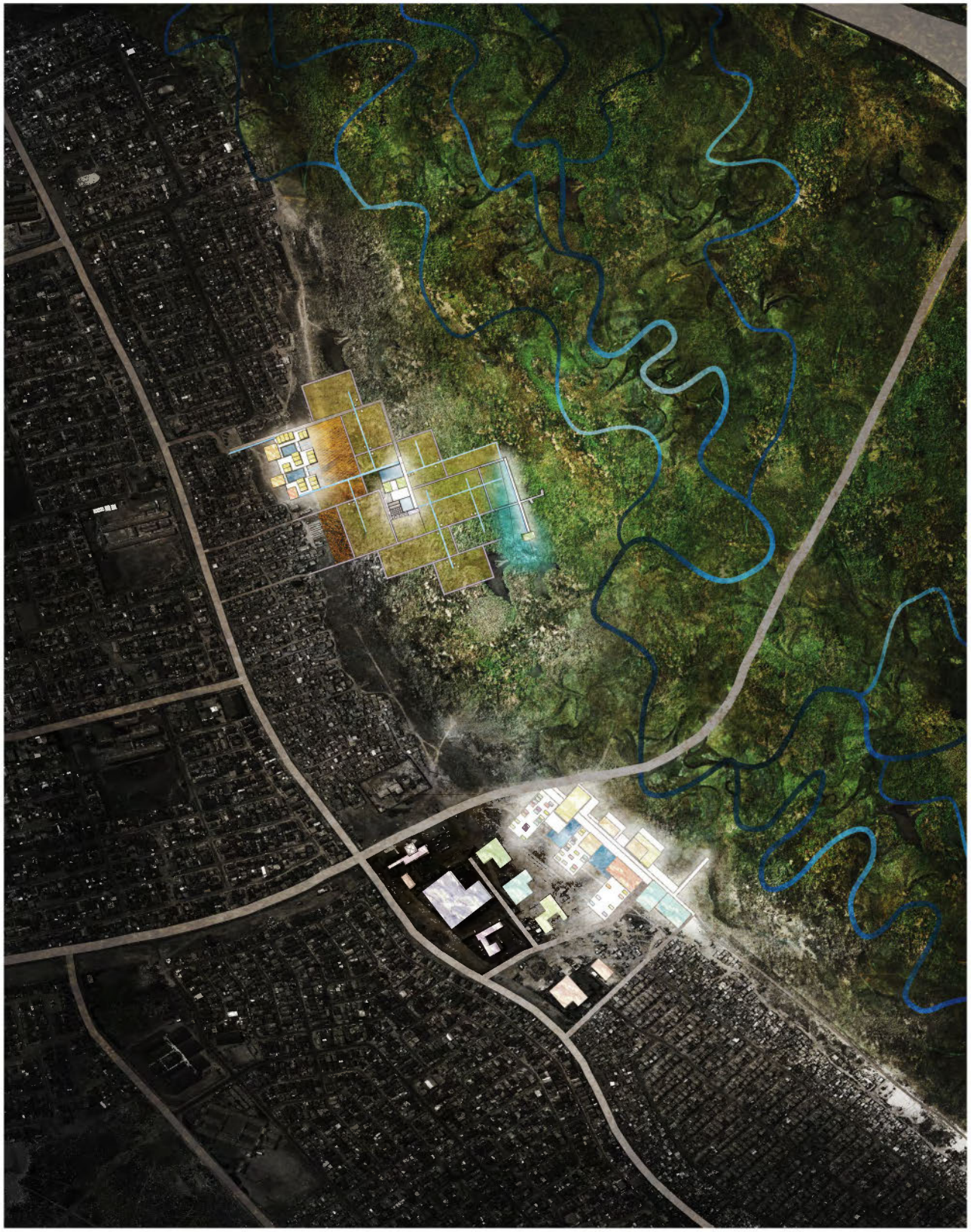
The film studio's anchor is not only a division between the two distinct biotopes but also an access road that connects the island to the main road and a barrier that keeps the filmstudios safe from water and wildlife.



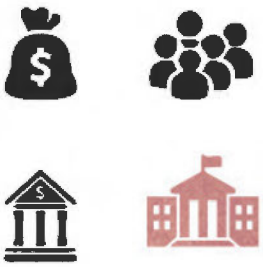


Enclave entrance and enclave edge

Anchors at the edge of the enclaves are different in appearance. Both storm and waste water are retrieved and guided to small treatment units at the edges of the enclaves. This is the primary form anchors are used as at the edge. We worked on two different edge conditions: an enclave entrance and an enclave edge.



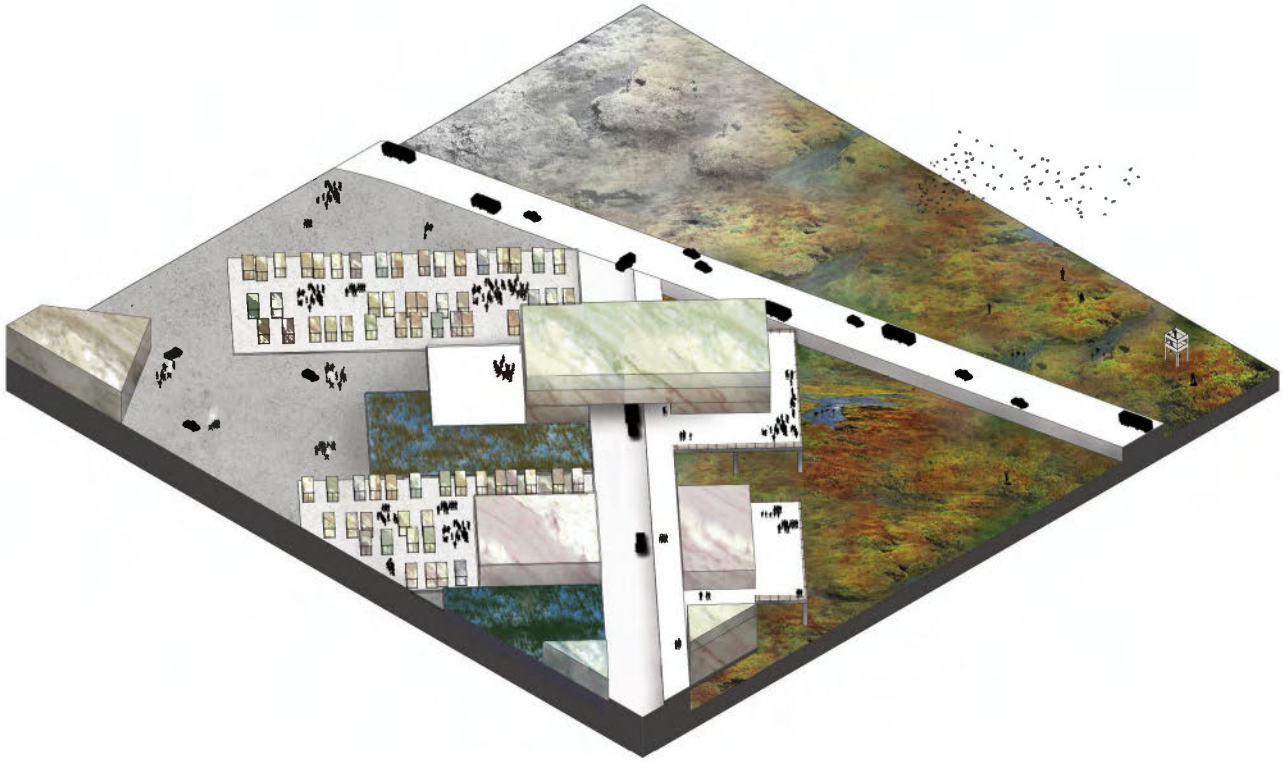
▼ possible actors involved

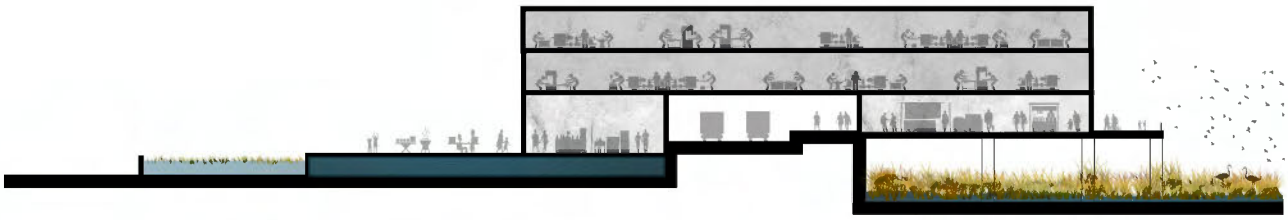


▼ location of the zoom

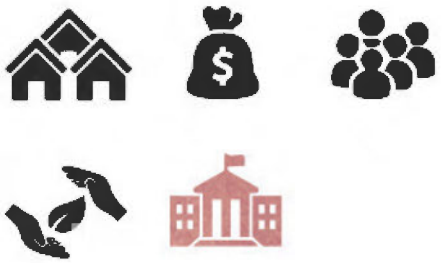
Enclave entrance

The market is an example of a friction figure positioned at the entrance of an enclave. It clearly defines the border between urban fabric and natural landscape. Water in the enclave is guided to the market, where it is cleaned in different treatment units that are closely positioned next to each other. After it is purified it enters the natural system. The closed basins and open constructed wetland basins lean against a dike that clearly defines the urban border. Both purification basins and dike form the anchor. The dike doubles as the main access for arrival and departure of several goods. All the products of the productive landscape arrive at the market to be sold: fruit, seedlings, wood, cows, meat, milk... The dike and basins are also the foundation for other buildings besides the two storey market. There are storage facilities and also several workshop buildings. These workshops are places were more artisanal crafts can be exercised, in contrast to the processes of the factory. Along the dike is also a walkway that connect the different buildings for pedestrians and creates balconies that look out over the natural landscape. Lastly there is infrastructure on the side to the enclave that provides for small informal traders, thus the market brings formal and informal merchandises together.

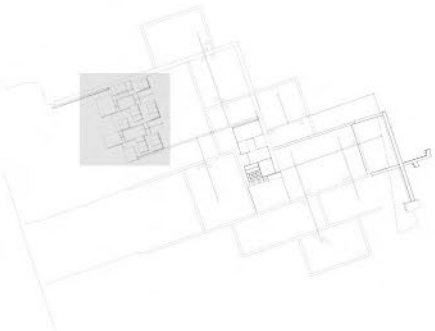




▼ possible actors involved



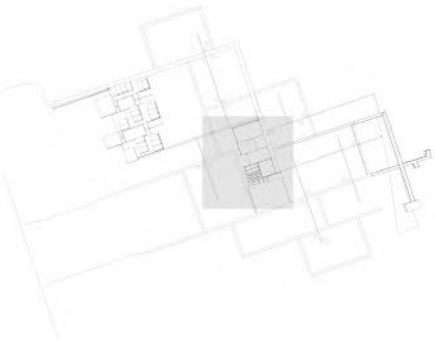
▼ location of the zoom



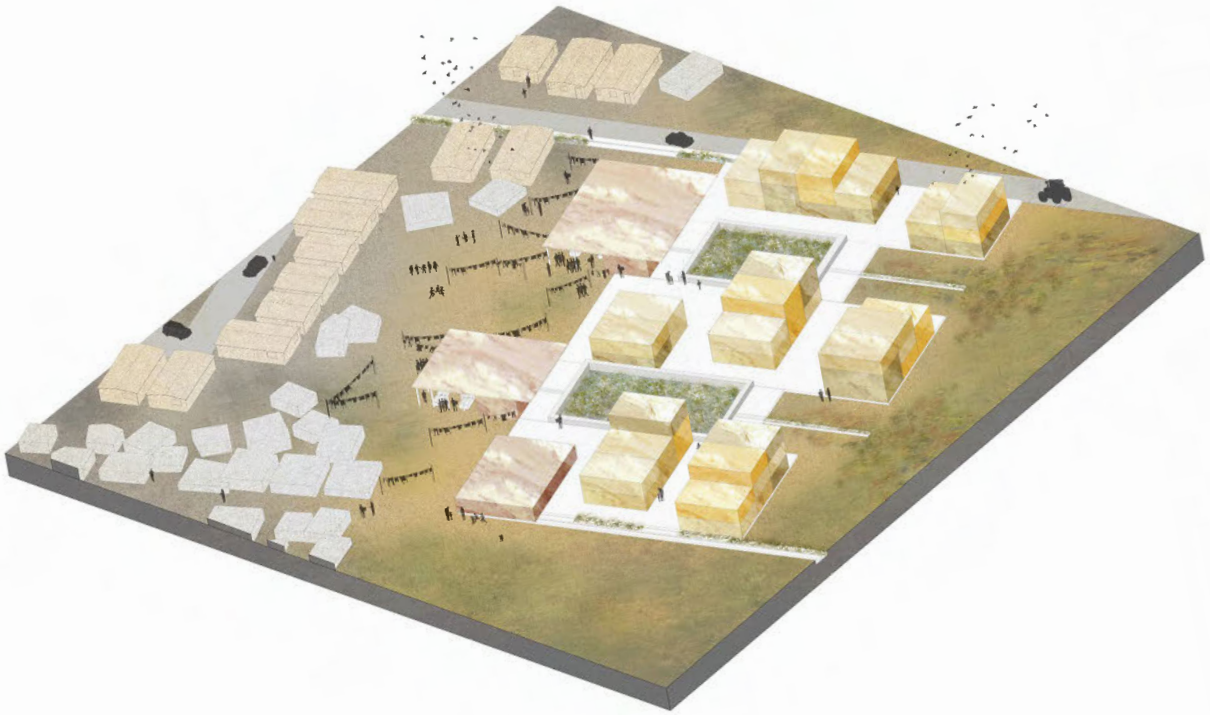
Enclave edge

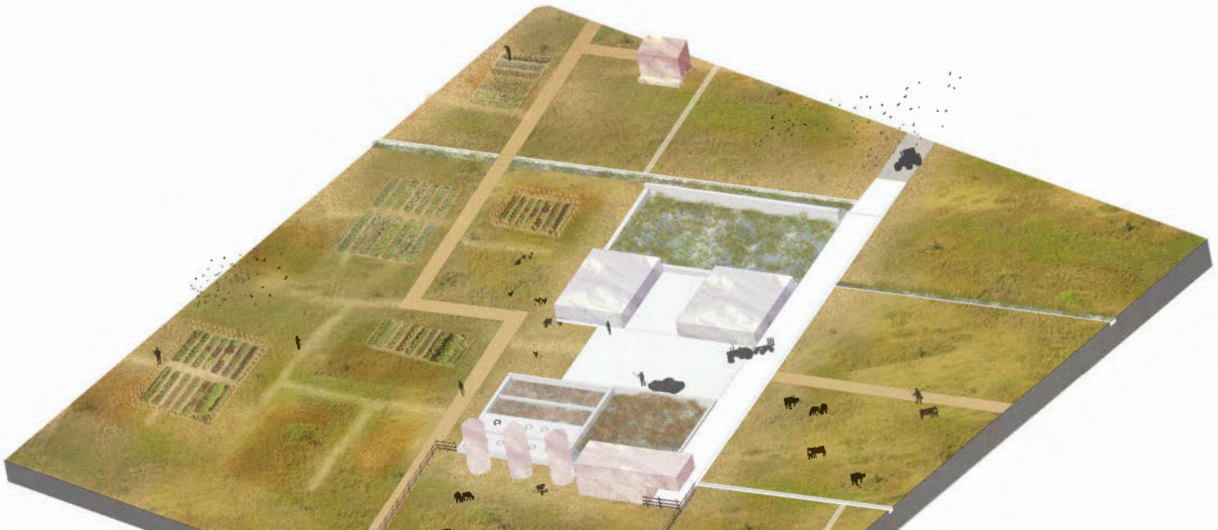
The figure at the edge creates a more gradual transition from urban fabric to natural landscape. With its three different anchors that are placed apart, it creates a mix of smaller cultural and productive landscapes. The anchors mostly consist of water treatment units and each have a different impact on their surroundings.

▼ location of the zoom

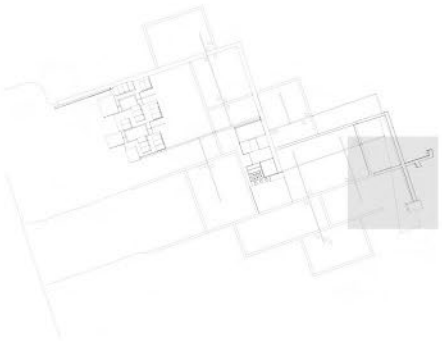


The water is first collected in the enclave before it arrives at the first anchor. This first anchor consists of the basins were the first steps of the waste water treatment process happen, the pretreatment and primary treatment. This in combination with storm water basins. The closed basins form the foundation for several smaller programs. They could be used to construct new housing projects.



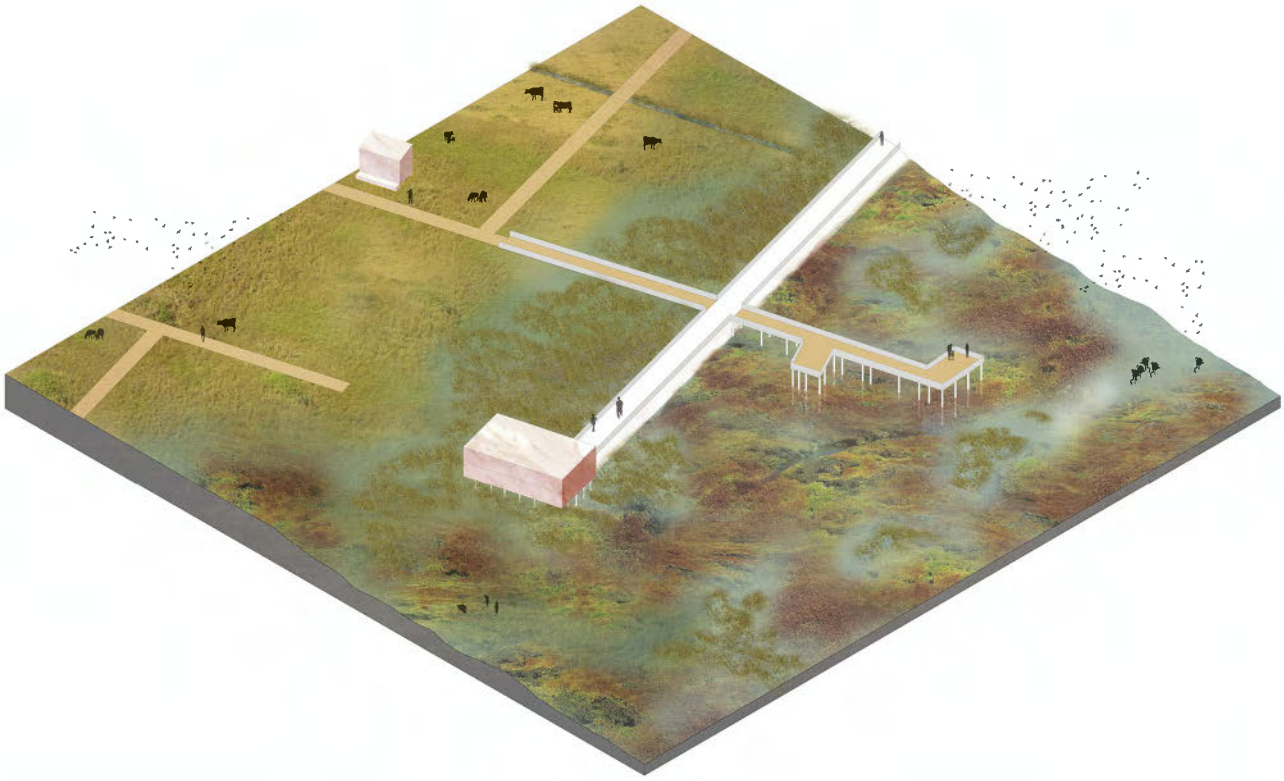


▼ location of the zoom



There is a lack of housing and several housing providers could come together to start a project that is a mix of different housing typologies: social housing, gap-housing, apartments... Another possible program is a laundry house, which is a place where people use cleaned storm water from the basins to wash their clothes. This is a program both for the new residents as well as for the people from the surrounding neighborhoods. Near here are small playgrounds for children of the neighborhood. Together with an NGO like VPUU there could be the construction of a community house with common spaces for all the different communities. When the capacity of the storm water basins is exceeded, the excessive storm water is released on the fields just behind the anchor, turning them in seasonal wetlands. Thus this sets new boundaries for the urban fabric.

The second anchor in the figure is a combination of basins and a low platform.

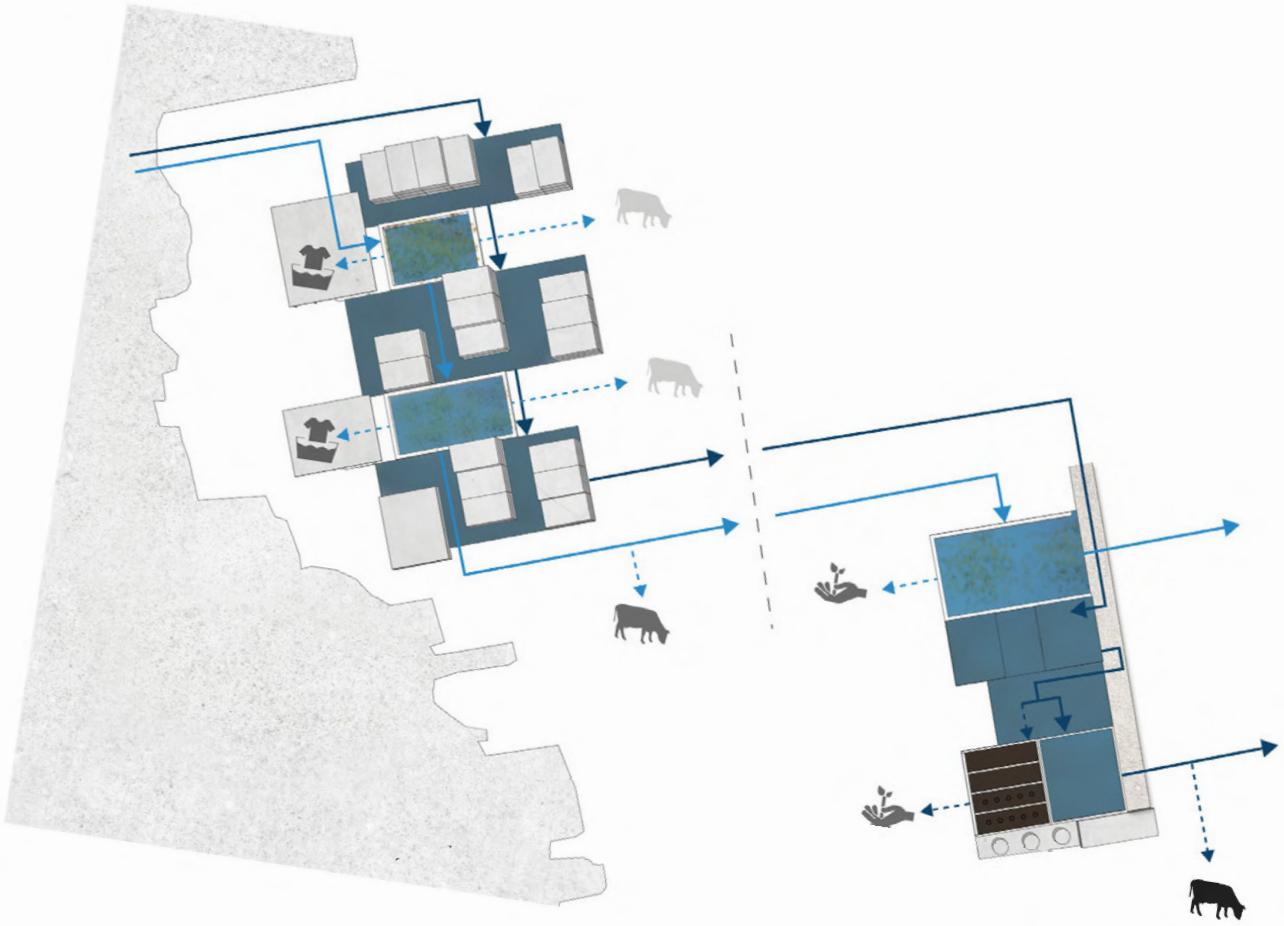


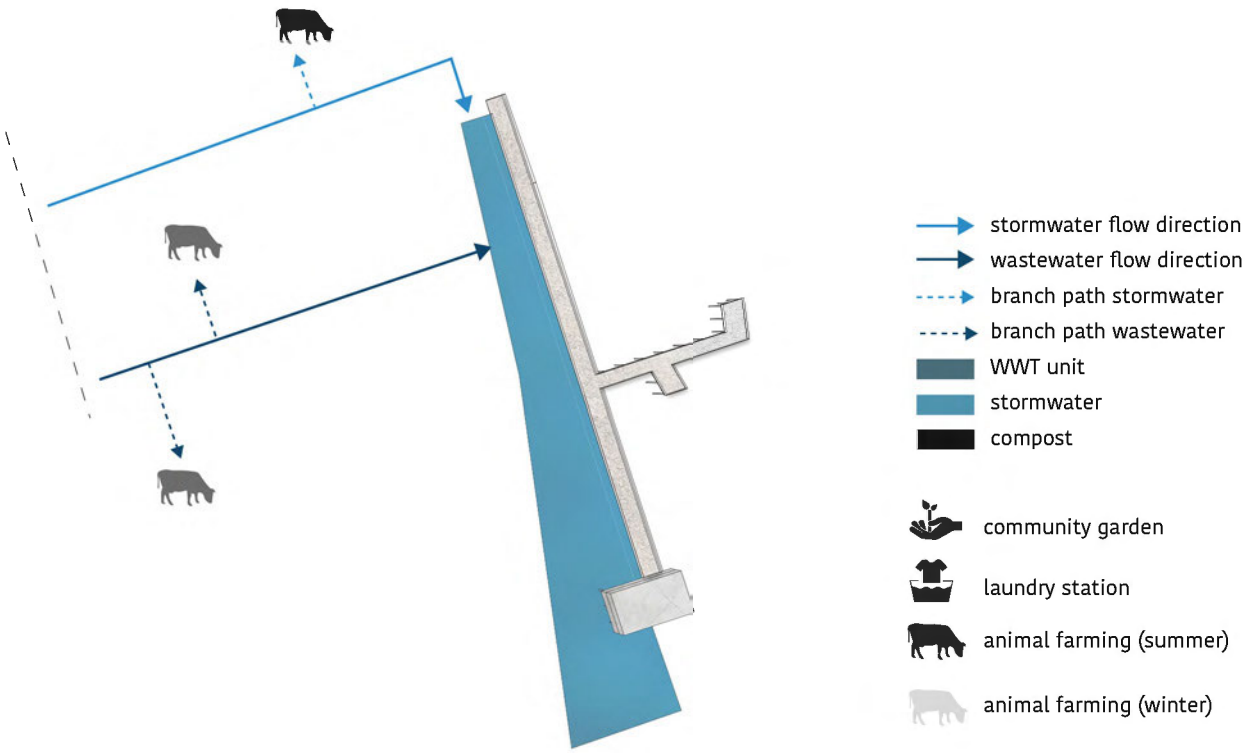
Storm water arrives in a single storm water basin. Waste water arrives in units where the secondary treatment process takes place. After being treated storm and wastewater continue as separate lines to the last anchor. The closed basins are again used as foundations for new programs. A small building is used for supporting community gardening for the surrounding communities. These small gardens can use sludge from the waste water treatment, as well as manure from the cows from the smaller farmers and green waste from the factory. People can also irrigate their plants using water from the storm water basin.

Another program that is connected to the second anchor is a small dairy farm. Farmers regularly pass by the farm so their cows can be milked. The milk is gathered in large silo's before it is driven off to the factory or the market.

The furthest and last anchor of the figure is built as a small dike. It shares the most resemblances to the anchors at the core of the urban rift. Both storm water and waste water flow into a last treatment process that consists of constructed wetlands. After they're fully purified they enter the natural landscape. Some of the fields near this last anchor are lower and thus tend to flood during winter. This enables rotational grazing by cattle, that graze on these floodable fields during summer.

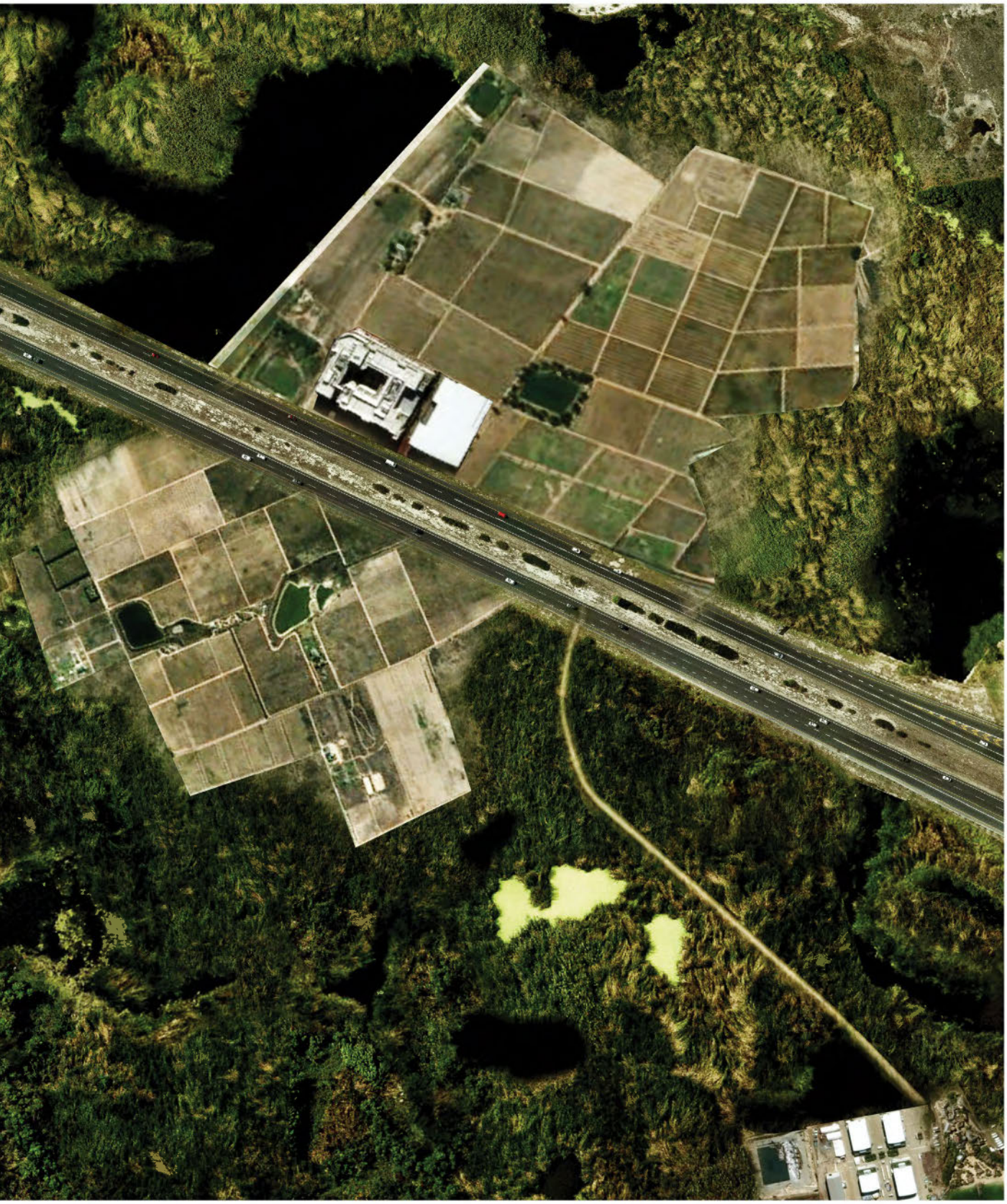
The only program on the last anchor is that of the Driftsands nature reserve. As a place between communities and the natural landscape, it is perfect to train people to remove invasive species and monitor the condition of the ecosystems.




stormwater flow direction
wastewater flow direction
branch path stormwater
branch path wastewater
WWT unit
stormwater
compost
community garden
laundry station
animal farming (summer)
animal farming (winter)

Reflection

We wanted to investigate how there could be a different approach to handling natural ecosystems. Can't we do more than hide valuable biodiversity behind fences and inside reserves. Are natural elements really a nuisance and are they misplaced in a city with metropolitan ambitions? We think it is possible that people's attitude towards nature can be improved. By countering the backside situation and focusing development at the edges. By stopping to protect natural elements without being able to use them. When people use the natural landscape through cultural and productive landscapes this adds value to the land, which is another way to protect them from urban growth. This proves open space can be more than building plots for generic development. The latter can happen, but in a way that it strengthens both the bond between natural landscape and urban system and strengthens nature itself. Both soft- and hardscape coexist and are interrelated. But how strong is this relation? It is essential that each figure is further developed in relation to natural ecosystems after the anchor has been built. The friction figures try to provide platforms were different actors come together and collaborate to reach a common goal. This could both be a strength and a weakness. Although idealistic it results in hybrid designs that try to show the possible opportunities of collaboration. However there is also always a tension between starting to actively cultivate the natural landscape and trying to safeguard parts from human activity. Are the natural systems strong enough to do both? However, we can conclude that it is interesting to stop seeing nature as a passive element in urban dynamics and try to embrace them as a worthy part of our cities.



reflection

Looking back at what we accomplished, brings us back to our letter to Cape Town. Our aim was to implement the concepts of landscape as an ally in our designs. As a consequence, all our designs discuss the same concepts, but handle them differently according to the specific condition of the figure. They consider the potential of the friction between the landscape and urbanity. As they work on a different scale and context, there is not one exact manner to deal with everything. The designs have succeeded in the sense that they can open up the discussion. We analysed three figures in the open space of Cape Town. They can serve as a starting point, but are not sufficient for the whole of Cape Town. All of the three figures in themselves have to potential to transform the open space from non-places that are currently not perceived as part of the city, to essential and vibrant places.

Cape Town's management and operation is and has been characterized by a secular approach. Since it forbids interaction, our second aim was to turn this around by advocating frictional design. This includes acknowledging Cape Town's existing frictions and implementing them in our designs. The frictions themselves are initiated by tensions in different scales, programmes, needs, intentions, speed, colour, dynamics, ... Instead of perceiving these frictions as negative and keeping them dissipated, we embraced them and saw potential exactly in the tension between them. The concept of a hybrid structure pops up in some of our design approaches, combining several layers. These hybrids may come off as rather fictional, sometimes even utopian, but clearly show the potential of embracing frictions.

Reflecting on our perception of Cape Town as an archipelago city, some insights came forward. We don't put a negative mark on the concept of the archipelago, if there is enough possibility for interaction. An archipelago city is a powerful city structure when functioning as a network instead of separate elements. Enclaves should be encouraged to foster their own character, and their interaction should be strengthened so that they can provide opportunities for each other.

There is a duality between the remnants of the void and urbanity that reminds us of schizophrenia. Today this schizophrenia is regarded as something negative, almost consciously ignoring the creativity it brings along. By our designs, we encourage to further exploit this creativity. From our fictions, we can learn how to deal with frictions. We not only acknowledge the frictions, we want to search for them and allow/stimulate them to arise.

We have very deliberately chosen to design no master plans. Instead, we focussed on systems, which have the potential to plan for the unplannable. The physical form is only a tool for these systems to touch the ground. The biggest challenge was to design a dynamic system. We had to forget the traditional way of designing, to do it on the fly. We were thought to plan everything top down, but a more system-based approach was needed in this case. Design needs to continue while executing, as interaction is needed. Therefore, our designed systems need to be robust to take in the the unforeseeable.

Cape Town can be perceived as disurban. The city did not grow in a concentric way out of a nucleus but instead, new nuclei popped up continuously like mushrooms further and further away. The density is relatively low for a city, lacking complex centres. Social heterogeneity is missing because all social classes are pulled apart, although there is a large cultural diversity. Social and functional heterogeneity is perhaps one of the main characteristics constituting a city. Because of this absence, Cape Town perhaps cannot be perceived as one. This contrasts strongly with the image of Cape Town as a global city. This city wants to live up to the western model of cities and aims to be like one. But Cape Town cannot be met with a western city. It is an African city with a very strong character and diversity. The city needs to be re-invented, obtaining its strengths from the diversity and frictions that are present. Pursuing a western model of a no-friction city is pointless. Cape Town needs a different approach that embraces frictions. It could become a new model city for Africa, and perhaps all developing cities in the world.

references

Books and articles

Adelana, S. (2010). Groundwater resource evaluation and protection in the Cape Flats, South Africa, (August).

African Centre for Cities. (n.d.). Rising Waters.

AlSayyad, N. (2001). Hybrid urbanism: on the identity discourse and the built environment. Greenwood Publishing Group.

Amelia K, K. (2001). The potential for constructed wetlands for wastewater treatment and reuse in developing countries: a review. Ecological Engineering, 16(4), 545–560.

Appleyard, D., Lynch, K., & Myer, J. R. (1964). The view from the road.

Bal, M. (2008). Perceptions , Planning and Principles of Public Open Spaces (POS), (September).

Balme, K. H., Roberts, J. C., Glasstone, M., Curling, L., Rother, H.-A., London, L., … Mann, M. D. (2010). Pesticide poisonings at a tertiary children's hospital in South Africa: an increasing problem. Clinical Toxicology, 48(November), 928–934.

Barry, M., & Rüther, H. (2004). Data Collection Techniques for Informal Settlement Upgrades in Cape Town , South Africa. Urisa Journal, 17(Weaver), 43–52.

Battersby-Lennard, J., & Haysom, G. (2012). Philippi horticultural area: A city asset or potential development node?, (April), 1–17.

Bertram, N., & Murray, S. (Eds.). (2005). 38 South: Urban Architecture Laboratory 2002-2004. RMIT Publishing.

Bouchard, B., Goncalo, A., Susienka, M., & Wilon, K. (2007). Improving flood risk management in informal settlements of Cape Town, 69.

Boulton, J. (n.d.). Housing Finance Programme for Sub- Saharan Africa.

Brown University Project. (2014). Khayelitsha VPUU. The Gerontologist, 54, 1–28.

Brown, C., & Magoba, R. (2009). Rivers and Wetlands of Cape Town. Working Paper.

Brown, T.C, Bergstrom, J.C, Loomis, J.B. (2006). EcosystemGoodsandServices: Definition, Valuation and Provision.

Brown-Luthango, M. (2015). State/society synergy in Philippi, Cape Town. Cape Town: African Centre for Cities.

Burger, D. (2013). South Africa Yearbook 20012/13.

Carden, K., Armitage, N., Sichone, O., Winter, K., & Rivett, U. (2007). Management Options for the Safe Use and Disposal of Greywater in the Non-Sewered Areas of South Africa. Geographical, 33(4), 433–442.

Chadernnay, B. (2014). Moving Towards

a Strategy for the Sustainable Delivery of Emergency Housing and Temporary Residential Accomodation in the City of Cape Town, (October).

City of Cape Town. (2012). Integrated Human Settlements: Five-Year Strategic Plan 1 July 2012 - 30 June 2017, (July), 1–48.

City of Cape Town. (2007). IDP 5 Year Plan for the City of Cape Town. Integrated Development Plan (IDP). 2007/8–2011/12. Summary, draft for comment. Version 2.3. 23.03.07(To Council).

City of Cape Town. (2013). Tourism development framework: 2013 to 2017, (March).

CoCT. (2014). Integrated Human Settlements Five-Year Strategic Plan, July 2012 - June 2017: 2013/2014 Review, (July 2012).

Cody, W. J. (n.d.). Housing for Special Functions.

Compton, John S. (2004). The Rocks & Mountains of Cape Town. Cape Town: Double Story

Currie, P., Lay-sleeper, E., Fernández, J. E., Kim, J., & Musango, J. K. (2015). Towards Urban Resource Flow Estimates in Data Scarce Environments: The Case of African Cities. Journal of Environmental Protection, 6(September), 1066–1083.

Currie, P., Radmore, J., Musango, J. K., & Brent, A. C. (2013). Sanitation technology options in informal settlement : a system dynamics approach, 1–30.

Daily, G.C.(Ed), (1997). Natures Services: SocietalDependenceon Natural Ecosystems. Island Press,Washington, D.C.

Daraghma, A. (2009). Constructions of Nature and Environmental Justice in Driftsands nature reserve, South Africa, 282.

Deelstra, T., & Girardet, H. (2000). Urban Agriculture and Sustainable Cities. Growing Cities, Growing Food, (Thematic Paper 2), 43–66.

Department of Housing. (2004). "Breaking New Ground" A Comprehensive Plan for the Development of Sustainable Human Settlements, 1–42.

Department Of Human Settlements. (2009). Csir Provides Support in Guiding Housing and Human Settlement, 46–68.

Department of Human Settlements. (2014). Enhancements to the National Norms and Standards for the Construction of Stand Alone Residential Dwellings and Engineering Services and Adjustment of the Housing Subsidy Quantum.

Dunn, S. (2010). Urban Agriculture in Cape Town: An investigation into the history and impact of small scale urban agriculture in the Cape Flats townships with a special focus on the social benefits of urban farming.

Frayne, B., Battersby-lennard, J., Fincham, R., & Haysom, G. (2009). Urban food

security in South Africa : Case study of Cape Town , Msunduzi and Johannesburg. Development Planning Division Working Paper, (15), 4–43.

Freund, B. (2005). Urban History in South Africa. South African Historical Journal, 52(1), 19–31.

Geyer, H., & Schloms, B. (2012). Land quality, urban development and urban agriculture within the Cape Town urban edge. Town and Regional …, 41–52.

Goldberg, K. (2009). The Water Dialogue Synthesis Report: Cape Town Informal Sanitation, (August 2008), 46–52.

Goven, G. (2006). Green Urbanism - Kosovo informal settlement upgrade Case Study Background- Informal settlements. Africa, (February), 169–191.

Govender, T., Barnes, J. M., & Pieper, C. H. (2011). The impact of densification by means of informal shacks in the backyards of low-cost houses on the environment and service delivery in cape town, South Africa. Environmental Health Insights, 5(November 2015), 23–52.

Govender, T., Barnes, J. M., & Pieper, C. H. (2010). Living in low-cost housing settlements in Cape Town, south Africa-the epidemiological characteristics associated with increased health vulnerability. Journal of Urban Health, 87(6), 899–911.

GreenCape. (2015). Market Intelligence Report, (April), 1–55.

Gren, A. M. (2006). Exploring Typologies, Densities, and Spatial Qualities; The Case of Low-Income Housing in South Africa.

Greyling, C. (2009). The RDP housing system in South Africa.

Haskins, C. A. (2012). Cape Town's sustainable approach to urban stormwater management C.A. Haskins, (January).

Haskins, C. A. (2014). Kuils Forum water quality report, (May).

Hatchard, J. (1994). The Constitution of the Republic of South Africa. Journal of African Law.

Henry, R. K., Yongsheng, Z., & Jun, D. (2006). Municipal solid waste management challenges in developing countries - Kenyan case study. Waste Management, 26(1), 92–100.

Hoekman, P. (2015). Urban-Scale Material Flow Analysis in a South African Context: A Cape Town Feasibility Study. Doctoral Dissertation, University of Cape Town, 35–43.

ICLEI Local Governments for Sustainability. (2008). Biodiversity Report, 4 – 68.

Information and Knowledge Management Department. (2005). A Population Profile of Khayelitsha, (April).

Jacobs, F., & Baud, I. (2013). the Challenge of Housing the Poor Stakeholders , Politics and Knowledge Use in Decision-Making, (September), 1–24.

Jaglin, S. (2004). Water delivery and metropolitan institution building in Cape Town: The problems of urban integration. Urban Forum, 15(3), 231–253.

Jaglin, S. (2013). Urban Energy Policies and the Governance of Multilevel Issues in Cape Town. Urban Studies, 51(May), 1–21.

Jenkins, P. (2013). Urbanization, Urbanism, and Urbanity in an African City: Home Spaces and House Cultures. Palgrave Macmillan.

Johnson, N. (n.d.). AFRICAN Cities reader II: Mobilities and Fixtures.
Karusseit, C. (2008). Practice and Education : Housing and Urban Environments in South Africa.

Kilian, D., Fiehn, H., Ball, J., & Lewis, S. (2005). NATIONAL STATE OF THE ENVIRONMENT PROJECT Background Research Paper produced for the South Africa, (December), 1–37.

Korn, M., & Voida, A. (2015). Creating Friction: Infrastructuring Civic Engagement in Everyday Life. Aarhus Series on Human Centered Computing, 1(1), 12.

Lagardien, a, & Cousins, D. (2004). Sanitation demand and delivery in informal settlements - Planning and implementation support.

Langergraber, G. (2013). Are constructed treatment wetlands sustainable sanitation solutions? Water Science and Technology, 67(10), 2133–2140.

Langergraber, G., & Muellegger, E. (2005). Ecological Sanitation - A way to solve global sanitation problems? Environment International, 31(3), 433–444.

Lannas, K. S. M., & Turpie, J. K. (2009). Valuing the provisioning services of wetlands: Contrasting a rural wetland in lesotho with a peri-urban wetland in south africa. Ecology and Society, 14(2).

Lassen, B. (2012). Dairy production in South Africa. Agri Benchmark, 2(2386), 730.

Lemanski, C. (2007). Global Cities in the South: Deepening social and spatial polarisation in Cape Town. Cities, 24(6), 448–461.

Lemanski, C., & Oldfield, S. (2003). Parallel Claims-Global Responses? Gated Communities and Land Invasions in a Southern City, 1–19.

Lemanski, C., & Oldfield, S. (2009). The parallel claims of gated communities and land invasions in a Southern city: Polarised state responses. Environment and Planning A, 41(3), 634–648.

Louis Wirth. (1938). Urbanism as a Way of Life. The American Journal of Sociology, 44(1), 1–24.

Luger, M. K. (1998). Environmentally-

sensitive river management: assessment and mitigation of impacts on urban rivers, (March).

Maclear, L. G. . (1995). Cape Town Needs Groundwater.

Mammon, N. (2005). Cape Town 2025: Urban Form and Infrastructure. Cape Town 2025 Conference, (July), 14–15.

Marais, L., & Cloete, J. (2014). "Dying to get a house?" The health outcomes of the South African low-income housing programme. Habitat International, 43(November 2015), 48–60.

Matheson, S. (2011). The Informal Housing Crisis in Cape Town and South Africa.

Maylam, P. (1995). Explaining the apartheid city: 20 years of South African urban historiography. Journal of Southern African Studies, 21(1), 19–38.

Melorose, J., Perroy, R., & Careas, S. (1977). National Building regulations and building standards act. Statewide Agricultural Land Use Baseline, 1(103).

Mels, A., Castellano, D., Braadbaart, O., Veenstra, S., Dijkstra, I., Meulman, B., … Wilsenach, J. A. (2009). Sanitation services for the informal settlements of Cape Town, South Africa. Desalination, 248(1-3), 330–337.

Melzer, I., & Moothilal, R. (2008). Supply and demand of rental accommodation in South Africa, 56.

Milchunas, D. G., & Lauenroth, W. K. (2016). Quantitative Effects of Grazing on Vegetation and Soils Over a Global Range of Environments, 63(4), 327–366.

Misselhorn, M. (2008). Position paper on informal settlement upgrading. Draft. Part of a strategy for the second economy for the office of the South African presidency., (April), 1–54.

Mtantato, S. (2015). Self-build Housing Initiatives in South Africa, 145–158.

Municipality: Statutory and regulatory framework. (2010). PUBLIC HOUSING DELIVERY BY THE CITY OF CAPE TOWN, 32–47.

Murray, A. S., Obree, M. S., & Hall, C. S. (1998). Catchment management in the valley of the kuils river.

Napier, M. (2002). The origins and spread of core housing.

National Department of Human Settlements. (2009). The National Housing Code: Volume 6 (Social & Rental Interventions): Part 3 Social Housing Policy, 6, 93.

Nestegard, C. A. (2009). " We are struggling " Coping with chronic disaster in a changing environment, (February).

Newton, C. (2010). The N2 gateway project in Cape Town: relocation or forced removal?

Newton, C., & Schuermans, N. (2013). More than twenty years after the repeal of the

Group Areas Act: Housing, spatial planning and urban development in post-apartheid South Africa. Journal of Housing and the Built Environment, 28(4), 579–587.

Ntema, J. (2012). the Southern African Housing Foundation International Conference , Exhibition & Housing Awards, (September), 1–27.

Ntema, L. J. (2011). Self-Help Housing in South Africa : Paradigms , Policy and Practice, (May), 1–238.

Odendaal L. J., Haupt T. M. & Griffiths C. L. (2008). "The alien invasive land snail Theba pisana in the West Coast National Park: Is there cause for concern?". Koedoe - African Protected Area Conservation and Science 50(1): 93-98.

Palmer, Ian; Brown- Luthango, Mercy; Berrisford, S. (2011). Financial and Fiscal Commission The Economic and Fiscal Costs of Inefficient Land Use Patterns in South Africa, (March).

Office for National Statistics. (2011). Census 2011. Census, (May), 78.

Osman, A., & Davey, C. (2011). Sustainable building transformation in the South African housing sector : CSIR case studies, 25.

Pan, S. M., Armitage, N. P., & Van Ryneveld, M. B. (2015). Sustainable and equitable sanitation in informal settlements of Cape Town: A common vision? Water SA, 41(2), 222–231.

Passell, A. (2013). Building the New Urbanism: Places, Professions, and Profits in the American Metropolitan Landscape. Routledge.

Pharoah, R. (2014). Built-in Risk: Linking Housing Concerns and Flood Risk in Subsidized Housing Settlements in Cape Town, South Africa. International Journal of Disaster Risk Science, 5(4), 313–322.

Pieterse, E. (2009). Post-Apartheid Geographies in South Africa: why are urban divides so persistent. Interdisciplinary Debates on Development and Cultures: Cities in Development - Spaces, Conflicts and Agency, 15.

Pieterse, E., & Edjabe, N. (2004). African Cities Reader, 30(1).

Pieterse, E., & Edjabe, N. (2004). African Cities Reader (Vol. 30).

Pieterse, E. A. (2010). Counter-currents: Experiments in sustainability in the Cape Town region. Auckland Park: Jacana Media.

Pillay, U., Tomlinson, R., & Toit, J. du. (2006). Democracy and Delivery.

Poulsen, L., & Silverman, M. (2005). Design strategies for the densification of low income housing. International Journal for Housing Science and Its Applications, 30(1 SPEC. ISS.), 19–31.

Qadir, M., Wichelns, D., Raschid-Sally, L., McCornick, P. G., Drechsel, P., Bahri, A., & Minhas, P. S. (2010). The challenges of wastewater irrigation in developing countries.

Agricultural Water Management, 97(4), 561–568.

Ramdewor, K. (n.d.). Vacant Land Audit in the city of Cape Town : Analysis for determining suitable vacant land for Social Housing Vacant Land For Housing : Review of previous literature.

Rebelo, A. G., Holmes, P. M., Dorse, C., & Wood, J. (2011). Impacts of urbanization in a biodiversity hotspot: Conservation challenges in Metropolitan Cape Town. South African Journal of Botany, 77(1), 20–35.

Republic of South Africa: Human Settlements. (1994). The National Housing Code: Incremental interventions, 3.

Roman, A., Winker, M., Tettenborn, F., & Otterpohl, R. (2011). Informal Settlements and Wastewater Reuse : Improve of Urban Environment and Alleviate Poverty in Lima , Peru, (November 2007).

Rubin, M., & Gardner, D. (2013). Developing a Response to Backyarding.

Scobey, D. M. (2003). Empire city: The making and meaning of the New York City landscape. Temple University Press.

Settlement Planning and Dludla Development. (2008). Densification framework, (January).

Shay, D. (2014). Violence Prevention through Urban Upgrading Project, 2–3.

Silver, J. (2013). Reconfiguring electricity infrastructures in Accra and Cape Town: Understanding the political ecologies of networked urbanism.

Smit, J., & Nasr, J. (1992). Urban Agriculture for sustainable cities: using wastes and idle land and water bodies as recources. Environment and Urbanization, 4(2), 141–152.

Statistics South Africa. (2014). Mid-year Population estimates, (July), 1–18.

Swilling, M. (2006). Sustainability and infrastructure planning in South Africa: a Cape Town case study. Environment and Urbanization, 18(1), 23–50.

Swilling, M. (2006). Sustainability and infrastructure planning in South Africa: a Cape Town case study. Environment and Urbanization, 18(1), 23–50.

Swilling, M. (2010). Sustainability, poverty and municipal services: The case of Cape Town, South Africa. Sustainable Development, 18(4), 194–201.

s.n., Housing Typologies. (2011), (November), 84–106.

s.n., Nomination of the extension of the cape floral region protected areas: world heritage site of South Africa. (2015).

s.n., Water and Sanitation in the City of Cape Town Integrated Analysis Baseline Report. (2007). Africa.

The City of Cape Town. (2005). Greater Cape Town's Rivers.

The City of Cape Town. (2013). Integrated Development Plan 2013/14 Review.

The City of Cape Town Invasive Species Unit. (2012). Invasive species : a threat to our heritage, 1(June), 1–20.

Theron, G. (2010). Assessing the South African city as a cultural landscape, 32–38.

Thunstrom, A., Miles, K., Alberts, S., Scott, D., Fourie, K., & White, L. (2012). The role of cities in Africa's rise. Kpmgafrica.Com.

Tissington, K., Munshi, N., Mirugi-Mukundi, G., & Durojaye, E. (2013). "Jumping the Queue", Waiting Lists and other Myths: Perceptions and Practice around Housing Demand and Allocation in South Africa, (June), 1–59.

Tobergte, D. R., & Curtis, S. (2013). No Title No Title. Journal of Chemical Information and Modeling, 53(9), 1689–1699.

Tonkin, A. (n.d.). Sustainable medium-density housing.

Tredoux, G., & Cain, J. (2010). The Atlantis Water Resource Management Scheme: 30 years of Artificial Groundwater Recharge.

Tsinda, A., Abbott, P., Pedley, S., Charles, K., Adogo, J., Okurut, K., & Chenoweth, J. (2013). Challenges to achieving sustainable sanitation in informal settlements of Kigali, Rwanda. International Journal of Environmental Research and Public Health, 10(12), 6939–6954.

Turok, I. (2009). Driving Density Higher : Challenges for Central Cape Town, 1–9.

Turpie, J. (2001). Value of Open Space in the Cape Metropolitan Area. City of Cape Town report.

Undersander, D., Albert, B., Cosgrove, D., Johnson, D., & Peterson, P. (2014). Pastures for profit: A guide to rotational grazing, A3529, 1–39.

Van Niekerk, A., Laubscher, R., & Laflamme, L. (2009). Demographic and circumstantial accounts of burn mortality in Cape Town, South Africa, 2001-2004: an observational register based study. BMC Public Health, 9(November 2015), 374.

Vestbro, U., & Emer, P. (2012). Housing in the Apartheid City, 1–8.

Vincent, W., & Fieuw, P. (2011). Informal settlement upgrading in Cape Town's Hangberg : local government, urban governance and the "Right to the City." Development, (December).

Western Cape Provincial Treasury. (2012). Regional Development Profile: City of Cape Town Working paper, 57.

Western, J. (2002). A divided city: Cape Town. Political Geography, 21, 711–716.

Wilkinson, P. (2000). City profile: Cape Town. Cities, 17(3), 195–205.

Willekens, F. & Rogers, A. (1978). Spatial Population Analysis: Methods and Computer

Programs. International Institute for Applied System Analysis. Research Report RR 78-18. Laxenberg, Austria.

Willekens, F., Por, A. & Raquillet, R. (1978). Entropy multiproportional and quadratic techniques for inferring detailed migration patterns from aggregate data. International Institute for Applied System Analysis. Working Paper WP-79-88. Laxenberg, Austria.

Wilson, D. C., Velis, C., & Cheeseman, C. (2006). Role of informal sector recycling in waste management in developing countries. Habitat International, 30(4), 797–808.

Ziervogel, G. (2012). The power of collaborative governance : Managing the risks associated with flooding and sea level rise in the City of Cape Town, (December), 1–16.

Ziervogel, G., Waddell, J., Smit, W., & Taylor, A. (2014). Flooding in Cape Town's informal settlements: barriers to collaborative urban risk governance. South African Geographical Journal, (September), 1–20.

Websites

A new design for RDP housing in South Africa? (2014, September 2). Retrieved May 27, 2016, from http://futurecapetown.com/2014/09/a-new-design-for-rdp-housing-in-south-africa/#.V0hQqFeex6B

About Our Finalists: Kim le Roux and Margit Sichrovsky - The Better Living Challenge. (2014, October 01). Retrieved May 27, 2016, from http://betterlivingchallenge.co.za/finalists-kim-le-roux-margit-sichrovsky/

AdelanaI, S., XuII, Y., & VrbkaIII, P. (2010, July). A conceptual model for the development and management of the Cape Flats aquifer, South Africa. Retrieved May 21, 2016, from http://www.scielo.org.za/scielo.php?script=sci_arttext&pid=S1816-79502010000400011

Albonico, M., & Lone, P. (2010). Kliptown Explored (Panel 2). Retrieved May 27, 2016, from http://informalcity.co.za/kliptown-2

Bafana, B. (2016, April). Africa's cities of the future | Africa Renewal Online. Retrieved May 20, 2016, from http://www.un.org/africarenewal/magazine/april-2016/africa's-cities-future

Battle over Barcelona's Buckets. (2013, May 29). Retrieved May 27, 2016, from http://www.groundup.org.za/article/battle-over-barcelonas-buckets/

Cape Town's Early Detection and Rapid Response. (n.d.). Retrieved May 27, 2016, from http://www.capetowninvasives.org.za/edrr/map

Cape is world's extinction capital | IOL. (2014, August 14). Retrieved May 20, 2016, from http://www.iol.co.za/news/south-africa/western-cape/cape-is-worlds-extinction-capital-1735307

Cape Town is SA's fastest growing city | IOL. (2014, October 20). Retrieved May 20, 2016, from http://www.iol.co.za/business/news/cape-town-is-sas-fastest-growing-city-1767603

Cape Town History and Heritage. (n.d.). Retrieved May 20, 2016, from http://www.capetown.at/heritage/

Census 2011 - Sub Place "Gugulethu SP" (n.d.). Retrieved May 27, 2016, from http://census2011.adrianfrith.com/place/199030007

Design thinking for better living. (2014, October 7). Retrieved May 27, 2016.

Doig, W. (2013, May 30). How Urban Sprawl Is Creating Echoes of Apartheid in Cape Town – The Informal City Dialogues. Retrieved May 20, 2016, from https://nextcity.org/informalcity/entry/how-urban-sprawl-is-creating-echoes-of-apartheid-in-cape-town

Ensminger, D. (2011, April 10). In the City of Friction and Frisson Street Art and Urbanism. Retrieved May 27, 2016.

Furlong, A. (2016, January 21). Barcelona residents throw poo onto N2. Retrieved May 27, 2016, from http://www.groundup.org.za/article/barcelona-residents-throw-poo-n2/

Gaffney, O. (2016, March 15). Researchers look ahead to the growth of African cities. Retrieved May 20, 2016, from http://www.futureearth.org/blog/2016-mar-15/researchers-look-ahead-growth-african-cities

Gontsana, M. (2015, September 2). Barcelona residents angered by piles of rubbish. Retrieved May 27, 2016, from http://www.groundup.org.za/article/barcelona-residents-angered-piles-rubbish_3270/

Hajer, M. (n.d.). Zero-Friction Society. Retrieved May 27, 2016, from http://www.rudi.net/books/11454

How will climate change affect Cape Town's coastlines? (2013, June 19). Retrieved May 20, 2016, from http://www.capetownpartnership.co.za/2013/06/how-will-climate-change-affect-cape-towns-coastlines/

Immigration South Africa - Intergate Immigration Service. (n.d.). Retrieved May 20, 2016, from https://www.intergate-immigration.com/

Leidreiter, A. (2013, July 24). Inspiring Change for Regenerative Cities. Retrieved May 20, 2016, from http://futurecapetown.com/2013/07/inspiring-change-for-regenerative-cities/#.Vz9pEleex6B

Lemanski, C. (2007). Global cities in the South: deepening social and spatial polarisation in Cape Town. Cities, 24(6), 448-461.

Luhanga, P. (2008, March 6). Turning RDP houses into big business | IOL. Retrieved May 27, 2016, from http://www.iol.co.za/news/south-africa/turning-rdp-houses-into-big-business-392142

Post-Apartheid developments and challenges. (n.d.). Retrieved May 20, 2016, from http://www.ekapa.ioisa.org.za/module3/developments.htm

Terhorst, A. (1988, July). Bulletin No.22: The seafloor environment off Simon's Town in False Bay, revealed by side-scan sonar, bottom sampling, diver observations and underwater photography. Department of Geology, University of Cape Town.

Theron, J.N. Gresse, P.G. Siegfried, H.P. and Rogers, J. (1992) Explanation sheet 3318 – The Geology of the Cape Town Area. Geological Survey, Department of Mineral and Energy Affairs, Government Printer, Pretoria.

The Cape Floral Region. (n.d.). Retrieved May 20, 2016, from http://www.southafrica.info/about/animals/capefloralregion.htm#.Vz-RN1eex6B

Wainwright, O. (2014). Apartheid ended 20 years ago, so why is Cape Town still 'a paradise for the few'? Retrieved May 20, 2016, from http://www.theguardian.com/cities/2014/apr/30/cape-town-apartheid-ended-still-paradise-few-south-africa

Wilkinson, K. (2015, July 15). New York Times & others STILL wrong on number of immigrants in S. Africa - Africa Check. Retrieved May 20, 2016, from https://africacheck.org/reports/new-york-times-use-plagiarised-article-to-back-up-sa-immigrant-number

WPR. (2015, September 13). Retrieved May 20, 2016, from http://worldpopulationreview.com/world-cities/cape-town-population/

Images

All of the aerial images were created were obtained from Rosetta Fisher, GIS Analyst: Development Information and GIS

The following images were created by the authors based on GIS information, Census profiles (2011) and/or other information obtained from City of Cape Town Official website [https://www.capetown.gov.za/en/Pages/default.aspx]

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p. 172-173 Geological section was created by the authors based on images of Peter Southwood obtained from https://commons.wikimedia.org/wiki/File:Geological_section_ofthe_Cape_Peninsula_and_False_Bay.png
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http://www.projetsdepaysage.fr/fr/landscape_as_guiding_element_in_the_design_and_planning_of_dutch_colonial_settlements_1600_1800_

https://en.wikipedia.org/wiki/Jan_van_Riebeeck#/media/File:Jan_van_Riebeeck.jpg

http://www.academicroom.com/topics/

history-netherlands-holland

http://www.onsetimages.com/english/SouthAfrica/city/HoutBay/Museum/hbm_Khoi_e.htm

http://spreekbeurten.info/nelson-mandela.html

http://www.paginavermelha.org/noticias/131210-o-legado-de-nelson-mandela.htm

http://the-white-wolfs.de.tl/The-Great-Trek.htm

p. 119 https://docs.google.com/document/d/1445E5bT3YsgnYiy02XwqSml2Z7Sy6upGnRrhF14R2ho/edit

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https://twitter.com/originalkaffir/status/592653966879645697

http://www.susanziehl.com/book.html

http://www.digitalcollections.lib.uct.ac.za/islandora/object/islandora%3A12569?page=1

http://www.stellenboschheritage.co.za/stellenbosch/information

https://dreamlife.wordpress.com/2013/04/03/cape-town-through-the-years/

http://etienneoosthuizen.photoshelter.com/image/I0000mrxzm5nv9tg

http://www.thepaintboxgarden.com/2015/05/

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http://www.zandvleitrust.org.za/art-ZIMP%20history%20aerial%20photos.html

http://blog.dhec.co.za/2011/04/history-of-the-cape-flats-vleis-part-v-some-early-maps/

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https://sites.google.com/site/mareascott/news/Table-mountain-news/the-waters-of-life

https://en.wikipedia.org/wiki/Molteno_Dam

http://www.goodhopeadventures.com/tunnel-tours

http://www.notesfromthecape.com/2016/04/table-mountain-dams.html

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http://www.groundup.org.za/article/barcelona-residents-throw-poo-n2

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http://www.arcspace.com/features/urban-think-tank/empower-shack/

This book is the thesis project concluding the master's program in Architectural Engineering at KULeuven. It forms a reference document on the urban growth of African cities, more specifically in the case of Cape Town. The work seeks to explore and demonstrate the role of urban design and architecture in one of the most rapidly growing cities in sub Saharan Africa.