IESL - Master Studio Summer Term 2023

Net Zero City

A City for Green Hydrogen in Namibia

KIT Karlsruhe // Institute for Urban and Landscape Design // Prof. Markus Neppl


STOP

"Africa has the opportunity to take a global lead in innovations towards greener, healthier and more sustainable urban societies,"
(UN-Habitat, The State of African Cities, 2014, S. 7)

Content

Introduction

Prof. Markus Neppl, Dr. Manuel Giralt

PROJECT BACKGROUND

Europe has committed itself to taking a pioneering role in climate protection. Germany has also set ambitious goals to fulfil this commitment and wants to be climate neutral by 2045. However, in the near future, there will be not enough renewable energy generation and storage capacities available to meet the demand locally. Therefore, the use of additional alternative energy sources from abroad are necessary.

Green hydrogen is a promising option for importing renewable energy. For this reason, large-scale projects for the production of green hydrogen are initiated in various countries. One of these projects, which has received a lot of media attention, is located in the south of Namibia, in the hinterland of the port city of Lüderitz, a region with a lot of wind and sun and thus particularly favourable climatic conditions for the production of renewable energy.

As architects and urban planners, we follow the projects on the intended energy transition with great interest. The Southern Corridor Development Initiative (SCDI) to develop Green Hydrogen industries in Namibia, and especially the project planned by Hyphen Hydrogen Energy around Lüderitz, occupies an outstanding position as a flagship project of international importance. We would like to take up the overarching issue of large-scale production of green hydrogen in Namibia as a starting point. The aim is to answer the

Lüderitz from bird's eye view

question about the form of successful urban development to accommodate the new permanent jobs and new inhabitants to create a liveable and sustainable future for Lüderitz.

Taking into account the current population of roughly 12,500 people and considering that the planned 3,000 permanent jobs are likely to create additional indirect and induced employment and subsequently will support entire households, it is reasonable to assume that the population of Lüderitz might increase by 30-40 % in a timeframe of only a couple of years. Such dynamic urban growth is challenging, but we also see this as a unique chance to create an innovative neighbourhood that will complement the ambitious goals of the green hydrogen project.

Especially in terms of sustainability and decarbonisation, an urban development of such a scale in relation to the existing urban fabric offers the unique opportunity to create a lighthouse project that might act as a showcase for sustainable urban development. Providing new mobility solutions, attractive public spaces, the state of the art distribution, and use of energy while at the same time creating an attractive working and living environment for future employees and their families in Lüderitz.

This master studio is looking for innovative concepts for a Net Zero City combining a diverse mix of uses and sustainable urban development in the given context. The concepts should demonstrate, in the sense of "What if...?" scenarios, which urban development qualities a CO2-neutral urban expansion can offer and which potential synergy effects could be realised in interaction with existing urban structures.

TASK OF THE MASTER STUDIO

In order to be able to complete the task within the framework of one semester, the complexity was deliberately reduced to a specific development scenario. The starting point was the forecast of 3,000 new permanent jobs in Lüderitz. Other expected indirect and induced jobs were not taken into account. Supplementary needs that could arise from an intensification of new or existing industries, such as oil production, fishing or tourism, were also excluded.

With regard to the increase in population and thus future housing needs, a factor of 2.0 was applied to the 3,000 permanent jobs, resulting in a total of 6,000 new inhabitants and an assumed total building mass of about 330,000 m² gross floor area (GFA) including social infrastructure, commercial and retail functions. Considering the average household size in Namibia, this assumption is probably at the lower end of the spectrum. Also excluded from this task were the 15,000 workers required for the construction period of four years, who are to be accommodated at various locations in the vicinity of the construction activities.

The students accepted this task with curiosity and showed a lot of enthusiasm while working on this assignment. Due to the unfamiliar geographical, climatic and cultural context, the framework conditions were quite challenging. The students did not have the opportunity to visit the site beforehand, so all information was researched from sources generally available on the internet. The teams created the plan based on satellite images and open street maps themselves. The students were divided into seven teams of two to three people each. A total of 15 weeks were available from the issue of the assignment to its submission.

Train Station in Lüderitz

GOAL OF THE PROJECT

In view of the specific framework conditions and the limitations of the task, these papers are not intended to serve as precise blueprints for future developments, but as scenarios that can contribute to the discussion about the future of Lüderitz. They provide an example of how such a task can be approached in the given context or comparable situations in Namibia and beyond. It is not so much about the final picture that emerges in the results, but rather about the task and the approach as such.

There are several examples of mining towns, oil industry settlements or town foundations next to industrial sites in remote areas that show what happens if urban development is neglected next to resource extraction. Since in the context of Lüderitz large-scale sustainable energy production is designed for the long term, it is particularly worthwhile to carefully plan settlement development here. In this way, the background of sustainable energy production forms a unique opportunity to bring innovation and sustainability not only to the energy sector but to the existing city as well. As a result the urban development project has the potential to become a lighthouse project on its own. To achieve this, some key questions need to be answered:

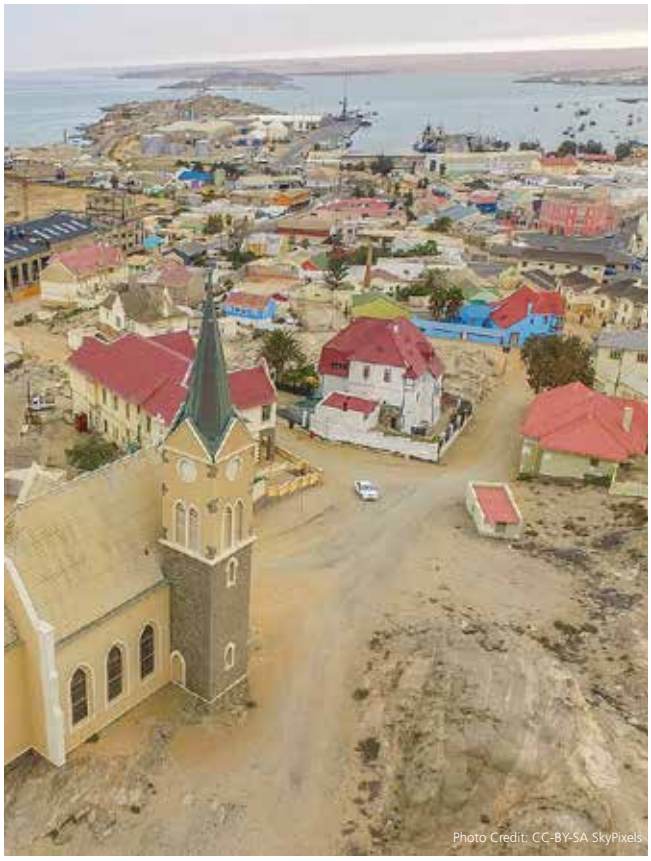
- What does dynamic growth mean for Lüderitz?
- How to integrate with the existing fabric & how to create synergies?
- Which location offers connecting points and potential for urban expansion?
- Which urban structures are appropriate for the location?
- How to create Identity, character and atmosphere?
- Which ecological and social concepts could be applied here?
- What could a Net Zero City look like in Namibia?
- How to create an inviting open space in the given arid environment?

RESULTS

The students dealt with an initially foreign environment in terms of climate, culture, language and history. In the course of the work, they developed a coherent attitude for their respective team and derived their design approach from this. In the design process, the right degree of density and height development, the appropriate typologies, urban structures and the mix of uses were clarified.

A constant companion was the sensitive treatment of the existing buildings and the associated question of the right relationship to the existing town centre and the surrounding neighbourhoods. Which connections should be strengthened? Where can densification take place? Which structures should be redeveloped, which are suitable for conversion? What are the appropriate locations for the expected urban expansions?

On this basis, seven - in part very different - scenarios for the future development of Lüderitz were created. One team, for example, focuses on dense urban development directly on the coast, and another team creates an attractive open space connection inland and links it to the existing neighbourhoods. Still, another creates two strong poles north and south of the centre, while yet another team strings all interventions along a circular ´string of urban pearls´. However, the concepts presented on the following pages differ not only in terms of structural responses in the overall urban context but also in terms of typologies, height development, open space concepts and the location of different uses in terms of residential, commercial, retail and social infrastructure.



Street in historic center of Lüderitz

"The growth in green technologies signals the world's emerging acknowledgement of global resource constraints and the need for low-carbon growth.
Given Africa's predicted population expansion, the continent's role in resource efficiency and low-carbon growth will need to be significant, and is also a critical precondition if sustainable and sustained economic growth is to be achieved."
(UN-Habitat, The State of African Cities, 2014, S. 19)

Task of the Urban Design Master Studio

Prof. Markus Neppl, Dr. Manuel Giralt

DEPARTURE

Climate change has become a ubiquitous topic in recent years. While at first its very existence was often doubted, the debate has increasingly shifted to the expected impacts and the magnitude of the global temperature increase. Already today, new temperature records are being broken globally year after year, and more extreme weather events are being reported. In particular, the increasing consequences such as heavy rainfall events, droughts, storms and extreme heat and cold waves are claiming many victims and causing great damage. All this is largely due to the use of fossil fuels such as coal, oil or gas and the associated CO2 emissions. The goal is therefore to be able to stop using fossil fuels as quickly as possible and to massively expand the use of renewable energies.

Since the Russian war on Ukraine began in February 2022, the urgency of a rapid phase-out of fossil fuels has intensified. Since the oil and gas supplies from Russia that had been relied on until now will no longer be available in Central Europe in the future, we are in the midst of an energy crisis. This has caused severe distortions in the energy markets, which ultimately fuels inflation and leads to extreme price jumps for end customers. They suffer from high energy prices for gas, electricity and fuel and price increases for food and consumer goods. The situation described above increases the pressure to implement the energy transition even faster than originally planned.

Germany wants to be climate neutral by 2045. In 2021, the share of renewable energies in gross electricity consumption was 41%, but if we look at total energy consumption, the picture is somewhat different. The share of renewables in the cooling and heating sector is 16 % and in the transport sector only 7%. Overall, the share of renewables in gross final energy consumption is only about 19%. (Source: Federal Environment Agency as of 09/22) This shows how large the gap to a climate-neutral energy supply actually is and what backlog demand remains. It can be assumed that Germany will not have enough renewable energy generation and storage capacities to meet local demand in the foreseeable future. Therefore, alternative renewable energy sources from abroad will also have to be taken into account.

Green hydrogen is an important part of a climate-neutral and reliable future energy supply. It can be used flexibly and directly for heat generation, in the transport sector or for the recovery of electrical energy. Another feature is the storage and transportability of the energy carrier. Hydrogen can be produced CO2 - free by using regenerative sources such as wind and solar energy. In the overall reaction of electrolysis, molecular hydrogen and molecular oxygen are produced from water. The energy efficiency of the electrolysis of water is over 70%. Unlike the use of fossil fuels, no CO2 is released during electrolysis. However, this only applies if the electricity used was not generated from fossil fuels. In 2013, the efficiency of hydrogen production, storage and subsequent conversion back into electricity was a maximum of 43%. Sterner et al. give efficiency ranges between 34 and 44%. It is assumed that overall electrical efficiencies of a maximum of 49 to 55% can be achieved in the future.

Various hydrogen projects are being promoted as part of the German government's national hydrogen strategy. One of the first large-scale projects is the Namibian Green Hydrogen Project, which is to use the particularly favourable conditions of over 300 days of sunshine and reliable winds on the coast to generate renewable energy in Namibia. The project is to be planned and implemented by Hyphen Hydrogen Energy, a joint venture of the British Nicholas Holdings Limited and the German company ENERTRAG. In this project, a gigantic solar park and approximately 700 wind turbines are to be built in the region around the port city of Lüderitz in southern Namibia as early as 2025. A total of around 9.4 billion USD will be invested in this project. The goal is to produce two gigawatts of power or 120,000 tonnes per year in the first phase and five gigawatts of power or up to 300,000 tonnes of green hydrogen per

year in the second phase. One tonne of hydrogen generates about 33,000 kW/h of electricity and is theoretically sufficient to cover the annual electricity consumption of eleven 3-person households, i.e. 300,000 tonnes could cover a total of about 3.3 million people.

After the construction phase, it is expected that approximately 3,000 permanent jobs will be created, of which at least 90% will be filled by Namibians. This shows that those involved in the project are already responding to possible criticism of energy imperialism or extractivism. In addition to the technical facilities for energy production planned in the region, electrolysis, storage, shipping in specially built port facilities, there is a parallel pressure for change in the port city of Lüderitz itself. Depending on the sources, the town currently has between 12,500 and 15,000 inhabitants. An increase of 3,000 jobs directly linked to the project, together with the jobs indirectly associated with the project, in conjunction with the corresponding family members and the induced economic and social effects represent a substantial population increase and development impetus for Lüderitz. Exactly this is where the planning task of the Net Zero City Master Studio starts.

PLANNING OBJECTIVE

Against the background of the mentioned large-scale planning in the region around Lüderitz, a new urban district is to be planned within the urban boundaries, which will accommodate the headquarters of Hyphen Hydrogen Energy and at the same time create a high-quality residential environment for the expected new residents. The aim is to show how the additional living space required for the new workforce and their families can be created and how the necessary follow-up residential facilities such as local amenities, social infrastructure, open space and mobility facilities could be integrated.

The aim is to create an innovative, mixed district with high quality open spaces and a distinctive identity. In order to achieve the greatest possible social mix while integrating different income groups and lifestyles, a wide variety of different housing typologies and unit sizes are to be realised. At the same time, it is important to integrate non-residential uses and social infrastructure and to position the office and commercial space of Hyphen Hydrogen Energy in a representative location.

Visualisation of Namibian Green Hydrogen Project

Innovative planning approaches are required, particularly in the area of open space design, in order to achieve the highest possible quality in the open space within the context of Lüderitz's barren landscape and challenging climatic conditions. In addition, a future-oriented mobility concept is expected, which takes into account the local conditions and meets the needs of comfortable local mobility to link the district with the overall transport network of the city.

In addition to the goal of creating a new district with its own character, it is essential to treat the existing buildings with care and to integrate them thoughtfully into the context of the city as a whole. Among other things, possible synergies between already existing urban facilities and the newly planned additions will be investigated.

The planning of this model district should, in the sense of the overarching project around green hydrogen, take the form of a future-oriented and sustainable urban development as a Net Zero City.

PLANNING CONTEXT

The following paragraphs in this section are a summary of key information from Wikipedia regarding the geographical and historical context of the planning area.

Namibia (officially Republic of Namibia) is a country in southern Africa between Angola, Botswana, Zambia, South Africa and the Atlantic Ocean with a population of about 2.7 million. The capital and largest city of Namibia is Windhoek with about 460,000 inhabitants. The plan area is located in the port town of Lüderitz in the sparsely populated Karas region (0.53 p.e./ km²) in the south of the country.

Namibia has a long and complex history, having been colonised and occupied by foreign powers, first by Germany (1884-1915) and later by South Africa (1915-1989). South Africa's occupation of Namibia was initially legal and under a League of Nations mandate, but continued after the mandate was revoked by the United Nations General Assembly in 1966. Namibia finally gained independence on 21st of March, 1990.

Planning Area Lüderitz for the Urban Design Master Studio

The town of Lüderitz, with a population of about 12,500 to 15,000, is situated at Lüderitz Bay on the so-called Diamond Coast. It is bordered by the Atlantic Ocean to the west and the Namib Desert to the east. It was first mentioned in 1487 when the Portuguese navigator Bartolomeu Diaz, searching for a sea route to India, was the first European to land in the Great Bay. He named the bay, which is now called Lüderitz Bay, Angra Pequena ('Little Bay').

The place only gained importance with the founding of a first settlement in 1883 by the Bremen tobacco merchant Adolf Lüderitz. Hoping for mineral resources, he fraudulently bought a 300 x 150 km piece of land from the local Orlam leader. (see "Meilenschwindel"). The land was sold to the German Colonial Society for South West Africa in 1885. The small town experienced a very modest rise only in 1904 with the stationing of the Schutztruppen soldiers needed here in the fight against the rebellious Nama (Nama War). During this time, the town was best known for the concentration camp built off the coast on Shark Island. Orlam and Nama captured in the Nama War were interned here with their families. Of the approximately 2,000 prisoners, only about 450 tribesmen survived because of forced labour, poor hygiene and extreme weather conditions.

It was long after the death of Adolf Lüderitz - he had been presumed missing since 1886 during an exploration trip to the Oranje - that diamonds were discovered near Lüderitz in 1908 during the construction of a narrow-gauge railway, which led to a short-lived boom. The increasingly industrialised diamond mining, the fortune seekers who flocked to the country with it and the construction of the Kolmanskuppe diamond settlement (1908 - ca. 1930) also brought about a steep rise for Lüderitz to become a prosperous town. Subsequently, Lüderitz developed into a flourishing trading port. However, Lüderitz soon had to cede its role as the colony's most important port to Swakopmund, which was more centrally located and where an artificial harbour was built.

After the outbreak of the First World War, Lüderitzbucht was occupied by South African troops without a fight on 19th of September, 1914. The German civilian population was interned in South Africa. At the end of the war, Lüderitz became part of the mandate territory of South West Africa administered by South Africa.

From 1920 onwards, Lüderitz lost much of its importance, as diamond mining had shifted further and further south. Kolmannskuppe became a ghost town. A modest fishing industry and a few boatyards were able to establish themselves in Lüderitz. In addition, there were still some small carpet weaving mills, as Karakul sheep breeding was practised with some success in the south of present-day Namibia.

The centre of Lüderitz is situated on a mighty granite rock exposed to the stormy sea wind. Although the diamond boom only lasted a few years, the town's former wealth can still be seen today. The partly magnificently restored Wilhelminian and Art Nouveau houses speak for themselves. The city's artery is Bismarck Street. Most shops, offices, banks, restaurants and hotels are concentrated here. (Source: The above paragraphs in this section are summarized from Wikipedia)

Comparison of Countries (Source: CIA World Facebook)

	Namibia	**Germany**
Area	824,290 km²	357,020 km²
Population	2,727,400 (2022 est.)	84,316,622 (2022 est.)
GDP per Capita	8,900 USD (2020 est.)	50,900 USD (2020 est.)
Population Growth Rate	1.82%	- 0.11%
Fertility Rate	2.98	1.57
Median Age	21.8 years	47.8 years
Dependency Ratio	67.3	56.4 (dependency ratio: 0-14 and 65+ per 100 15-64 years working age)

PLANNING TASK

The core of the task is the urban design of a Net Zero City with 3,000 jobs and 6,000 new inhabitants in 2,400 residential units. This corresponds to an increase of about 50% compared to the existing population in Lüderitz.

In the following, the objectives of the task described under point 2 are summarised again in key points:

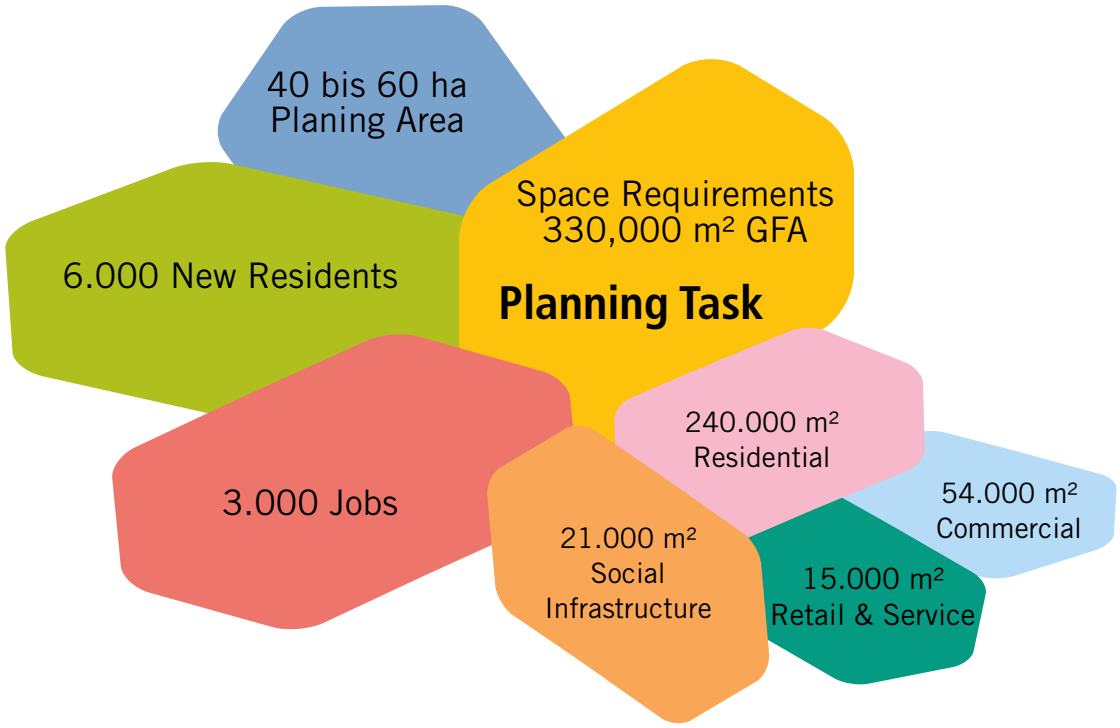
- Diversity of housing options, sizes and typologies.
- Appropriate scale and urban grain
- Mixed-use through complementary commercial uses
- Integration of social infrastructure such as education, health, administration, culture, recreation
- Complementary uses such as local supply like retail and services
- Sensitive treatment of existing buildings
- Innovative handling of local climatic conditions
- High quality of open space and recreation
- Innovative mobility concept
- Conception of a sustainable urban development as a 'Net Zero City'.

These planning goals are further differentiated in the following table and backed up with specific figures.

For the allocation of the areas within the plan area, empirical values can be used as a rough guide. In this consideration, the complete plan area corresponds to the gross building land (GBL). The public transport areas should be as small as possible and, according to experience, should not exceed a value of 20%. Public open spaces should reach a minimum of 20%, but can be adjusted depending on the design. The private and public land to be built on is referred to as net building land (NBL) and should amount to at least 60% of the total area in the design. Lower values for NBL may be an indicator of uneconomic land use.

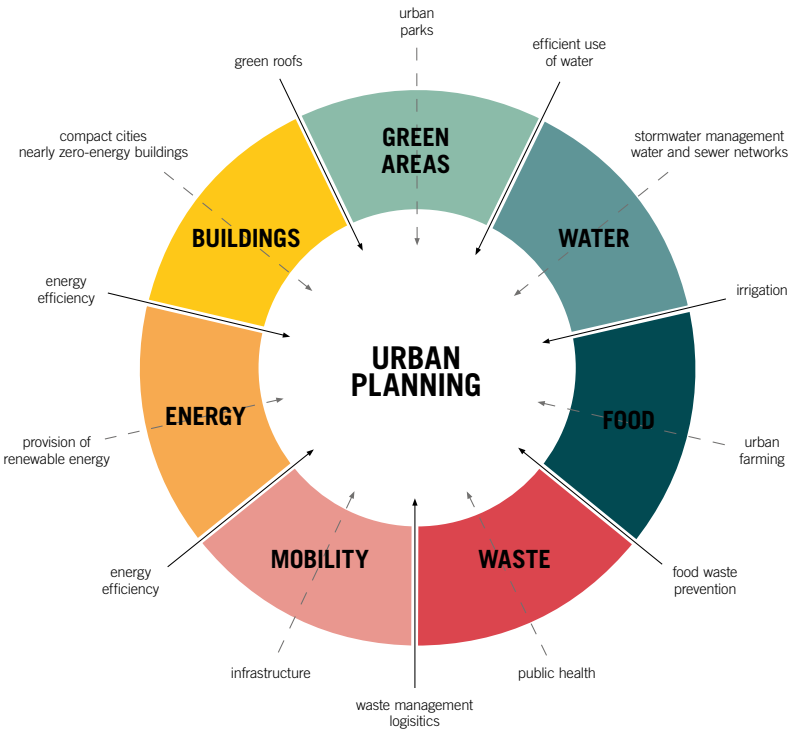
- development area (< 20% of the total area)
- public open space (20-30% of the total area)
- private land (net building land > 60% of total area).

The location and layout of the plan area can be chosen by each team within the city limits or the immediate surroundings. If there are existing structures within the plan area, they must be integrated into the design or replaced within the plan area by demolition and new construction.



Distribution of the above-ground gross floor area (GFA) according to uses

Uses		Area GFA	Share
Resudential			
Freifinanzierter Wohnungsbau	60%	144,000 m²	43.6%
Geförderter Wohungsbau	40%	96,000 m²	29.1%
		240,000 m²	**72.7%**
Social Infrastructure			
Education (Child Care, Schools, Library,…)		7,200 m²	2.2%
Healthcare (Medical Center, Hospital)		1,800 m²	0.5%
Administration (Town Hall, Service Center)		3,000 m²	0.9%
Other (Culture, Religion, Leisure,…)		9,000 m²	2.7%
		21,000 m²	**6.4%**
Local Retail and Sevices			
Retail		11,000 m²	3.3%
Services		4,000 m²	1.2%
		15,000 m²	**4.5%**
Commercial			
HYPHEN Headquarter (1/3)		18,000 m²	5.5%
ther Commercial Areas (2/3)		36,000 m²	10.9%
		54,000 m²	**16.4%**
Total		**330,000 m²**	**100.0%**



Source: Fallmann, J., Emeis S. (2020): Development in the Built Environment.

Linked Community

Atanaska Chausheva, Sabine Tröger, Niklas Wittig

CONCEPTUAL APPROACH

Namibia, especially Lüderitz, with its constant climate, lends itself perfectly for renewable energy production. The company Hyphen Hydrogen Energy wants to use this geographical advantage to counteract climate change with green hydrogen.
To accommodate the population growth that will result from these investments and to further develop Lüderitz as a sustainable and future-oriented city, our vision for Lüderitz includes connecting the fragmented urban structure, enhancing the existing city through diverse and decentralized social infrastructure and open spaces for residents, and creating a sustainable transportation structure.

The cityscape of Lüderitz is characterised by many small detached houses, the urban centre with larger art nouveau block-edged houses and the townships. The city structure appears very fragmented. The townships in the eastern part of the city and the northern residential area are topographically separated from the rest of the city by a hilly terrain. The separation of the individual areas also takes place at the edge of the historic centre on the north and the west. It appears necessary to overcome topographical borders to reunite Lüderitz and its population.

The distribution of wealth in Lüderitz is currently very uneven, as most of the population lives in segregated informal settlement structures called "townships", which contrasts with the colourful art nouveau houses of the colonial era. In order to create adequate housing for both newcomers and existing residents, new forms of housing will have to be created.

A closer look at the distribution of infrastructure in the city reveals that all social offers are clustered in the city centre. The northern residential area lacks social infrastructure and especially the townships in the eastern part of the city have a very precarious infrastructure. There is a need to develop infrastructure and reachable socials offers in all city quarters.

When analysing the landscape, it becomes apparent that the topography is very steep and rocky and that there are currently hardly any qualitative open spaces. The areas near the water are mainly focusing on industrial usage and deprives Lüderitz of its main quality in comparison to other citys. Therefore quality open spaces have to be created, also in the context of water.

Lüderitz Goal

Lüderitz is well connected to supra-regional infrastructure through a closed train linkage and an closed airport, which could be restored. A closer look at the urban mobility structure reveals that roads for cars are well developed, but more environmentally friendly means of transport are hardly promoted. Sustainable mobility does not play a major role in Lüderitz at the moment, so a new sustainable transportation concept will have to be developed.

GOALS

To reunite the fragmented city quarters geographically and socially, especially the townships in the east, the first goal for the urban expansion is to connect the city quarters, supporting social intermix.

To prevent accumulation of infrastructure and social offers and to create qualitative open spaces, the second objective arises to connect the areas by means of a qualitative open space corridor and to increase and distribute the offerings in the city indoor and outdoor.

In addition, the missing link to the water becomes apparent, so our goal is to restore the connection to the water apart from industrial usage.

The mobility within the town is currently mainly focused on the motor road network. The goal for the new urban development therefore is to make mobility more sustainable and to promote and restore an extensive public transport network.

Connection of City Districts

Qualitative Open Spaces

Sustainable Mobility

Link to Water

DETAILED CONCEPT

In order to connect the city and implement the goals, we do not see the urban development as a single area but rather use three urban planning areas that can continue to expand in the future. The first area is located in the west and expands the historic city centre, connecting the bordering parts of the city in the north and the south-east and the water. The second area is in the north and connects the northern residential neighborhoods with the rest of the city. The third area is in the east and connects the centre with the townships in the east. By directly adjoining the new areas to the existing areas, the exchange between those is facilitated and the individual neighborhoods can merge into a unified city.
The three areas, together with the existing, form a cohesive cityscape and counteract the fragmentation.

The areas are linked by an open space connection, which leads from the historic centre through the centre of all areas. Through the spatial edges of the adjacent buildings, the open space is urbanistically defined and thus develops into an open space corridor. Along it, a variety of different ammentities and activities are placed distributing throughout the city.

In addition, there are several neighborhood squares as social meeting points in each quarter. These are structurally enclosed by the spatial edges of the adjacent buildings as well and serve as meeting places for the residents within the quarters.

The connection to the water plays, especially in the western area, a significant role. The streets in this quarter are oriented toward the water, creating a direct connection from every building plot. In the northern area, the connection to the water is more indirect via the open space connection, which leads out of the area to the water and then runs along the shore.

The sustainable traffic concept is implemented primarily through public transportation. A connection of the quarters by bus lines is established, starting from the historic city centre and going trough the new and existing quarters in a circle.

The development of the new areas is broken up by individual special buildings that differ from the surrounding structures in their form, height and use.

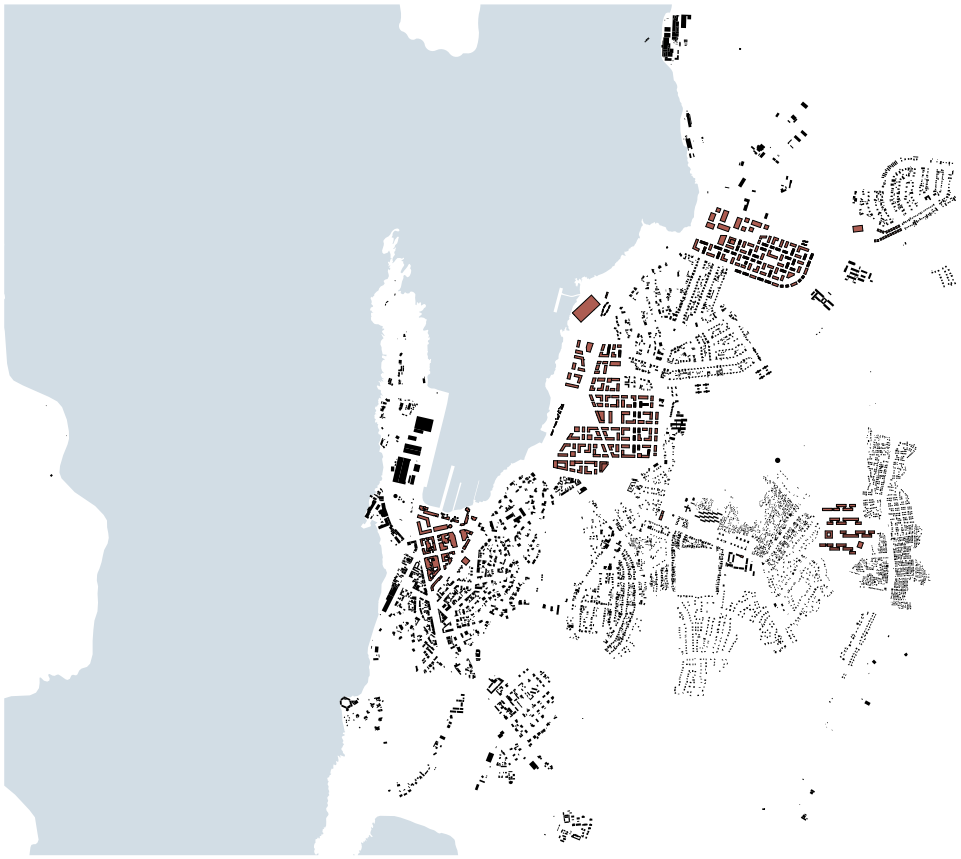


Figure-Ground Diagram

Conceptual Plan

Waterfront Theater

MOBILITY

The mobility of Lüderitz is to be shaped sustainably. The main road starting from the centre outlines the open space corridor and runs through all three areas to connect them into a circle. Along this circle, two buses run in opposite directions and connect all areas, starting at the restored train station. Bus stops are placed frequently along the connection and are easily accessible from any point in the quarters. An electric ferry will take workers to the Angra Point industrial site to reduce individual transportation by car. The harbour is reachable by bus.

The car lanes of the main road are divided on the left and right side and open space spreads out in the middle according to need and use. The focus of the main road is on the two-lane cycle path, witch runs adjacent to open space corridor in the middle.

The quarter streets are cycle and pedestrian friendly and, except for special usage, car free. In addition, unsealed parking areas with solar roofing will be installed at the edge of the quarters for park-and-ride purposes, which will also function as rental stations for car sharing, e-bikes and e-cars. In these places there is the possibility to change from the private means of transport to a public one.

OPEN SPACE

The open spaces are to be increased and made more qualitative. Public open spaces are distributed throughout the areas by the Open Space Corridor. They take advantage of the seemingly infinite available space Lüderitz has to offer and spread out generously. To create individual quality along the corridor, the areas of the corridor are assigned different functions. They offer space for culture, sports, leisure activities and nature.

In each quarter the neighborhood squares serve as open spaces within the sub-quarters. These are enlivened by the uses of the adjacent ground floor zones.

In the centre, the blocks have semi-public courtyards. The terraced houses located at the edges all have private open spaces. The same principle of distribution of open spaces continues in the north quarter. In blocks consisting of perimeter development and terraced houses, the courtyard is divided into semi-public and private open spaces. The skeleton buildings in the east quarter also have smaller semi-public open spaces assigned to each building.

Hyphen Headquarters

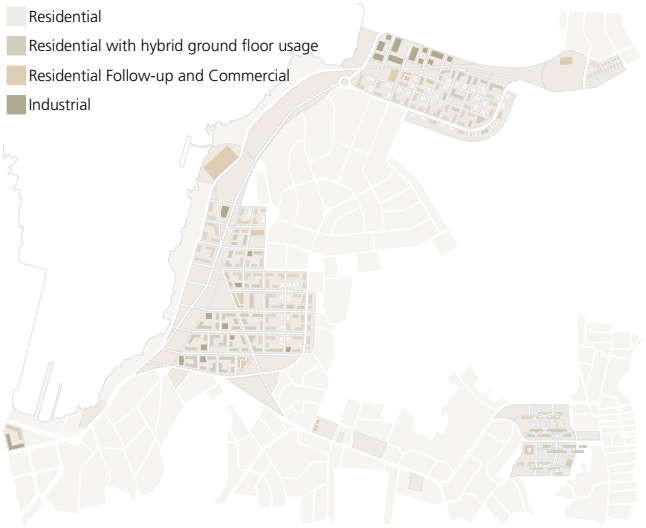
TYPOLOGIE AND USAGE

The building development adapts to the climatic conditions in all areas and is to be implemented as sustainably as possible. Clay is used as a building material, which provides a pleasant indoor climate as a thermal mass and is environmentally friendly. In addition, old materials will be partly reused and the buildings will be equipped with solar panels.

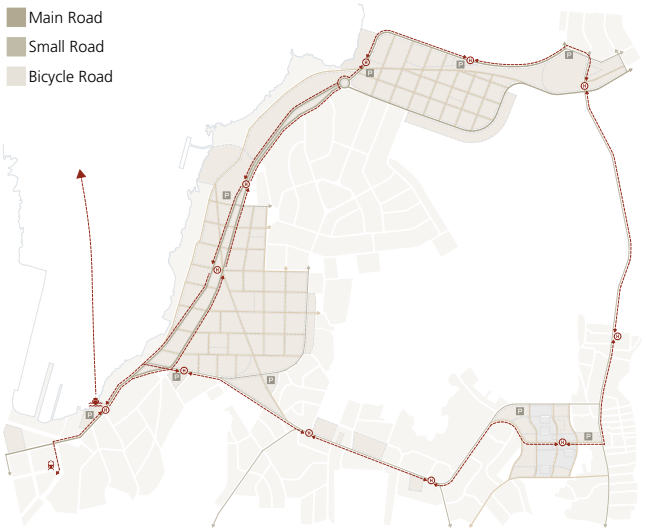
In the west quarter, the residential development borders on the city centre and is inspired by the existing Art Nouveau perimeter block development. The building plots are occupied by open perimeter block developments that vary according to their position. The development becomes larger towards the sea and the centre, while the edges become smaller. The development towards the centre consists of 2-3 storey residential blocks with ground floor commercial and office usage. Towards the edges, the perimeter blocks are replaced by 2-storey terraced houses. The building structure through the whole quarter is broken up by 4-storey office buildings, which are functioning solitary but are included into the perimeter blocks. The special buildings, such as the day care centre, are framed by squares and thus form small sub-quarters in the area.

In the northern area, the usage is also mixed, as the Hyphen Campus is located in the northern part towards the sea, consisting of office buildings and industry halls. Towards the campus, the building plots are more urban. Commercial and residential usage are mixed and the buildings are higher. Towards the southern and eastern edges, the buildings are smaller and adapt to the existing buildings with terraced houses.

In the eastern area, the development deviates and includes both commercial and residential. The development consists of 4-5 storey skeleton constructions which include an infrastructure core and a sanitation core that form the basis for self-build. Self-build takes place in a controlled manner and the size of the dwellings can be determined as per the need. The aim of this is to gradually reform the townships, most of which have no water or electricity supply, and create a new form of affordable housing. In the process, the residents can design their own part of the façade and contribute to the cityscape.



Typology and Usage



Mobility

Open Space

Master Plan

QUARTER CHARACTERISTICS

QUARTER WEST

The West Quarter acts as an extension of the historic centre. It connects the surrounding existing areas and allows the city to grow towards the ocean. Characteristic of this area is the large-scale open space connection and the large-scale urban development.

The urban building development partially moves away from the waterfront to provide space for open areas with a coastal view. At one point, this scheme is broken and the development extends to the shore. Here, 3-storey open perimeter block developments and a four-story office building bring the promenade into an urban context.

The open space connection begins in the historic centre and runs extensively through the new quarter. One arm runs parallel to the ocean and is accompanied by a promenade walk along the rocky shore, with view points over the ocean. Along it the generous open space is occupied with different functions. Various sports facilities and an area with small stalls for strolling along the promenade offer a variety of leisure activities. Also cultural activities are offered throughout the open space corridor. The Waterfront Theater is located directly on the waterfront and is framed by the coastal view and the urban building development. Across the street in the centre of the quarter lays the Street Art Area, a place for small artists, residents and children to express themselves creatively. In the north borders the Cultural Centre. It offers plenty of space for exhibitions, activities and workshops and is complemented by the Outdoor Exhibition Area. Next to it is the fish market. It offers the local fish companies the possibility to sell their goods in the city. Adjacent to the Cultural Center and the Fish Market is the Waterpark, which connects the West Quarter with the new North Quarter. With the view relationship to the ocean and the different water basins, the water theme is taken up here in the open space planning. It provides space for a swimming pool, a sports pool, a water playground for children and a pond for resting.

The second arm of the open space corridor turns east in the centre of the west quarter and creates a link to the east quarter. Along it, open spaces within the existing residential area are revitalized to generate new qualities within the existing quarters.

Community Park

QUARTER NORTH

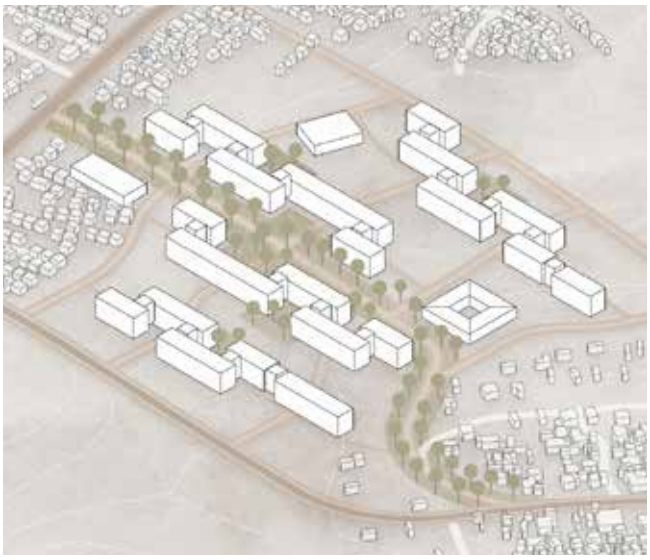
In the North Quarter, the focus is on connecting the isolated northern existing residential area to the city and creating new infrastructure and quality open space for the new and existing residents.
The area houses a new industrial area, including the Hyphen Campus. With a 4-storey building the Hyphen Headquarters form the entrance to the new quarter representing a future-oriented Lüderitz.
The open space corridor runs across this quarter, dividing it into an industrial area and a residential area. Along the open space connection is a market place, which serves as a social meeting place and shopping opportunity, and a shading park, offering protection from the sun. The open space connection ends in the Sport Center, which is a unique institution that attracts residents from the entire city, to stimulate social exchanges between residents of the existing and the new north area and residents throughout the city. It is also located in close proximity to two schools, providing training areas for the students.
The connection to the ocean in this area is created by a beach adjacent to the water park. At this, residents have direct access to the ocean for swimming and water sports.

QUARTER EAST

The east quarter connects the townships on the outskirts of the city with the rest of the development and aims to integrate the residents of the informal settlement into society through infrastructure and formal housing services, and to create a social mix.
The main actor to achieve these goals are the planned skeleton buildings. With them, residents are offered a support structure with infrastructure cores and sanitation cores, providing affordable formal housing.
The open space connection also runs through the middle of this quarter. The centre of the quarter is formed by a community park, with different stores and offers in the first floor zones of the surrounding development, a place for urban gardening for self-sufficiency and a connection to the transportation structure through the bicycle street and a bus stop. These offerings are complemented by an outdoor fitness area and a water playground located to the north and south of the centre. There is also a school and Daycare in the area to provide care and education for the children.


Quarter West


Quarter North


Quarter East

Lüderitz goes Green

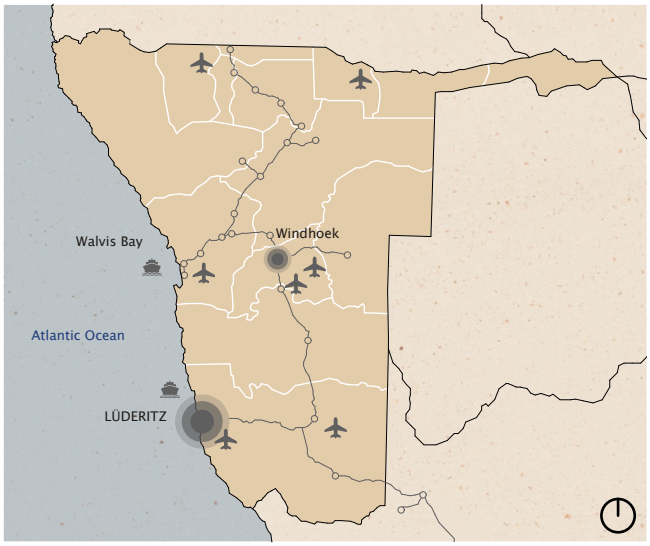
Lisa Podkalicki, Mario Pitschmann

A BLUEPRINT FOR SUSTAINABLE CITIES

Lüderitz goes Green - a Blueprint for Sustainable Cities: This is the motto of this urban planning design. As a former colonial town, Lüderitz´s history goes back decades. Especially in the city center, the historical background of the city is evident in the form of the structural substance. These should continue to chracterize the center. Instead of further densifying it, attractive open spaces are to enhance the center.

In order to create further qualitive living space for different target groups, undeveloped areas will be redensified. For this purpose, areas in the urban space are selected where the topography is not too hilly.

In the cause of a Net Zero City concept, sustainability issues are to be worked out in greater depth.

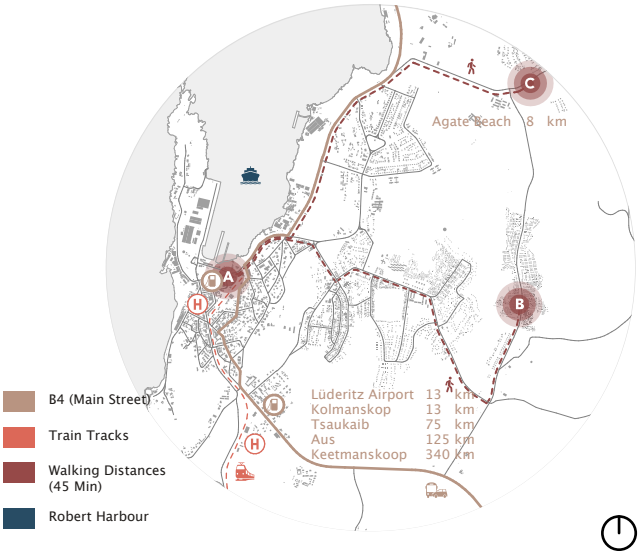


Namibian Context

Lüderitz Waterfront, City Center

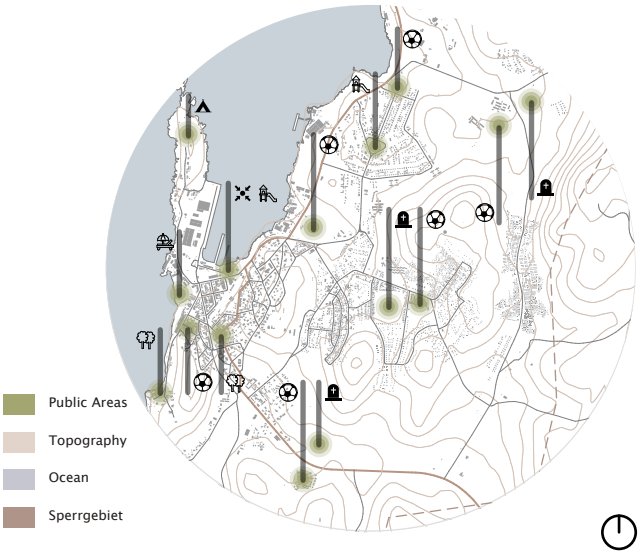
ANALYSIS: MOBILITY AND INFRASTRUCTURE

The existing infrasructure has great potential, which should be integrated and strengthened in the design. There is currently a railroad line and two stations, which are out of operation at present. The same applies to an airport located about 13 km to the east. The port facility is partiulary noteworthy, as it is one of the few Namibian ports and an important trading hub. Many of the existing roads are well developed. A current problem is the lack of public transportation.This results in walking distances of more than 45 minutes to the city center for some areas. In the draft, suggestions are made on how to expand and strengthen the local and supraregional infrastructure.



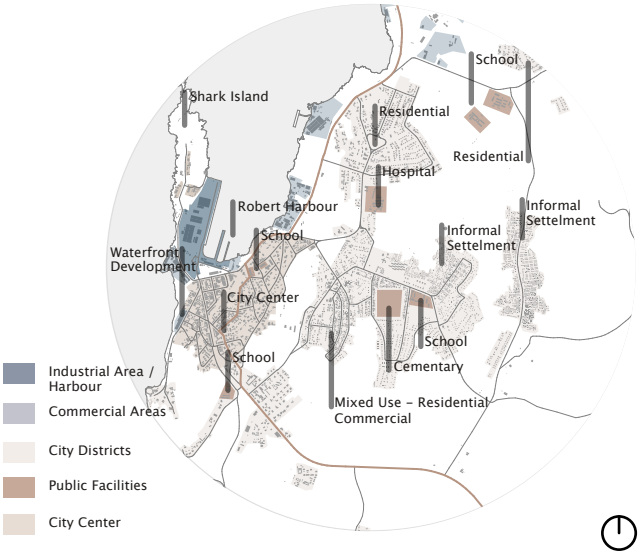
ANALYSIS: PUBLIC OPEN AREAS AND USE

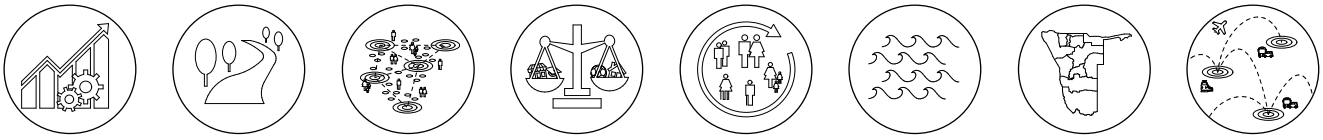
The city is very much shaped by its location and the surrounding topography such as the mountains and the sea. Currently there are very few public open spaces. Most of the existing open spaces are sports fields, which occur in conjunction with schools, or large burial grounds. The only open space worth mentioning is a large centrally located sports field. Green spaces are also scarce, or are located in private courtyards. In the design, numoerous open- or green spaces are to be integrated to compensate for the current deficit. Different offers in the outdoor facilities for culture, sports or entertainment, should make the open spaces more attractive for all kinds of target groups.



ANALYSIS: CITY STRUCTURES AND USE

The current urban structure appears very fragmented. This is due to the hilly topography and causes the seperation of the social classes. Self-built settlements, are very decentralized and far from any infrastructure. The opposite is the densely built-up city center, with a well-developed infrastructure and stately houses. The port and the entire coatstal area are currently used as industrial- and commerical sites, which is why there is hardly any attractive access to the sea. The design provides approaches for the integration of all parts of the city into an overall concept. The coastal area in particular is to be made more attractive and the city center more accessible more quickly for all.





Generate / expand diverse economy

Create attractive open spaces

Connect fragmented parts of the city

Generate mix of uses

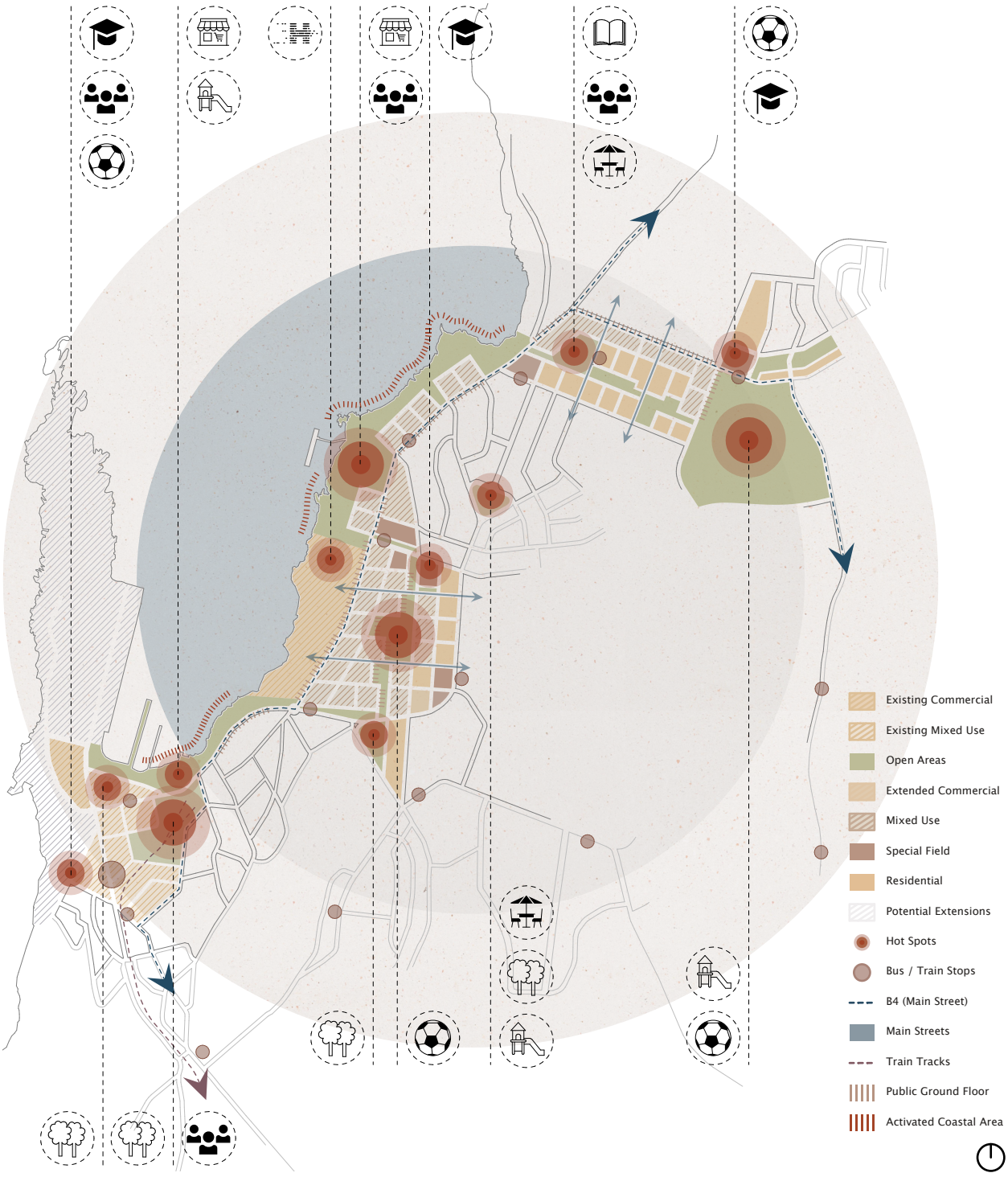
Generate social intermix

Enhance coastal area

Preserve local culture

Expanding Infrastructure

Conceptual Goals



Conceptual Plan

CONCEPTUAL APPROACH

A large number of goals have emerged from the preceding analyses. (see above on the previous page) The city is to be strengthened and made more attractive at a wide variety of levels. This includes social, cultual and economic aspects. Here it was also important to include the direct goals of the city itself and to incorporate them into the design.

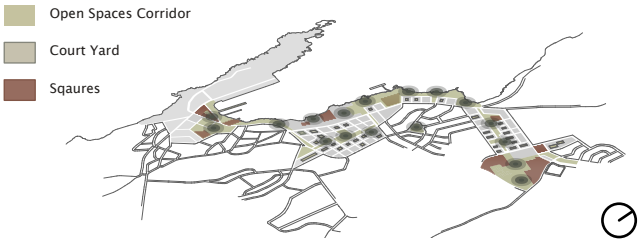
In order to achive these goals, the planning area was incopo-rated in free sections of the existing ciy. The proximity to the coast plays a decisive role here. Like pieces of a puzzle, the new quarters fit into the urban structure and, as connecting elements, create the approach of a previously missing uniform urban structure.

Through the analysis, existing centers and hot spots were iden-tified and others were added. An open space corridor is to run through the new and existing city structures as a connecting element. Like a vein, it creates a link between the individual neighbourhoods and hot spots. On one hand, it serves as an attractive traffic area and on the other hand, it should make various recreational oppotunities such as sports centers, cultural facilities and others accessible.

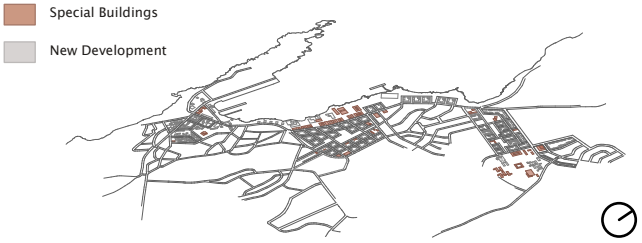
The existing commercial area on the coast will become part of the design area and is to be upgrated in terms of urban de-velopment in the course of this. Open spaces also make the area more attraktive for the city´s residents in the interveining spaces.

Figure Ground Plan

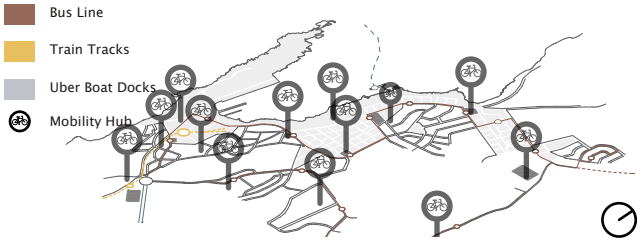
Design Layer: Parcelling and Layout



Design Layer: Open Spaces and Hot Spots



Design Layer: Development and Special Buildings



Design Layer: Mobility, Infrastructure and Public Transportation

In the city center, only selective redensification is planned. The existing vacant building sites are to be suplemented with public open spaces. In order to ensure quick access to the most nec-cessary infrastructures and local supplies, mixed uses are plan-ned in most areas. Activation of the first floors, especially along the B4 and the corridor, plays an important role here, The areas further out will be connected to the rest of the city by bus line.

A system of main roads will create smaller traffic-calmed areas. This measure will be implemented in the new neigbourhoods as well as the city center. In order to integrate the new deve-lopment well into the overall image of the city, the construction areas are largely oriented to the existing buildings.

Master Plan


Main Street
Traffic-Calmed Area
Sidewalks
Open Space Corridor
Courtyard
Parking Lot
Squares
Existing Building
Construction Field

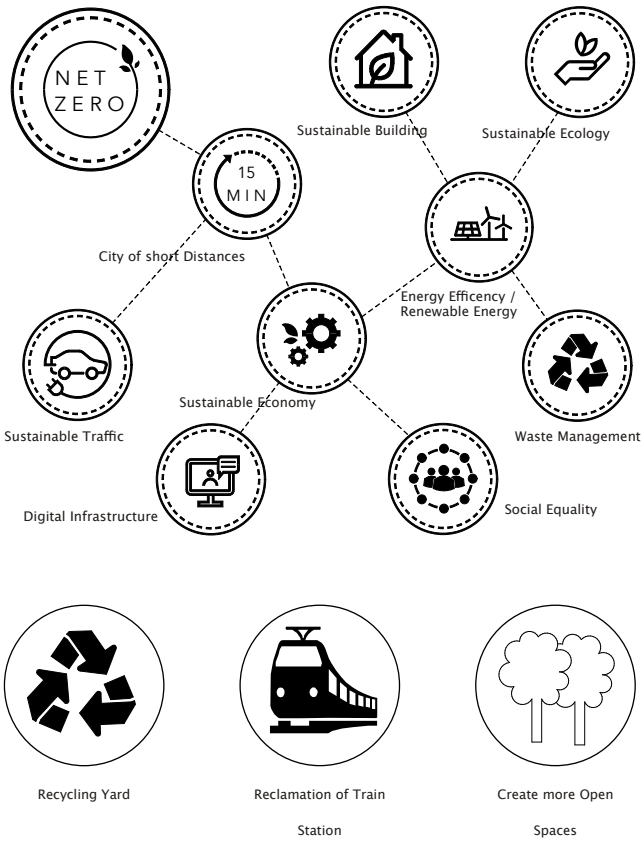
NET ZERO CITY CONCEPT

In-depth approaches for a future-oriented strategy of a so-called 'Net Zero City' are provided. Here, areas of economy, ecology and sociology are dealt with in the course of sustainablility and further developed in different directions.

LÜDERITZ CITY CENTER

In the historic city center the original urban form is to be preserved. Paths and streets will be upgrated and partly converted into traffic-calmed areas. Vacant building sites will not be further densified, but converted into generous open spaces. This will create more space for leisure activities.

In addition to upgrading the centrally located train station, the waterfron in particular, will be expanded with commercial functions, such as a crafts market. Other functions, such as a recycling yard or mobility hubs at regular intervals are to be part of the Net Zero City concept.



Net Zero City Measures, Lüderitz City Center

Lüderitz City Center

LÜDERITZ MIDDLE

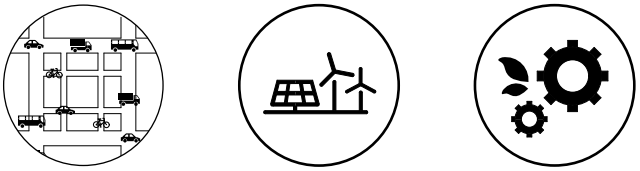
New Neighbourhoods are being created in the large, almost underdeveloped open spaces. As a neigbourhood close to the center, a high density is to be created in Lüderitz Middle. This is to be archived in particular through perimeter block development, which in part dissolves into two-story single-familiy hoses towards the east.

An open space corridor runs trough the neighbourhood and makes the attactively designed outdoor spaces quickly accessible to all. A variance of design elements and recreational amenities are intended to make the corridor appealing to different target groups. Accomodating a variety of commercial functions on the first floors and special building makes local service more quickly accessible to all residents.

Along the coast, the existing commerical area will first be developed into a kind of business park. Various businesses and start-ups are to be accomodated here. The Hyphen headquarters will also be located here. Various plaza situations and recreational facilities will make the businesspark more attractive and more diversely useable.

Further north, residential blocks strech along the B4. The corridor will run along the waterfront and is intended to make the coastal area in this part of the city more attractive. The former fishery will be relocated and the built substance converted into a kind of community center with a market place.

By forming two main streets from west to east, so-called 'Super Blocks' are formed. These Super Blocks form traffic-calmed areas exclusively for the respective residents. Mobility hubs are intended to counteract the increased traffic volume within the neighbourhood. Along the coast, a desalination plant is planned.



Net Zero City Measures, Lüderitz Middle

Lüderitz Middle

LÜDERITZ NORTH

Redensification is also planned in the more northern part of the city. As an additive area, the region is to serve as a connecting element between the fragmented districts in the north. Here, the existing school buildings in particular form an important basis for the expansion. A large school complex is to be created via additional buildings, whose various functions and open spaces will also be accessible to the general public.

The density in this quarter is adapted to the existing neigbourhoods and provides mainly two-story singlefamily houses. Only on the western and northern edges of the neighbourhood are taller terraced buildings planned, forming a spine to the main street. Here, the activation on the first floors is planned. Only selectively will entire buildings be used, for example as a mediacal center.

Again the corridor runs like a vein trough the area and connects imoirtant places with each other. These include the training center, which is intended for Hyphen, the library, the school campus and the indoor swimming pool.

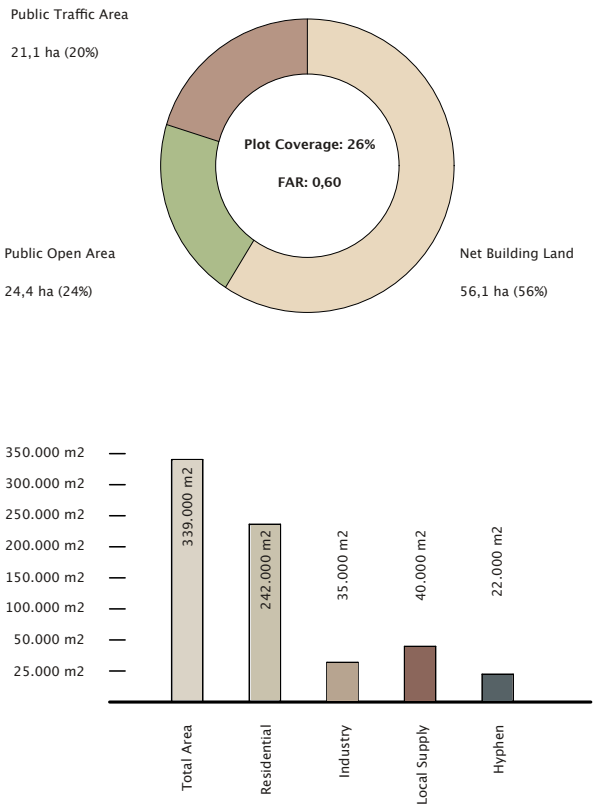
The principle of Super Blocks with traffic-calmed areas is also found here. The educational aspect is particulary important in this part of the city.

Due to the distance to the center, a well-developed system of public transportation and sharing concepts is planned.

At the eastern end of the area, further redensification can be carried out as needed - this can be done in both a southward and a northeastward direction.

Net Zero City Measures, Lüderitz North

Lüderitz North



Figures Total

FUTURE OUTLOOK

In summary, Lüderitz has great potential for further urban development. The topographical conditions allow for re-densification in certain areas. The special location by the sea allows for a lot of potential both on economic level and in terms of quality of life.

The design is based on the idea of creating an exemplary result for future projects in a similar context. For this purpose, the measures are to be tested for effectiveness in the course of the project in the future, further develpoed and implemented again.

Furthermore the goal must not be to consider this project as the conclusion of an urban development. This should be more of a foundation stone for a possible development. The needs of the city and its inhabitants must be clearly in focus in the further development.

The design is meant to provide a direction of growth for a small town in Namibia that is loaded with potential and to show possibilities.

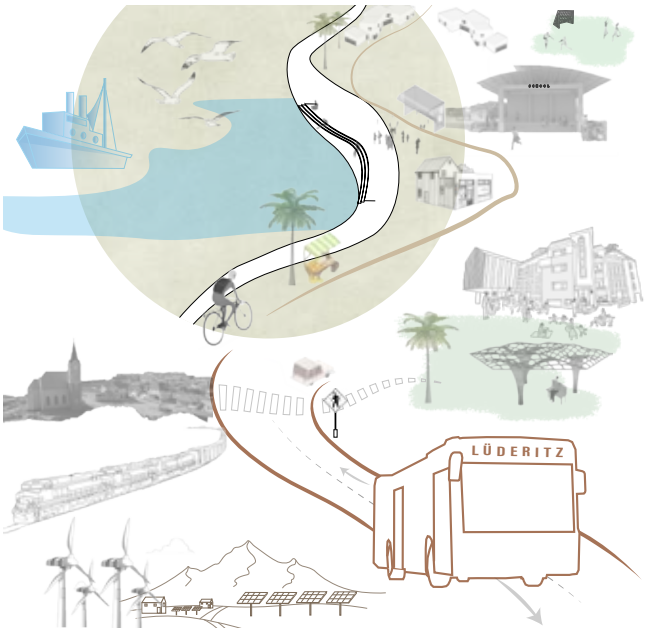
Forecourt Primary School, Lüderitz Middle

Seaside Stroll

Marcel Erdmann, Aimée Issaka, Kyra Weis

UNVEILING COASTAL CHARM

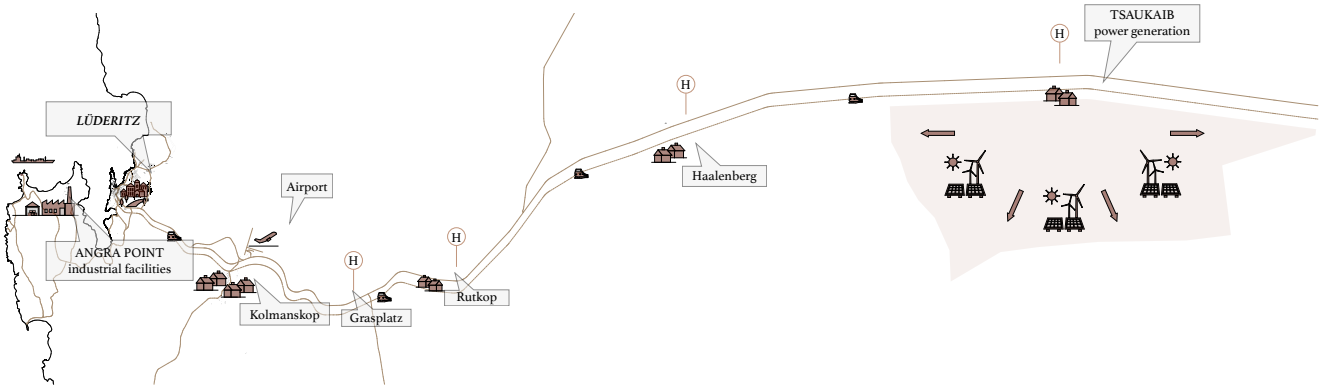
Namibia's historically important coastal town of Lüderitz is about to undergo a forward-looking transformation - the 'Seaside Stroll' project. This urban expansion and addition to the port city, combined with the development of a hydrogen industry, will not only ensure a sustainable future for the city, but at the same time preserve its unique landscape and cultural identity. Responding to the growing demands of modern times, the design will preserve Lüderitz's heritage while creating residential spaces that blend harmoniously with the existing cityscape and provide a publicly usable enhancement to the industrialized shoreline.The project's concept not only addresses the pressing needs of urban development and infrastructure, but also the responsible use of the region's natural resources. This is made possible by the core aspects that make up our design.



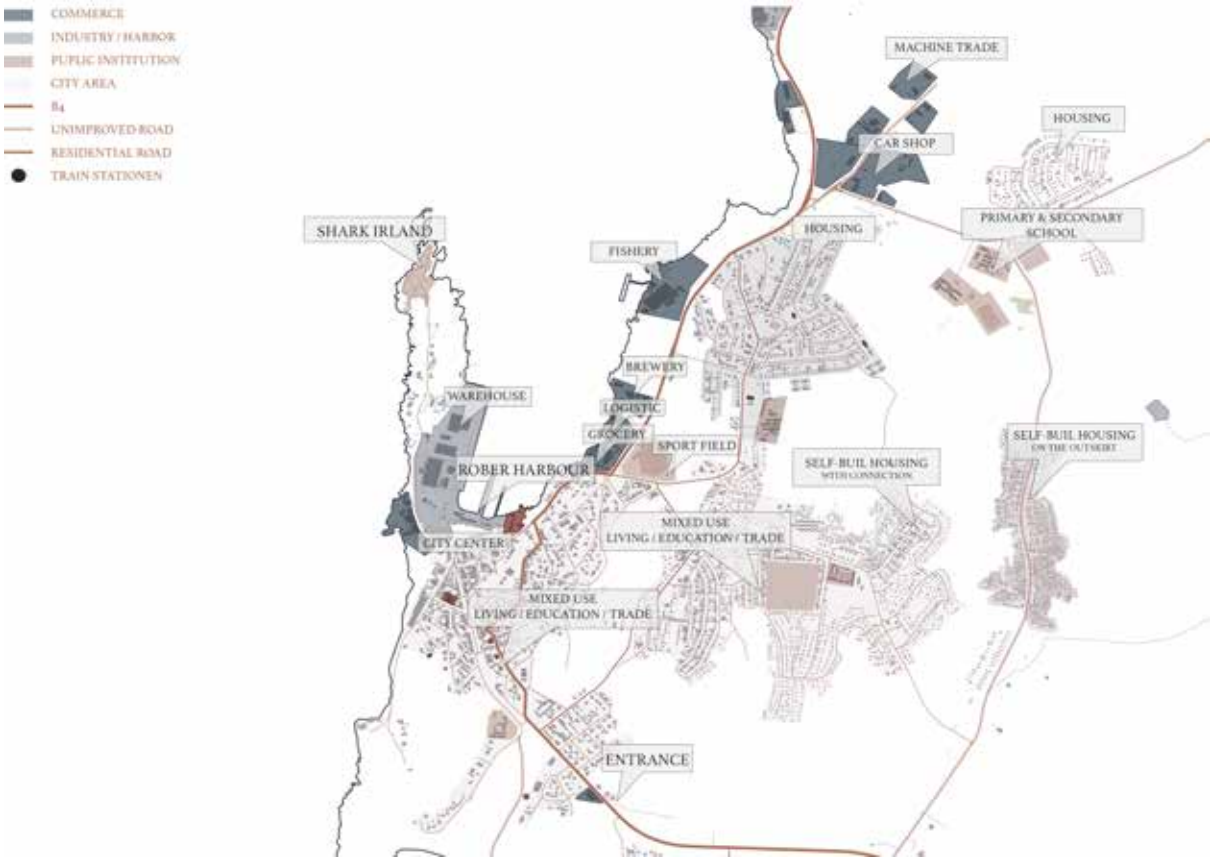
Collage Future Prospects

ANALYSIS

The Seaside Stroll project in Lüderitz not only represents local urban development, but it is also part of a trans-regional context that will enable pioneering hydrogen production in Namibia. The hydrogen production facility is divided into three strategic areas that complement each other and have the potential to shape the energy transition not only for Lüderitz, but for the entire country. At the port of Lüderitz, one of the central points of the Seaside Stroll project, the Hyphen headquarters will be established. Here, state-of-the-art technologies for the production of hydrogen will be developed and operated. The educational facility at Hyphen Headquarters plays a critical role in fostering a skilled workforce in the hydrogen industry. It provides apprenticeships and enables young people from the region to specialize in this emerging industry.



Analysis Regional Map

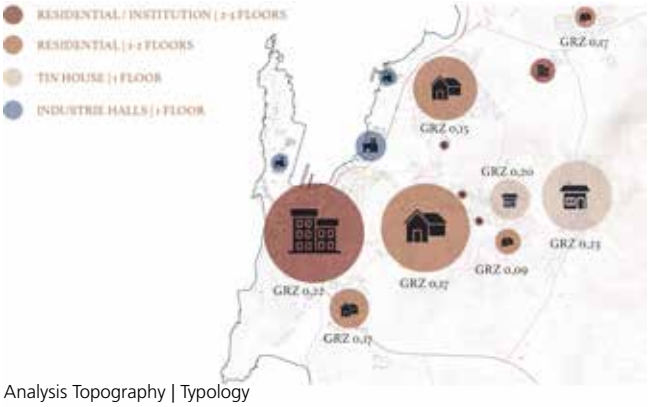


Analysis Use | Mobility

Extensive solar fields are being constructed in Tsaukaib in the interior of the country, enabling reliable and sustainable electricity production.

The generated solar energy will serve as the main source of energy for hydrogen production at Hyphen's headquarters in Angra Point, an area near Lüderitz, is the planned location for the Industrial facilities for the actual production of hydrogen. These facilities will use solar energy from Tsaukaib to produce hydrogen through electrolysis. The resulting hydrogen will be stored in tanks and will be available for different applications.

The Seaside Stroll project in Lüderitz, Namibia, represents a pioneering urban development that combines the establishment of a sustainable hydrogen industry with careful adaptation to the existing context. The integration of different housing typologies promotes a social mix, while the small-scale development preserves the cultural heritage.



Analysis Topography | Typology

Analysis Green Space

URBAN DESIGN

The different housing typologies take an inclusive approach to ensure social mixing and adaptation to the existing context. Various housing typologies are being designed to cater to the diverse needs of the population and foster a harmonious and inclusive social community.

On the one hand, apartments are to be built along the streets in a timber-framed design. Commercial units are located on the first floor to help promote the local economy. This approach not only promotes urban densification but also creates a lively street atmosphere. On the other hand, courtyard houses are also to be built, especially on the coast, which can be equipped with retail facilities in the courtyard area.

This promotes the emergence of small local businesses and contributes to the revitalization of the district. At the same time, the open courtyards create a social meeting place and promote togetherness among residents.

Another core idea is to create flexible living spaces that can adapt to the needs and financial possibilities of the residents. These expandable homes provide an affordable housing option that allows low-income populations to participate in the development and make a home in Lüderitz. This inclusive approach emphasizes the importance of social equity and sustainability in urban development.

Atmosphere Promenade

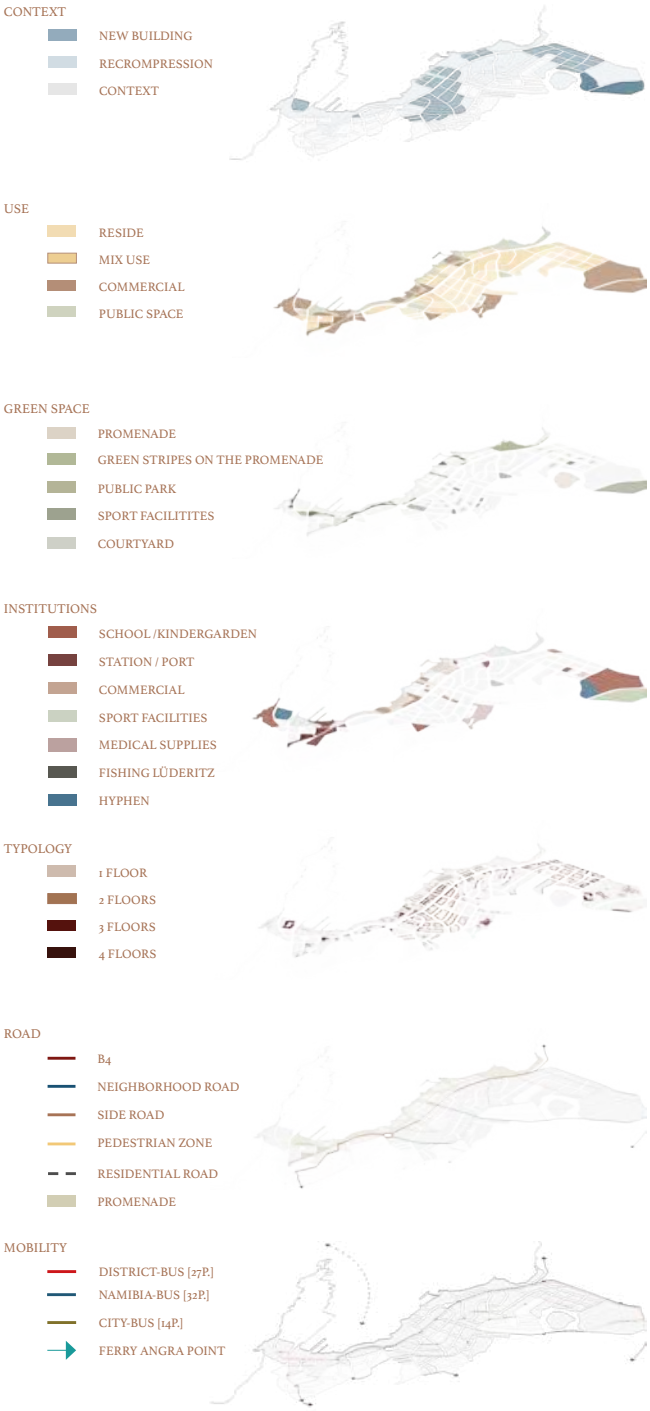
Road Handling

CONCEPT LAYERS

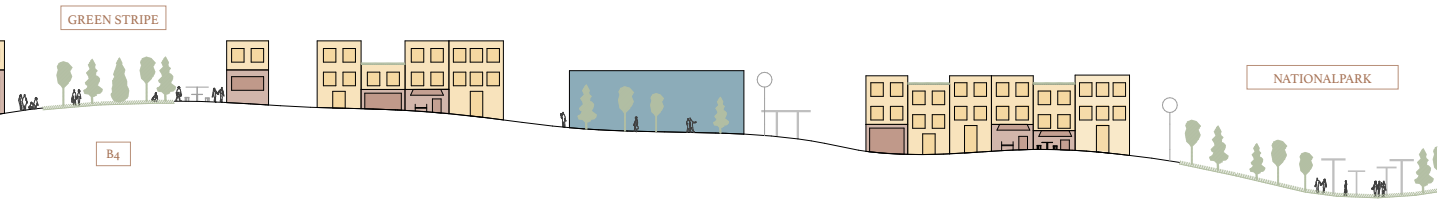
In addition to flexible living spaces, special attention will be given to fostering community and social cohesion. Public plazas and community gathering spaces will be strategically placed along the shoreline and in residential areas to promote a vibrant and inclusive neighborhood.

Overall, Lüderitz's urban renewal initiative will create a vibrant, diverse and sustainable city that takes into account the needs of both current residents and future generations. With a strong focus on social equity and sustainability, Lüderitz will become a showcase for modern, inclusive and sustainable urban development in Namibia.

City plan



Draft Layers



COMMUNITY NETWORKING

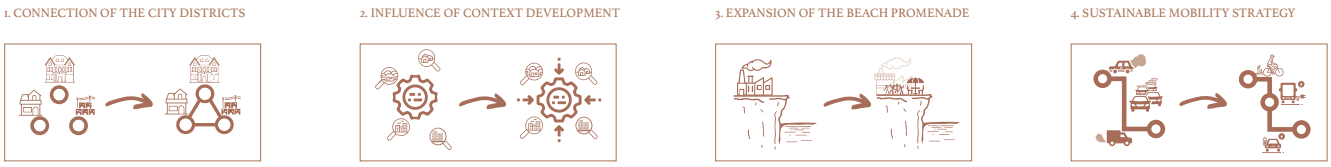
The main road B4, which is an important part of the circle around the city, and the secondary road, which acts as a central connection between the coast and the interior, are the two most important axes of the plan. For this reason it will be developed into a lively tree-lined avenue.

The careful selection of native tree species not only gives this avenue a natural appearance, but also helps to promote biodiversity. With the rows of trees, Lüderitz will connect with a green axis along the coast and a further direction of the educational complex inland and thus activate the open spaces.

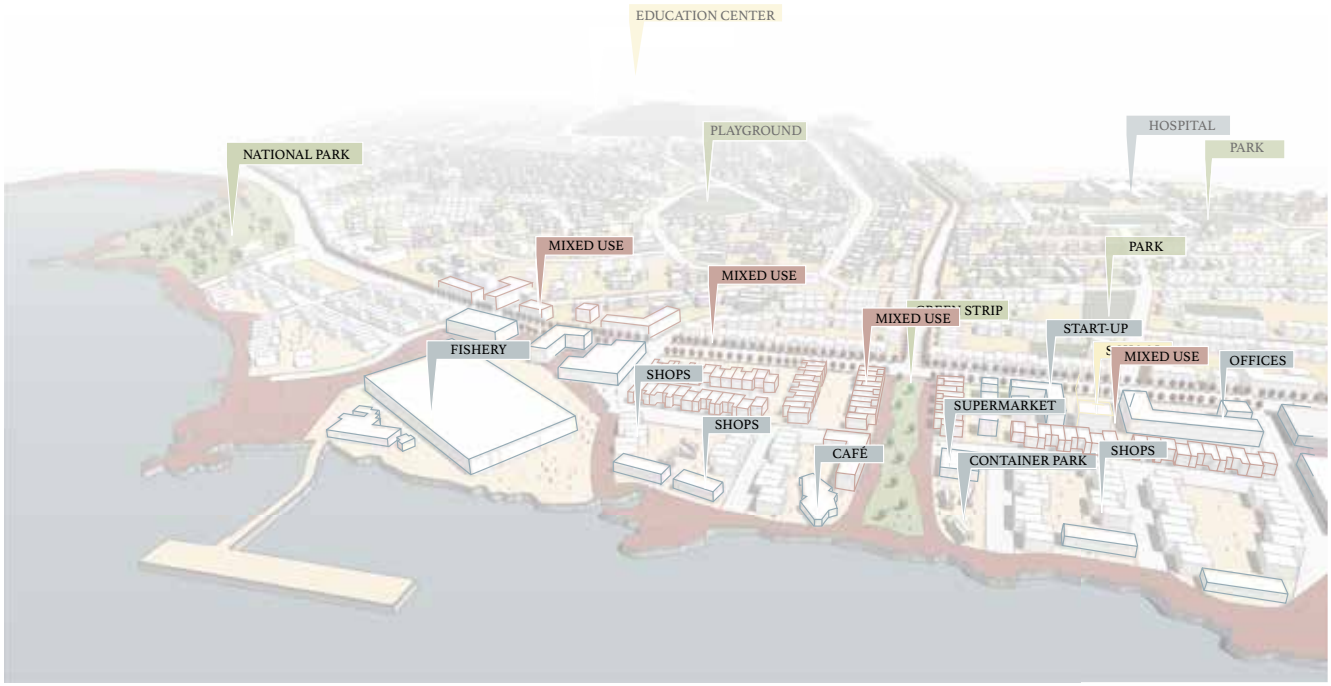
In addition to the two green axes, a promenade is to be designed along the coastline from the harbor to the north of the city. As a supplement to the promenade along the coast, a sustainable conversion of the existing industrial facilities is also envisaged. These will be carefully transformed to provide space for public functions. This transformation will help blend Lüderitz's industrial history with contemporary public spaces that honor the city's cultural heritage while creating new opportunities for social encounters and creative expression.
In addition, residential areas will also be created along the developed shoreline on the undeveloped areas.

By further complementing it with green spaces, the promenade offers a good opportunity to open up the city through the coastline and develop it as a recreational area.

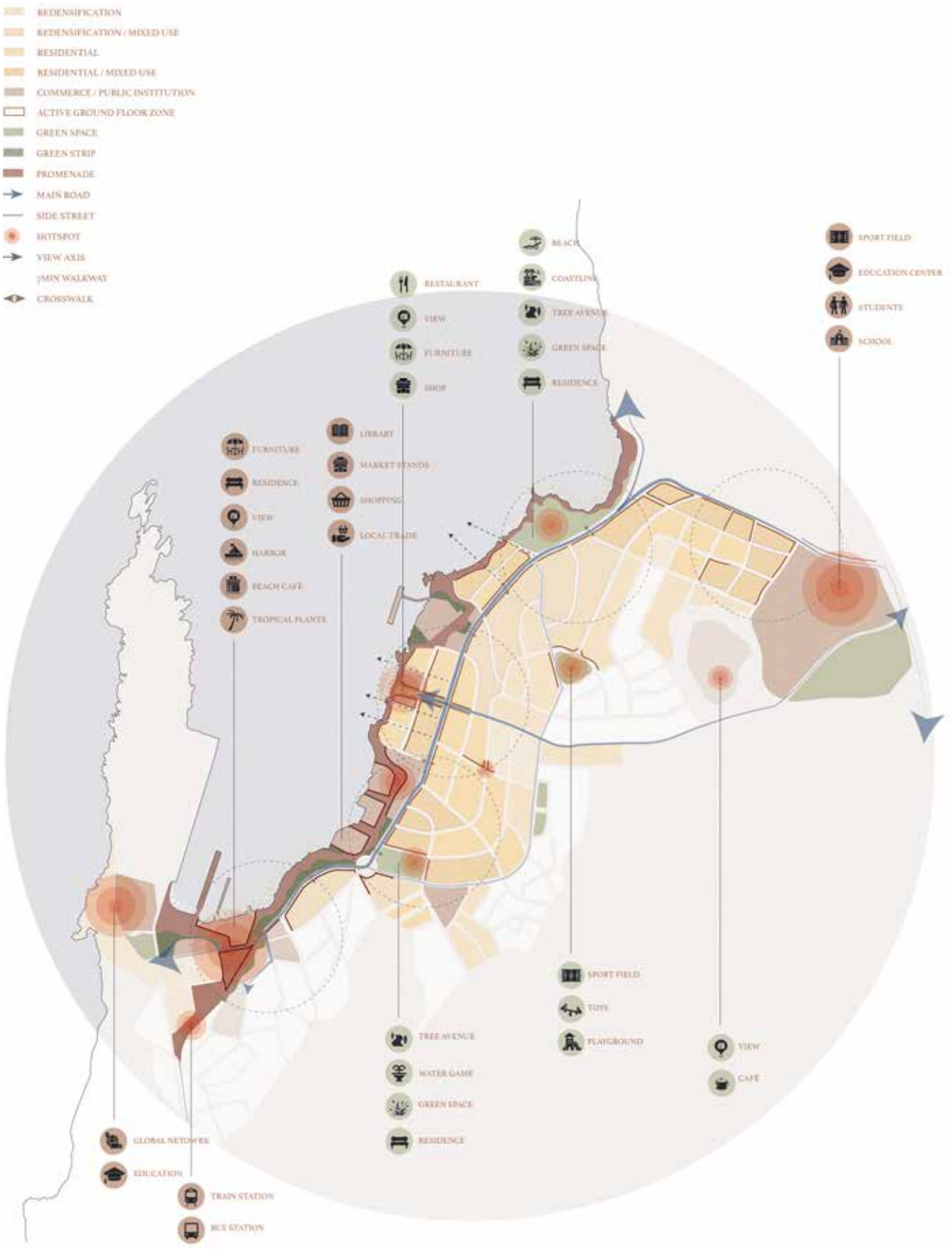
The combination of a vibrant promenade, the respectful reuse of the industrial past and the creation of new residential areas along the coast will make Lüderitz a place that wears its history proudly while looking boldly to the future. It will be a city that respects the heritage of its ancestors while remaining open to the needs and dreams of future generations.



Goals



Model Perspective Coastal Area



Concept Plan

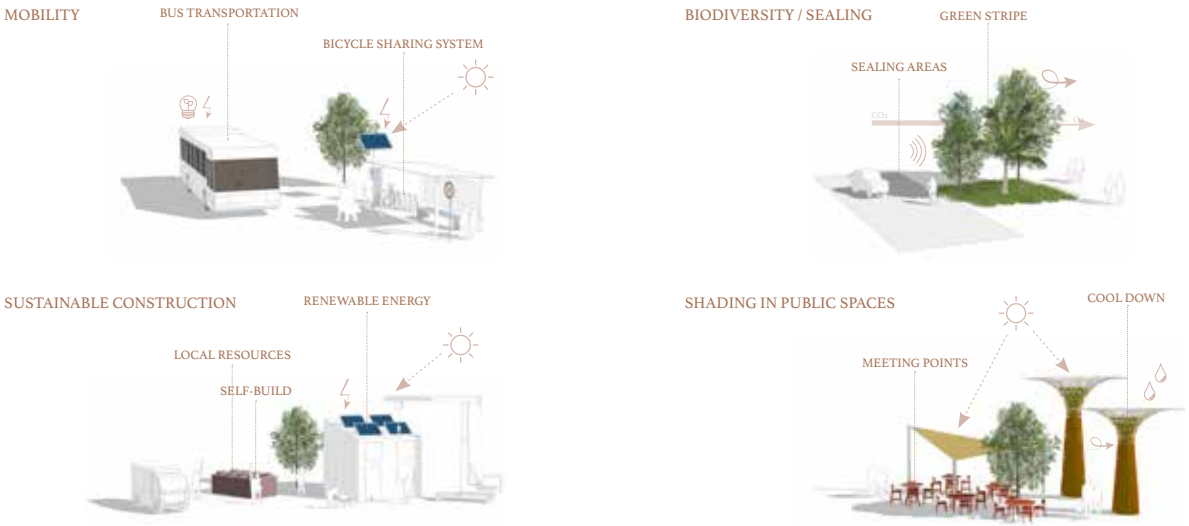
Master Plan

SUSTAINABILITY

The project's sustainability concept is characterized by a holistic and forward-looking orientation aimed at protecting the environment and promoting a sustainable lifestyle. The expansion of public bus transportation allows residents to travel comfortably through the city in an environmentally friendly manner and reduces the need for private transport. In addition, a bicycle sharing system will be introduced to promote the use of bicycles as an environmentally friendly and healthy transportation alternative.

The creation of green strips and green spaces promotes biodiversity and creates valuable habitat for plants and animals. Another integral part of the sustainability concept is targeted shading, which not only contributes to an improved quality of stay but also serves to cool public spaces. Strategically placed plantings, shade mushrooms, canopies, and awnings create shaded oases that serve as inviting places to meet, interact, and share.

An important point is sustainable construction, which focuses on the use of renewable energy and local resources. During the construction of the new typologies, special attention is paid to the installation of photovoltaic systems. The PV systems on the roofs will be oriented to the north to ensure optimal use of solar energy An important aspect of sustainable construction is the use of clay as a building material. Clay is not only a sustainable and environmentally friendly material, but also a natural regulator of humidity and temperature.



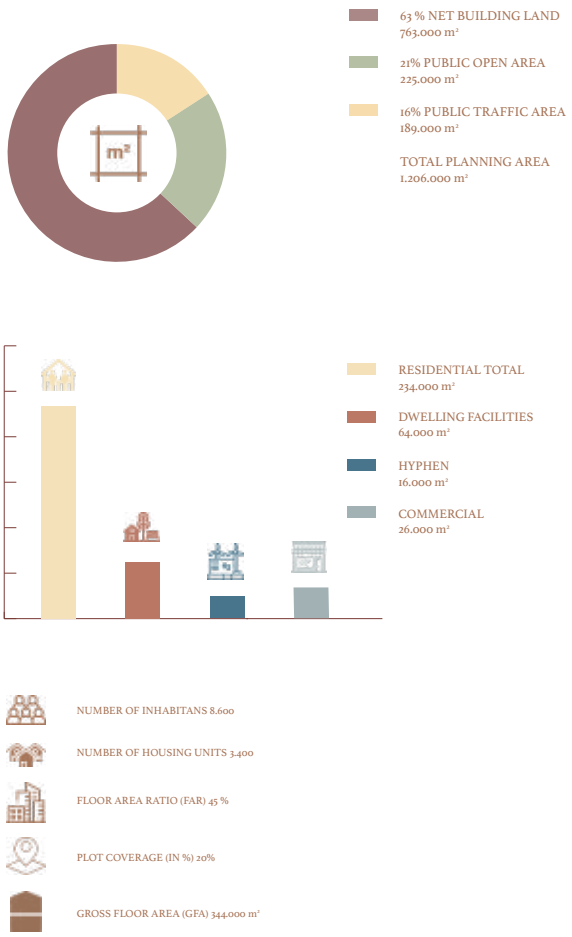
Sustainability Concepts

Atmosphere coastline

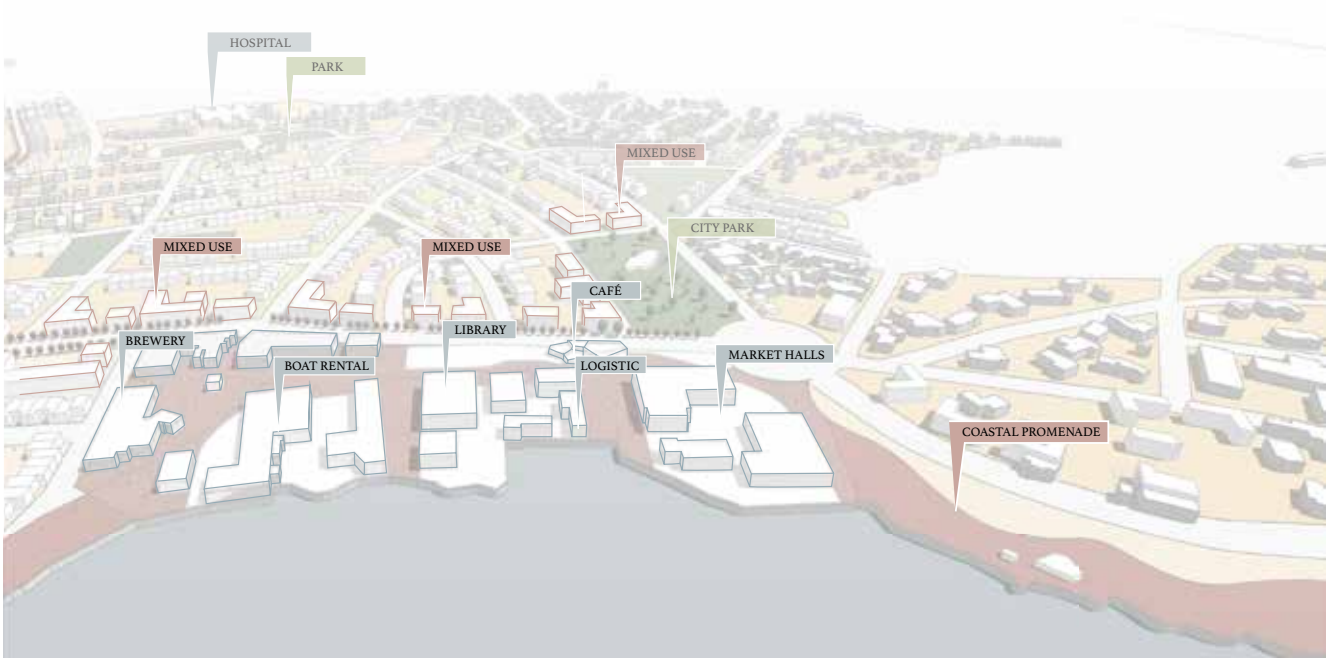
The project in Lüderitz covers a generous area totaling 120 hectares. This expansive land use allows for a carefully considered and versatile urban design that meets the needs of the community as well as preserving the natural environment.
Although the project occupies a generous amount of land, it is noteworthy that the overall footprint is not impacted by inappropriate densification. On the contrary, this project is characterized by a thoughtful and small-scale development that fits seamlessly into the existing context of the city. The low floor area ratio (FAR) of just 0.45 underscores the sustainable and sensitive approach to urban development.

The focus on this project is close collaboration with residents to take into account their wishes and needs and ensure their active participation. This participatory approach will create a strong bond between residents and their newly designed city and lay the foundation for a sustainable and livable future in Lüderitz. It highlights the importance of a balanced use of space and shows how a vibrant community can change sustainably without neglecting its historical legacy. As a reference for similar projects, the project demonstrates how an urban design can aim for a green and sustainable future.

‚Seaside Stroll' creates a vibrant and culturally rich city in harmony with the natural environment and the global challenges of the 21st century.

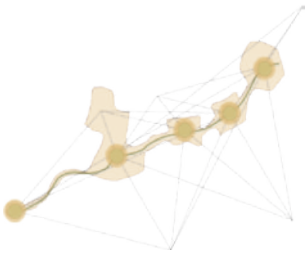


Area calculation



Model Industrial Facilities

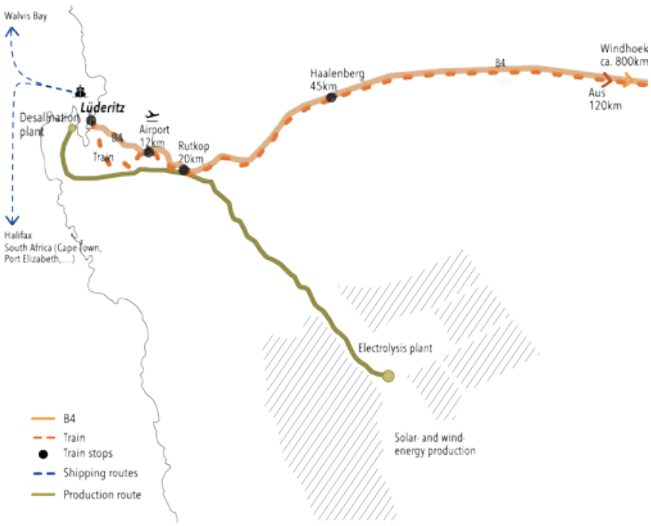
Neighborhood Network



Madalina Posea, Johannes Kautzmann

FROM NEIGHBORHOODS TO H_2 NETWORKS

A remarkable project for the production of green hydrogen is being built in Namibia near Lüderitz. There, 3,000 jobs will be created in connection with the establishment of hydrogen production by 'Hyphen Hydrogen Energy'. Lüderitz offers opportunities for positive urban development to create a resilient and livable city for the future. One opportunity for optimization lies in carefully improving the existing spatial extent and dispersion of the city, allowing for coordinated development and optimal distribution of public facilities, commercial areas and residential neighborhoods. The supply of communal exchange spaces, where different inhabitants with different habits, cultures and traditions come together is currently insufficient. An innovative concept for a low-emission city was developed, allowing a diverse mix of uses and sustainable urban development in harmony with existing structures.

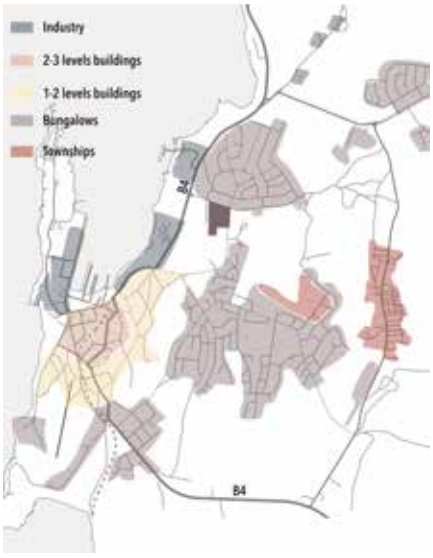


Regional context

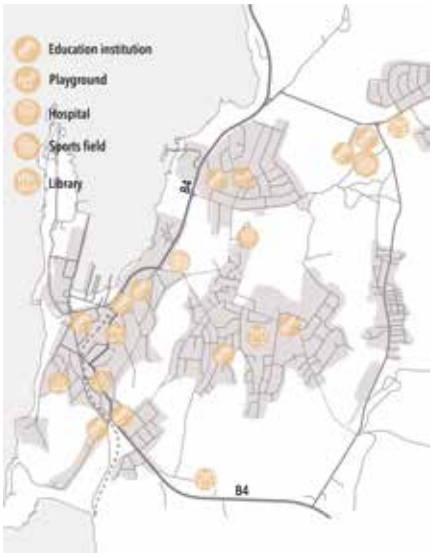
ANALYSIS

At the moment, except for the sports field and cemeteries, Lüderitz does not really have any and high-quality public spaces to spend time. By looking at the existing building structures, there are social differences to be seen. The upscale old town consist in 2-3 story buildings, directly adjacent 1-2 story buildings, in the other neighborhoods 1 story bungalows and the informal settlements in the direction of the interior. The social infrastructure is mostly also limited to the old town.

Public Spaces



Building Typologies

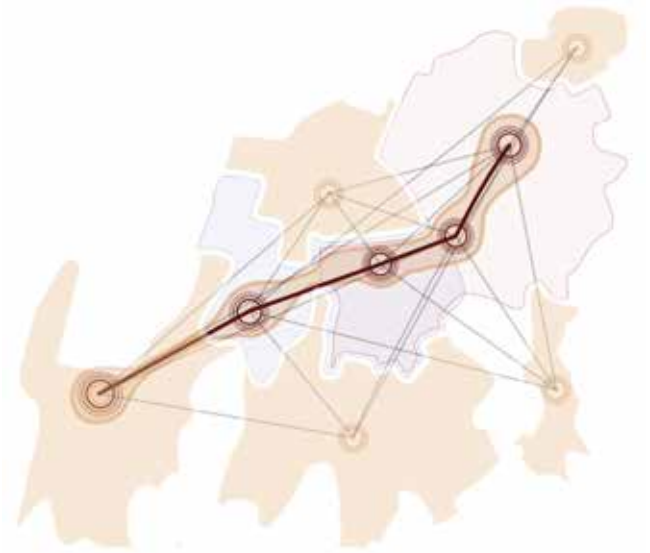


Social Infrastructure

CONCEPT IDEA

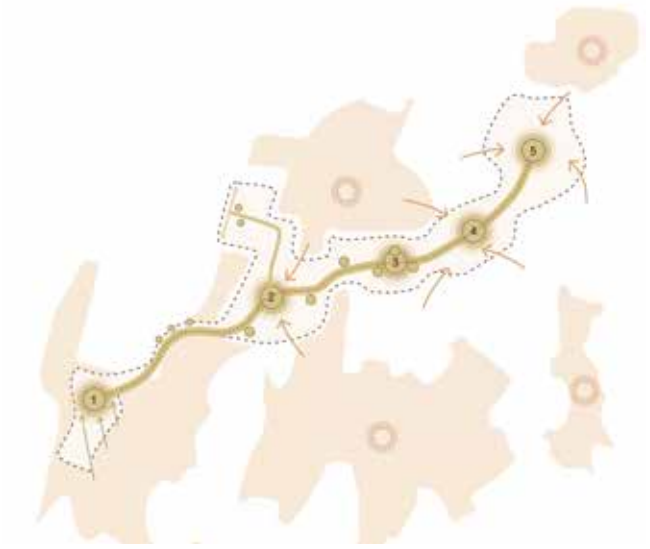
The goal of our concept is to connect the scattered residential areas by creating public squares and connected open spaces in the form of a green corridor meandering through each center, while connecting to the existing. Four new centers are created with different focal points in addition to the historic old town. The locations result from the centering of the existing, scattered quarters in order to connect them with each other as much as possible. This approach aims to foster a sense of belonging and a healthier urban lifestyle by providing easily accessible collective spaces that cater to the diverse needs and interests of the community. The envisioned green corridor will not only enhance connectivity but also contribute to the overall well-being and vitality of the community.

Open Spaces



Concept Idea: Network of Centres

Mobility



Concept Idea: Green Corridor

Usage

URBAN PLANNING CONCEPT

The plan involves creating four new centers alongside the historic old town, aimed at connecting existing scattered quarters. This results in the Community Center at the heart, the Residential Center next to the northern residential area, the Sports Center near informal settlements, and the Educational Center based on the two existing schools.

The historic district will transform into a hub for both residents and tourists. It's also the location of Hyphen's headquarters, designed as a block development with a prominent five-story landmark. The Community Center hosts an art gallery, church, marketplace, meeting spaces, open-air stage, and eateries. A green corridor leads to a waterfront promenade in the northwest, offering an urban vibe through block development, which transitions from busy streets to residential areas.

Residential and commercial facilities are placed along B4 and within green corridor courtyards. The residential zone includes rows of houses and a block development alongside the green corridor. Amenities like daycare, medical center, and a landmark library enhance the residential area.

The Sports Center links green living with sports facilities like tennis, calisthenics and a skate park. A modern sports hall becomes the landmark.

The Education Center features block-like structures encircling a central square, combining existing schools with modern education and innovative research centers. The shoreline's industrial development will be repurposed and densified, connecting the southern waterfront to the community district and the South Atlantic via two new plazas.

OPEN SPACE CONCEPT

Open space plays a very important role in our concept. As a central element, it connects the public spaces in the individual centers as well as the scattered parts of Lüderitz with each other in the form of the green corridor. Along the green corridor, you can find recreational opportunities in the open spaces, such as shades, playgrounds, etc.. On the coast, further amenity quality is created in the form of the promenade.

Visualisation Community Center

Concept Plan

Future Vision

MOBILITY CONCEPT

One of the most important aspects of the mobility concept are the Mobility Hubs, which are easily accessible in all neighborhoods. These offer the opportunity to switch to electric vehicles. These include e-bikes and electric scooters, as well as electric cars. Ridesharing can also reduce the need for individual car ownership.

A bicycle expressway runs throughout the greenway, providing a quick way to get around the entire city. Regular e-bike rental stations are located along the bicycle expressway to provide the ability to get around quickly at any time. The entire historic old town is being transformed into a pedestrian zone. The other neighborhoods are more traffic-calmed residential streets, as well as individual larger connecting streets.

The newly designed bus network, with hydrogen or electricity powered buses, provides access to the entire city through 3 bus lines, as well as Angra Point in the west and Hydrogen Production in the south.

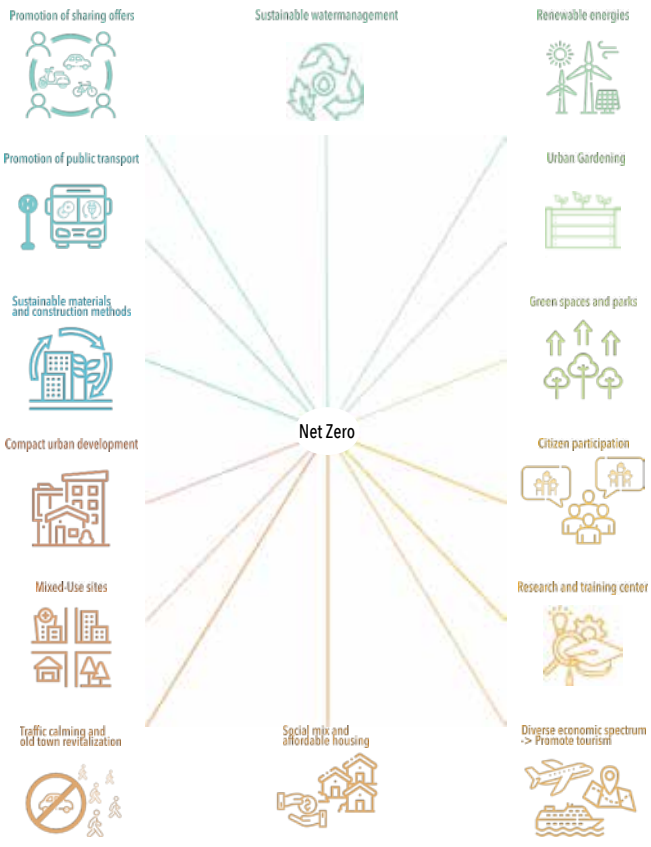
Mobility Concept

NET ZERO CONCEPT

Expansion of public transportation such as buses and bike lanes will be encouraged to reduce car traffic and lower CO2 emissions. In addition, integrating sharing services such as carsharing, bikesharing reduces the need for individual car ownership. Creating pedestrian zones, traffic-calmed zones, and bicycle lanes encourages pedestrian and bicycle traffic and reduces air pollution.

Tourism is expanded and promoted as another economic sector. Education is promoted through research and training centers. As well as citizen and stakeholder participation to ensure that community needs and concerns are addressed. Sustainable materials are used in new construction, as well as attention to sustainable design in urban development to reduce the environmental footprint and extend the life of buildings.

Creating green spaces and parks helps improve air quality and provides space for residents to recreate and interact socially. The integration of renewable energy sources in urban infrastructures such as solar energy, wind energy helps to reduce the carbon footprint of Lüderitz.



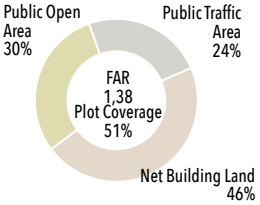
Net Zero Concept

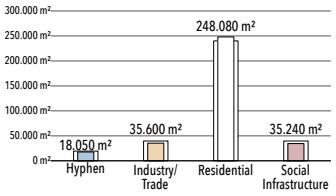
Master Plan

INDIVIDUAL QUARTERS

The plan envisions four new centers, enhancing the historic old town. These centers emerge by uniting scattered quarters, fostering connections. Included are the Community Center at the heart of existing neighborhoods, Residential Center by the northern residential zone, Sports Center near informal settlements, and Educational Center anchored around existing schools.

The calm historic district transforms into a hub for residents and tourists, housing Hyphen's headquarters within a block development. The Community Center features an art gallery, church, marketplace, open-air stage, and eateries. The green corridor opens to a waterfront promenade, reflecting an urban character that adapts to streets and residential areas.



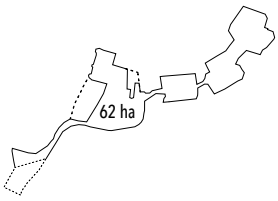


Gross Floor Area (GFA)
336.690 m²

Total Planning Area
62 ha

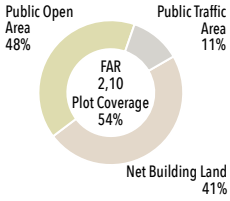
40 m² GFA/RE
=>6.202 Residents

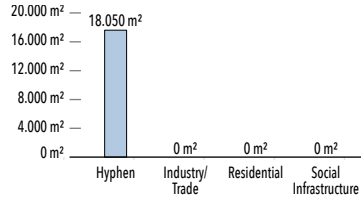
100 m² GFA/RU
=>2.481Residential units



HISTORICAL CENTER

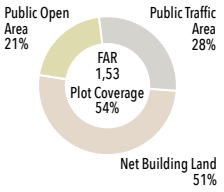
By transforming the old city town into a traffic-calmed area and establishing a stronger connection between the main streets and the harbor, it becomes a more attractive destination for both tourists and residents alike. It is also an attractive location for the headquarters of Hyphen.

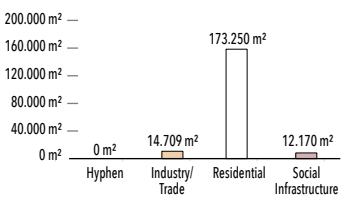




COMMUNITY CENTER

The community center, the place where residents with different habits, cultures, and traditions come together, includes an art gallery, church, and marketplace. It features meeting places, an open-air stage, and dining options. The green corridor extends to the waterfront in the north-west, with a mix of urban and green spaces.



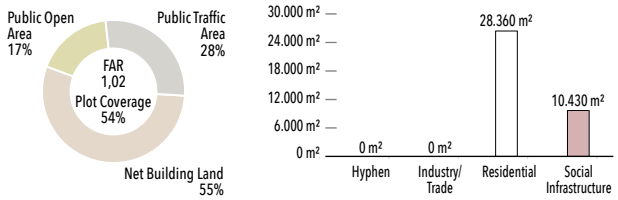


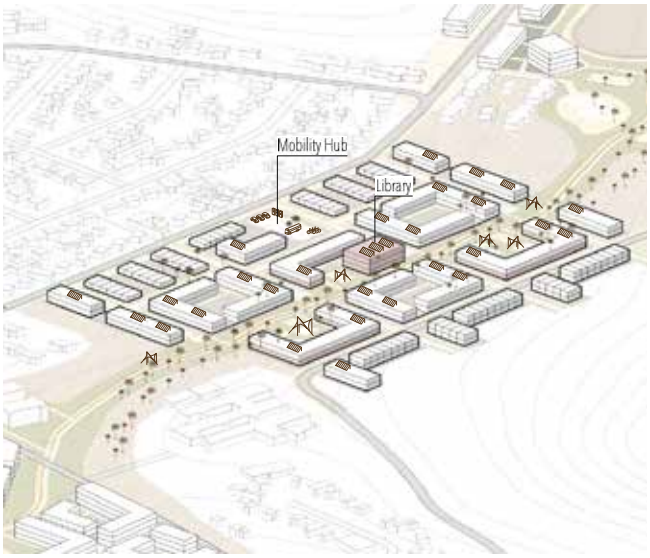
Historical Center

Community Center

RESIDENTIAL QUARTER

The building development is denser towards the green corridor and becomes more open towards the outside. The green corridor partially flows into the courtyards, and at those points, there are different follow-up facilities within the blocks with a library as landmark.

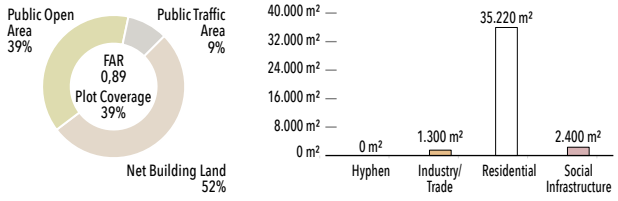


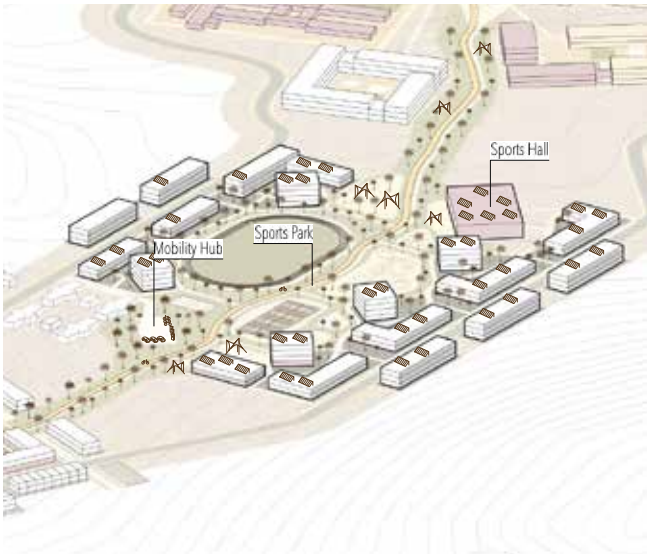


Residential Quarter

SPORTS CENTER

The sports center connects the living in the green, in the form of the point blocks with a back formed by rows, with various sports and leisure facilities, such as the sports field, tennis courts, skate park, etc.. The modern sports hall forms the landmark here.

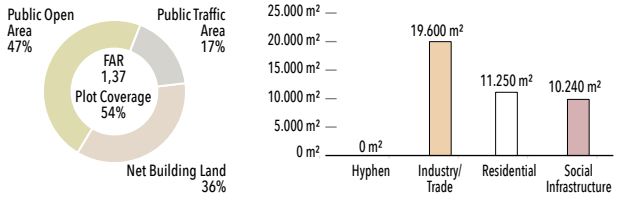


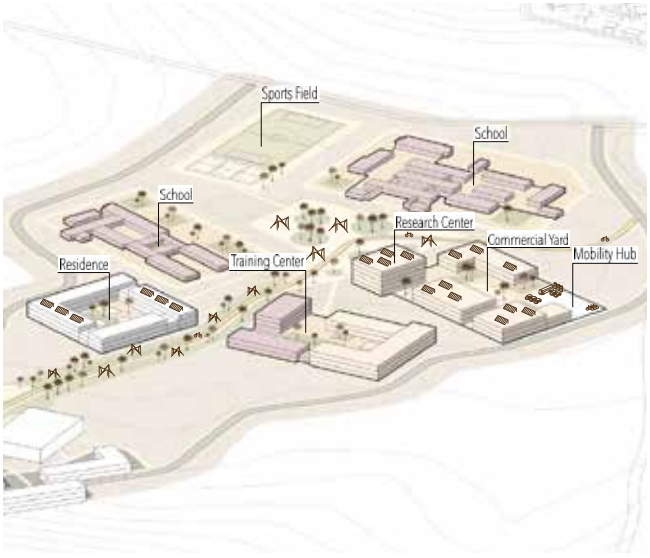


Sports Center

EDUCATIONAL CENTER

The education center consists of block-like solitaires in the open space, arranged as clusters and all aligned to a central square. Here, the existing schools meet a modern education center and an innovative research center forms the landmark of the neighborhood.





Educational Center

COEXISTENCE OF TRADITION AND INNOVATION

The visualization showcases how the old school and the new research center come together in the education center of the city. This mix of old and new buildings brings benefits to the community. The old school represents the city's history and values, while the modern research center represents progress and innovation. This combination gives people a sense of connection to the past and excitement for the future. The concept also encourage collaboration and learning between different generations and fields of study. Overall, this blend of old and new enriches the community's experience and creates a place where history and progress meet.

FIGURE GROUND PLAN

The figure-ground plan shows how the new development seamlessly integrates with the established existing quarters. In this interplay between the contemporary and the existing, the figure-ground plan visualises the essence of urban evolution. The new structures find their place among the familiar outlines of the pre-existing buildings. The balance struck between the two worlds reflects a thoughtful approach that acknowledges the importance of preserving the character of the surroundings while supporting progress. This plan not only underscores the physical connections between structures but also emphasizes the symbiotic relationship between history and innovation.

CONCLUSION

In conclusion, the innovative concept focuses on uniting fragmented residential areas through the establishment of a green corridor, complemented by inviting public squares and interconnected spaces. By introducing new centers alongside existing ones, the concept aims to provide community wellbeing, developing a strong sense of belonging facilitated by easily accessible communal areas.

Visualisation Educational Center

Figure Ground Plan

HYDROLINK

Alexander Albiez, Nicolas Klemm, David Tarrago

CONCEPTUAL APPROACH

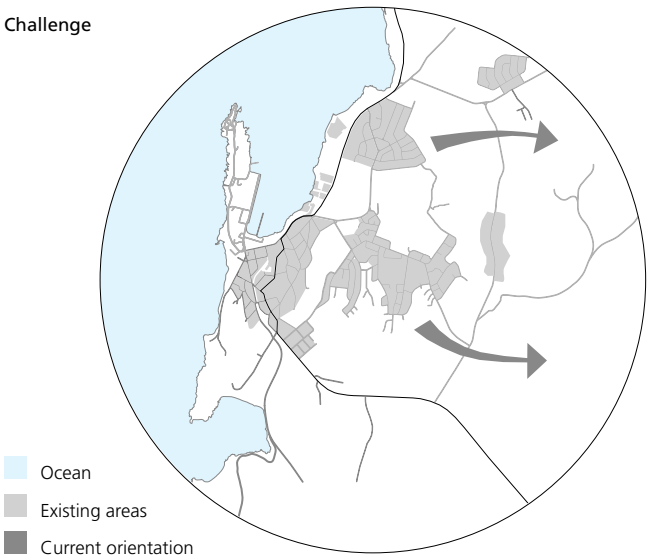
The guiding idea for Lüderitz is to make the city a pioneer in sustainability and green development. In doing so, we want to establish Lüderitz as an attractive work location that attracts talent and offers an inspiring work environment through its forward-looking infrastructure as well as a diverse range of leisure activities.
We see Lüderitz as a role model for a sustainable city, working together with the rest of the world to reduce global emissions to create a livable future for all.
Lüderitz and the whole of Namibia should profit from this in the long term and sustainably.
Due to the scattered neighborhoods of Lüderitz, the small coastal town is divided into different areas, most of which are oriented inland. We want to unite Lüderitz through targeted interventions and connect it to the sea to take advantage of maritime location.

URBAN PLANNING CONCEPT

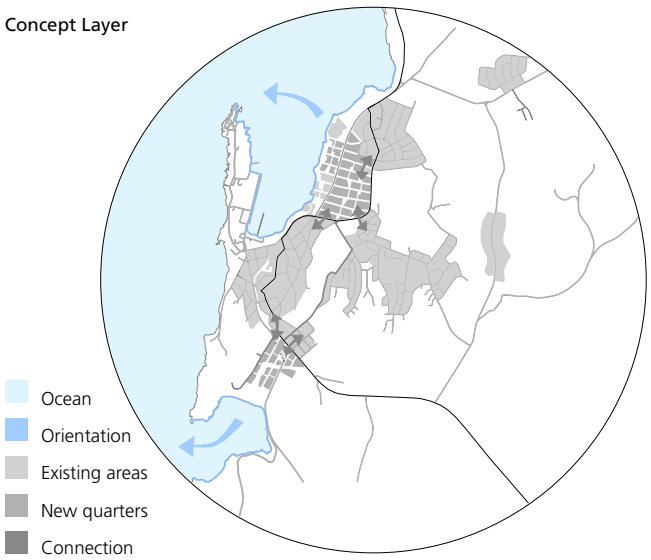
We are establishing two new urban districts. Lüderitz Ocean View in the north and Lüderitz Campus in the south, which are connected by a coherent inner-city link. The historic center of Lüderitz is the focal point of the inner-city link and thus acts as a connection between the new districts.
The inner-city link runs from north to south along the coast, linking the two new districts with the center and the existing ones. It includes a bicycle expressway and places of local supply.
Lüderitz Ocean View results of the repurposing of the industrial area at the coast. Meanwhile a new quarter is added between the coastal area and the existing inland building areas. It is embossed by an introverted, nested block structure.
Lüderitz Campus is characterized by the green strip with a river course that merges into a marshland. It runs like a swath through the area and intersects the adjacent typologies. The use of the typologies alternates between residential, education and commercial. A mixed-use area is created from which residents should benefit. The Ocean Links also take over the main development in the southern area.
The area is opened by a round building block, the Learning Center. In combination with the Hyphen Headquarters, it represents the central component of the campus.

Orientation of the city

Challenge



Concept Layer



OPEN SPACE CONCEPT

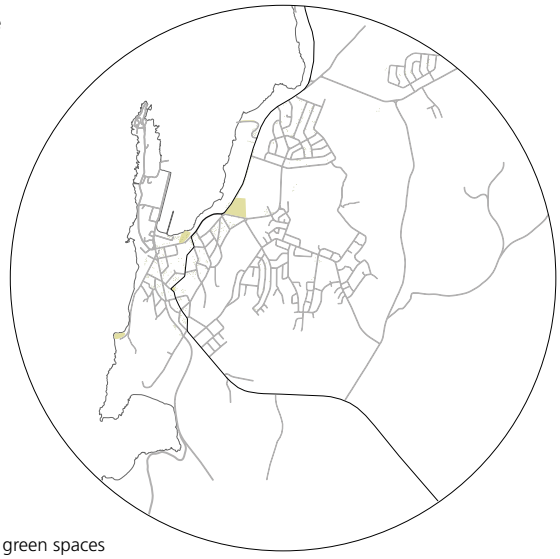
Secondary development structures run across the Ocean links in the northern area. They enable the crossing and connect alternately an open, green space for local recreation in the neighborhood and a square for the local supply.
The sports field moves into the vacant building field diagonally opposite and connects the existing building with the expansion. The Ocean Links run out into open spaces by the sea and form squares at the inner-city link.

Lüderitz Campus is characterized by a green belt with a stream course that crosses the entire development area and ends in a broad wetland on the Atlantic coast. The origin of the river course lies in the middle of the Learning Center and is fed by fresh water. This is obtained with the help of solar seawater desalination systems that condense the water vapour that is created inside greenhouses over the surface of the ocean. Thanks to these passive irrigation facilities the need for fresh water irrigation could be reduced.

An oasis is formed along the river, transforming the area in a sustainable way and offering residents a special place for recreation. In addition, the stream course and the wetland provide an opportunity for science and research on topics related to sustainable energy production and food production.

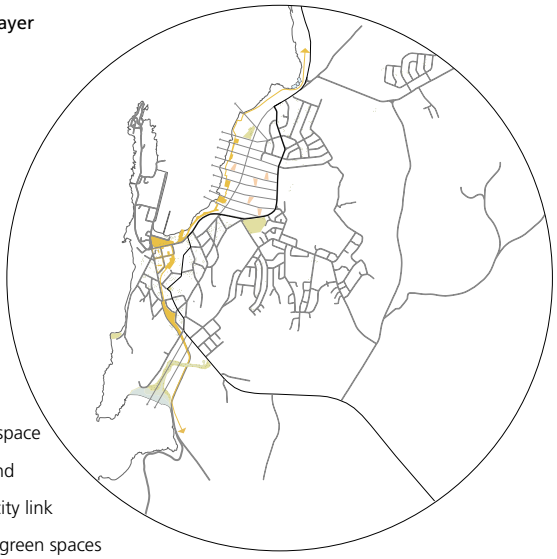
Public open areas

Challenge



Trees
Public green spaces

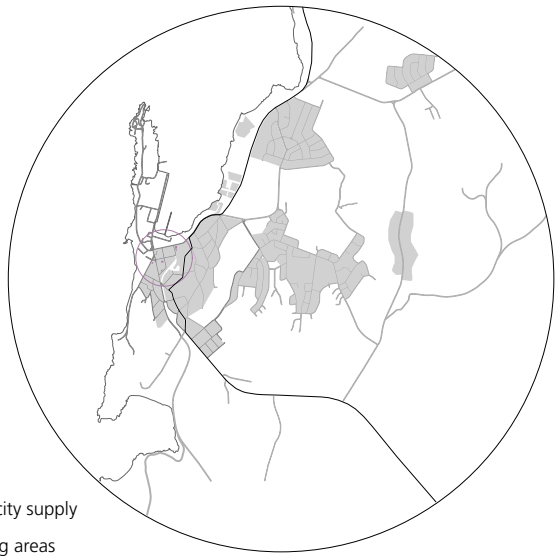
Concept Layer



Trees
Open space
Wetland
Inner-city link
Public green spaces

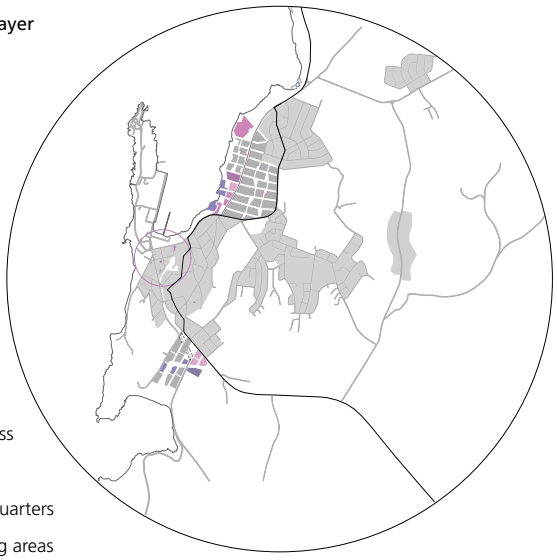
Supply

Challenge



Inner-city supply
Existing areas

Concept Layer



Business
Supply
New quarters
Existing areas

MOBILITY CONCEPT

The developed urban districts are to be made car-free, with some exceptions. For this purpose, generous bicycle lanes will be provided on the Ocean Links, through which the areas will be made accessible. An emergency lane on the links allows the passage in emergency or exceptional cases.

Bicycle rental stations are located at the most important places in the resdential and mixed-use areas as well as at the main traffic points. In addition, three bus lines will be introduced, with which every place in Lüderitz can be reached in a short time. With sufficient stops and an appropriate frequency of the bus lines, a first-class alternative to private transport will be created.

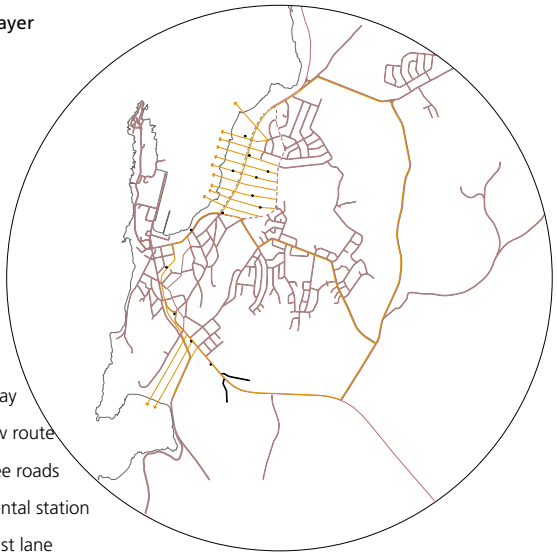
The mobility hub serves as an interface between motorized private transport and local public transport such as bus or train. From there, buses will travel to the port area at Angra Point. In addition, the train connection to the energy supply area will be expanded. Private individual transport in the form of cars will become obsolete as a result of these measures.

Public traffic system

Challenge

B4 Highway
Existing roads

Concept Layer



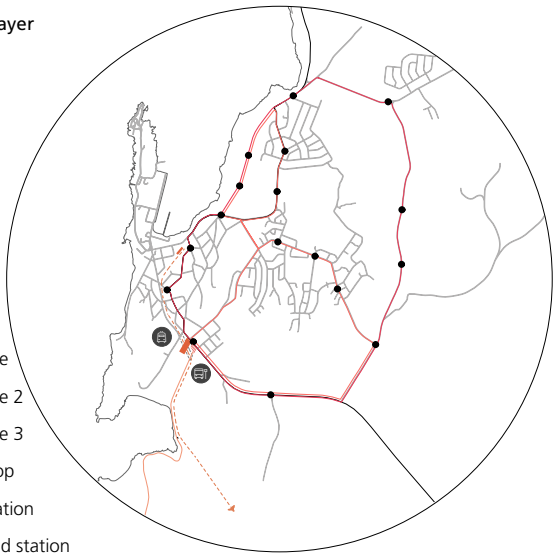
B4 Highway
B4 new route
Car free roads
Bike rental station
Bike fast lane

Public transport

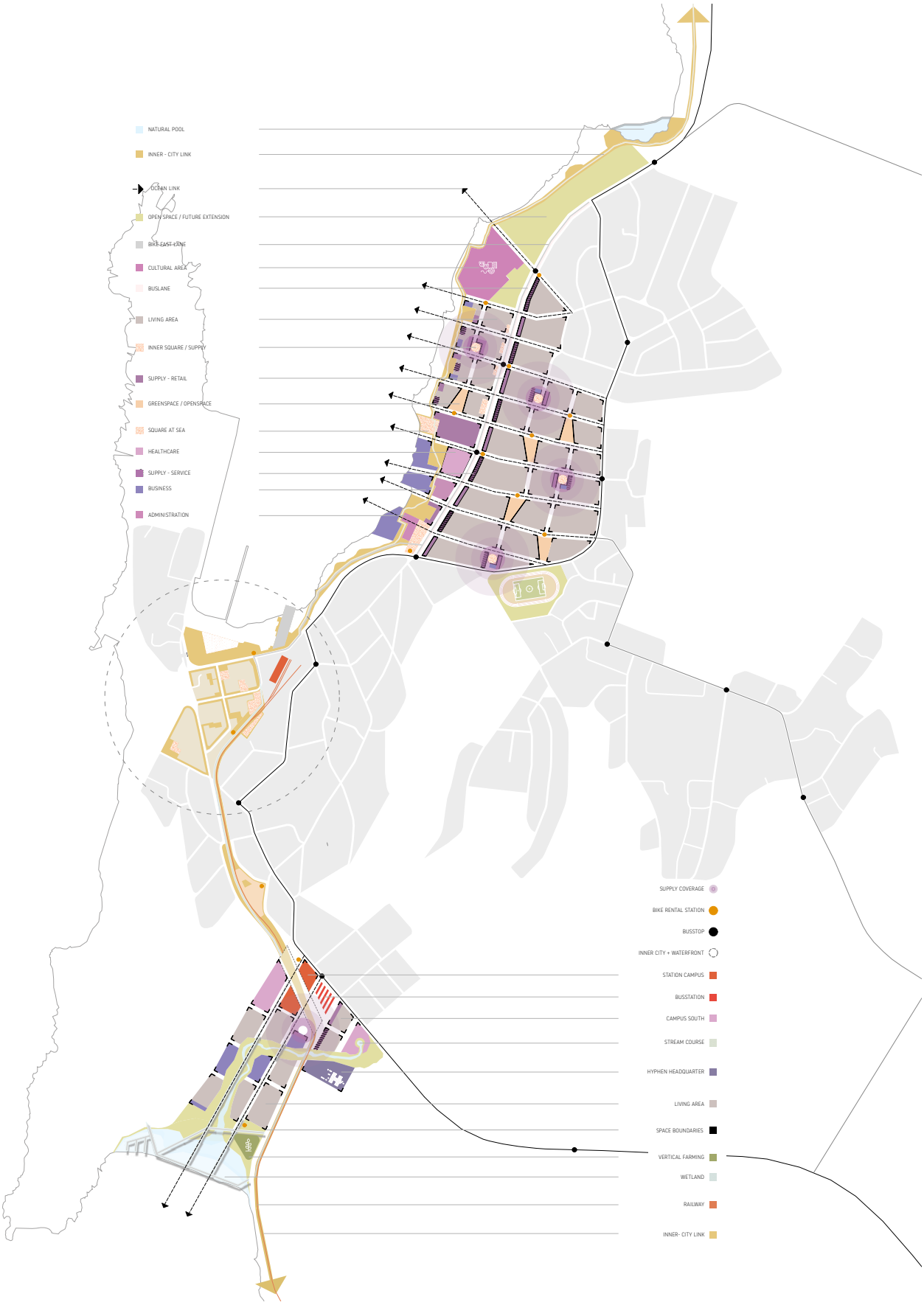
Challenge

Railway
Main station

Concept Layer



Bus line
Bus line 2
Bus line 3
Bus stop
Bus station
Railroad station

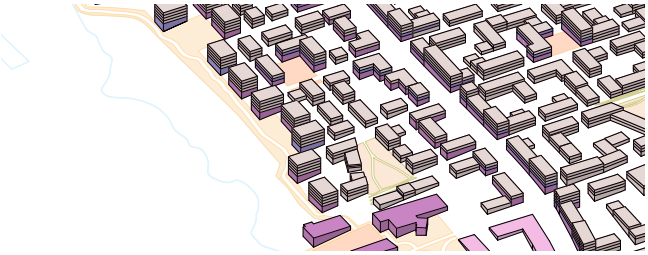


Conceptual Plan

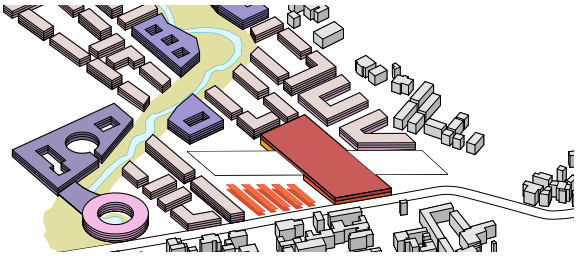
KEY FIGURES

Plot Coverage: 56%
Floor Area Ratio: 1,08

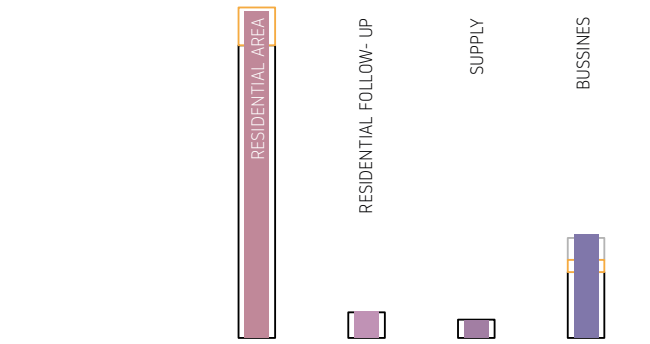
Inhabitants: 6343
Residential units: 2537



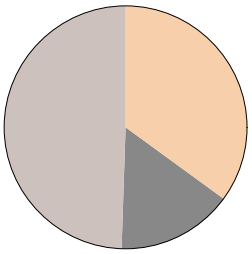
Usage distrubution, Ocean View



Usage distrubution, Campus



	RESIDENTIAL AREA	RESIDENTIAL FOLLOW- UP	SUPPLY	BUSSINES
is state	389.000m2	268.000m2	22.000m2	14.000m2	85.000m2
repurposing	18.000m2				- 18.000m2
demolition	- 41.000m2	- 31.000m2			- 10.000m2
shall state	330.000m2	-240.000m2	- 21.000m2	- 15.000m2	- 54.000m2
difference	0m2	= -3.000m2	= 1.000m2	= - 1000m2	= 3.000m2



Net Building Land = 33,2 Ha = 49%
Public Open Area = 23,5 Ha = 35%
Public Traffic Area = 10,4 Ha = 16%

Total Planning Area = 67,1 Ha

Figure Ground Plan: Interventions

Figure Ground Plan: City Structure

ARCHITECTURAL VISION

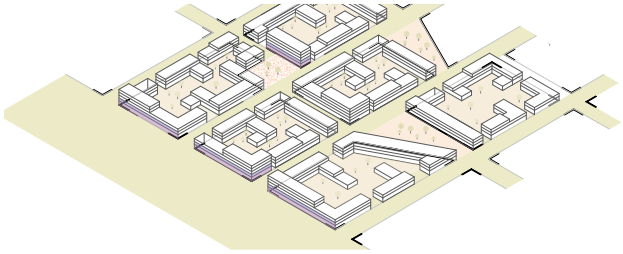
The planning area is in a region where it can get very cold at night and very hot during the day. The location on the Atlantic Ocean also means that there are often strong winds.

The new typologies respond to these climatic conditions. An introverted, nested block structure creates courtyards and terraces that are shaded by the buildings themselves. In addition, the nested structure provides protection from the strong winds.

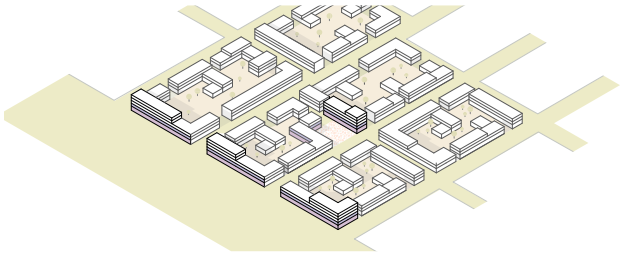
The use of solid building materials with a high thermal storage mass, such as clay or natural stone, provides a buffer effect through the thermal properties of the materials. The heat is absorbed during the day and released at night, which leads to a significant improvement in the indoor and courtyard climate and promotes the project in the long term.

In the upper construction area, the buildings form a clear back to the traffic-calmed main street. The development loses height the further one moves from the main street into the interior of the residential area, as well as in the direction of the inner courtyards.

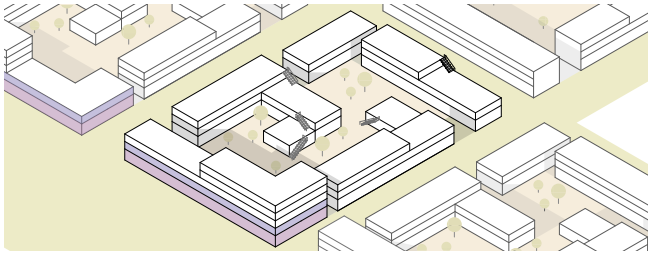
In addition height points are located at the squares, to act as guides to the local supply.



Space Boundaries



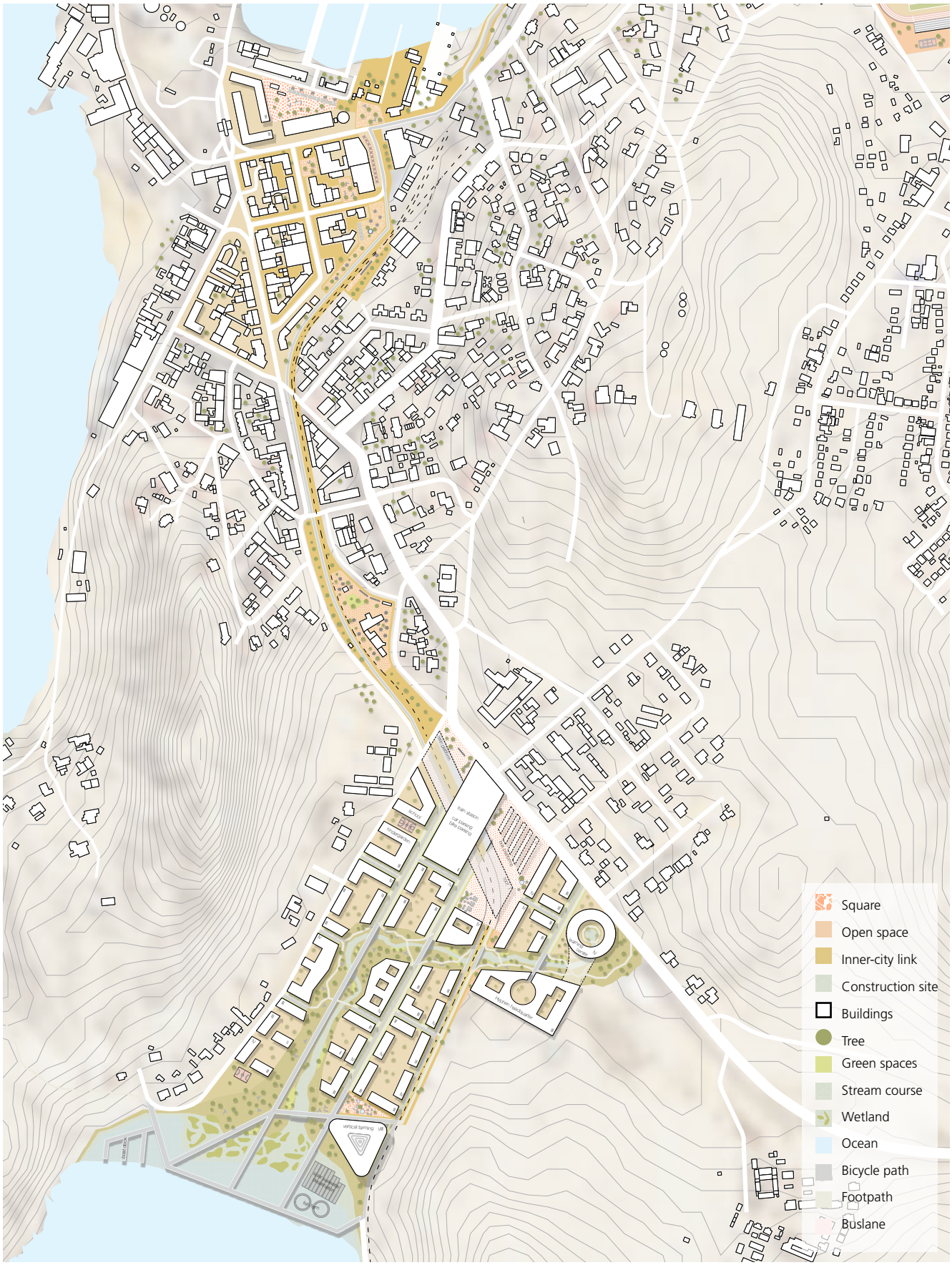
High Points



Building Structure

Visualisation Inner Courtyard

Master Plan: Ocean View and inner-city



Master Plan: Inner-city and Campus

NET ZERO / SUSTAINABILITY

In order to achieve the goal of sustainable urban development in line with the Net Zero City concept, we have developed seven key action areas.

Given Lüderitz's barren landscape and challenging climatic conditions, water management plays a critical role in the success of green open space design. Therefore, we devised the most passive irrigation system possible for both the northern and southern neighborhoods. This uses the condensation of fresh water at strategic high points to provide irrigation through the sloping terrain.

By establishing food production in the form of centralized and decentralized agricultural concepts and a fish farm, food dependency is to be reduced and the urban population is to benefit from the development impulse through the cooperative projects.

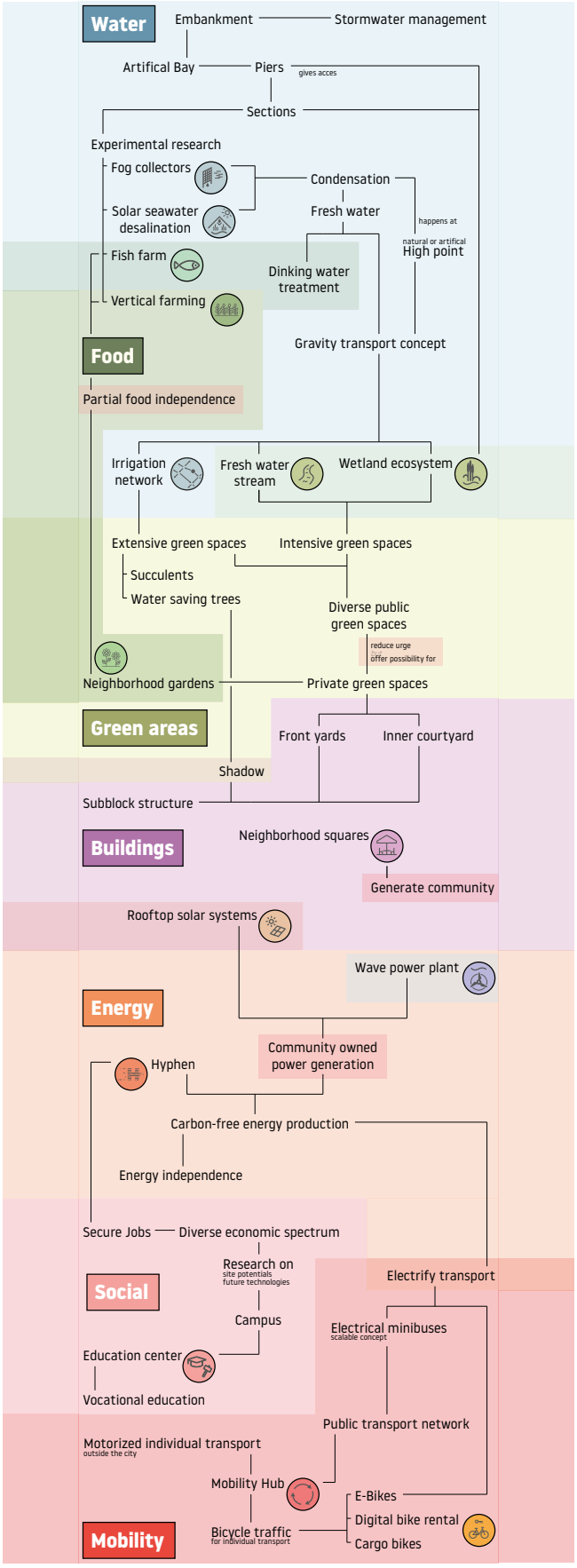
Due to the scarcity of water and the need for irrigation, green spaces have so far appeared mainly in the private sphere of better-off residents. Therefore, we advocate the establishment of public green spaces, which goes hand in hand with a democratization of green spaces. At the same time, we offer the possibility of creating private and communal gardens in the courtyards of our apartment blocks.

By working in partnership with Hyphen Hydrogen Energy, secure jobs are available to initiate economic development as a first step.

At the same time, our campus is geared towards cooperation between tradesmen and educational institutions. Within this framework, research on innovative concepts in the field of Net Zero development will also take place. Through this specialization and the use of local potentials, a further economic and social improvement is to be achieved.

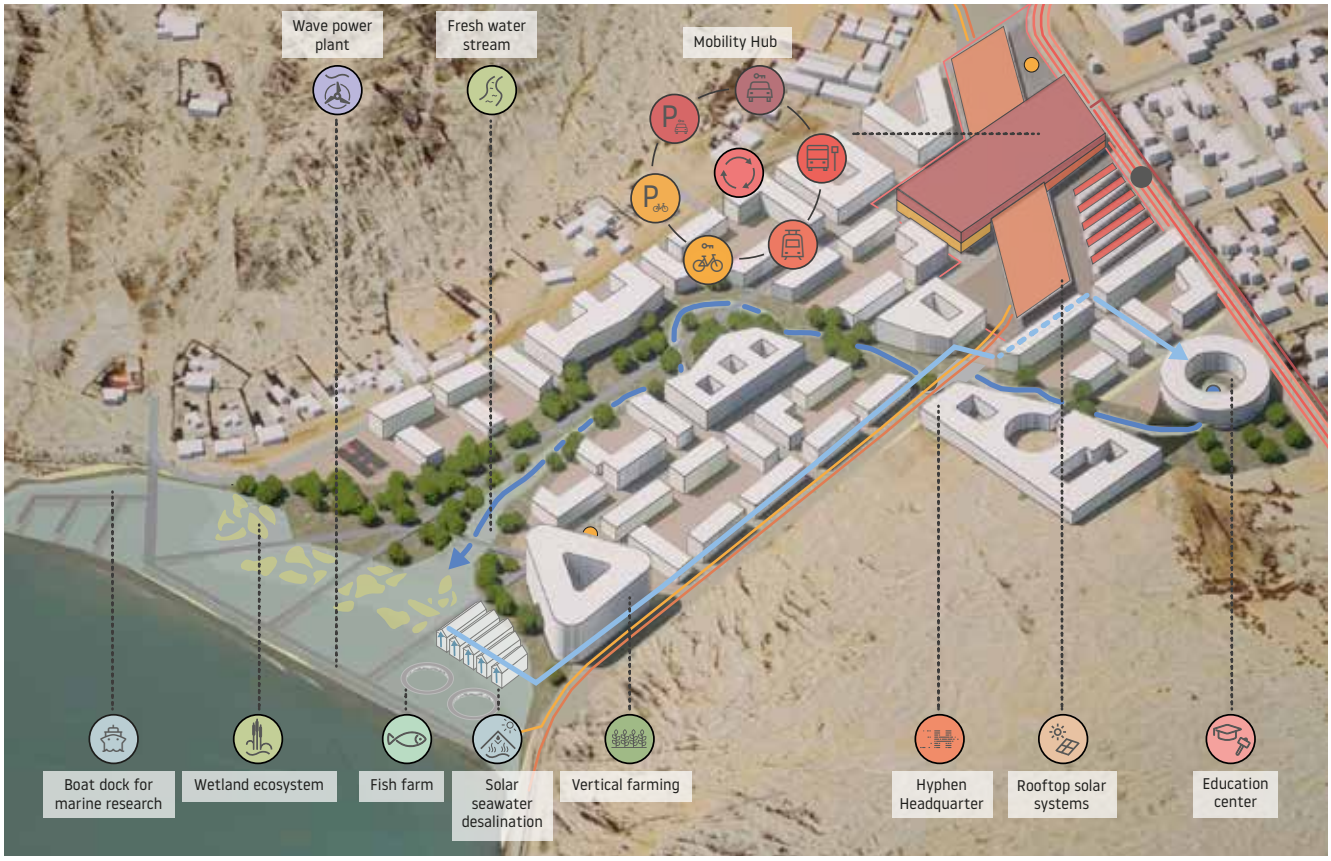
Lüderitz's energy independence is to be ensured by feeding in surplus energy from Hyphen power generation and from cooperative power generation plants. By utilizing the excellent site potential, Lüderitz can make a significant contribution to the expansion of CO2-free power generation both locally and internationally.

By offering CO2-free electricity, we propose a change towards an electrified mobility concept. This reduces the use of motorized individual transport to traffic in the hinterland of the city. A mobility hub with a parking garage is planned at the entrance to the city to enable the switch from hinterland traffic to the urban network. It serves as an interface from the automobile to the bicycle and public transportation in the form of bus and train.



Net Zero Concept

Net Zero Concept, Ocean View



Net Zero Concept, Campus

Harbour Horizon

Anne Maas, Luisa Weber

DEPARTURE

Between the fragmented settlements and the mountain hills, two new neighbourhoods will be developed in Lüderitz, offering an attractive life for the new residents. North of the old town, the new harbour district will stretch along the coastline, to achieve a stronger connection to the harbour. Additionally, a dense urban district will be created at the border of the old town, serving as a second focal point. This area will also act as a link connecting the adjacent regions.

The coast will feature attractive recreational areas along a long promenade. This greenway will unite the new neighbourhoods with the old town, creating a new sense of unity.

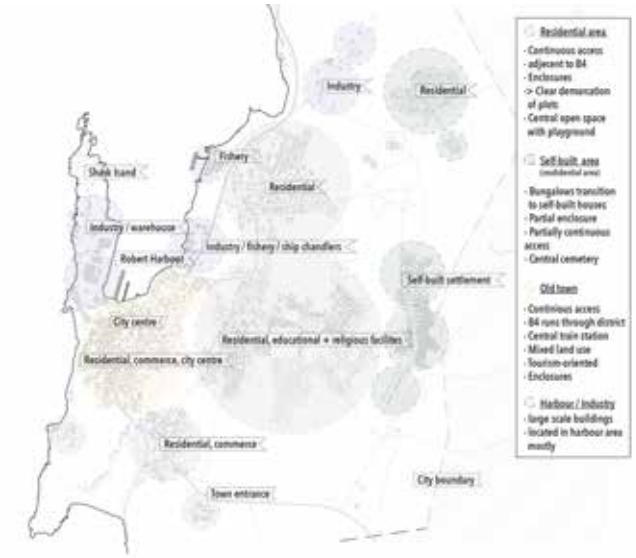
ANALYSIS OF THE EXISTING STRUCTURES

Lüderitz is an isolated small town in Namibia, situated directly along the coast of the Atlantic Ocean. It is one of only two major port cities in the entire country, with more planned for the future. There are connections to the nearby larger cities of Keetmanshoop and Windhoek, either via the B4 highway or the railway line. Not far to the east of Lüderitz, there is an airport.

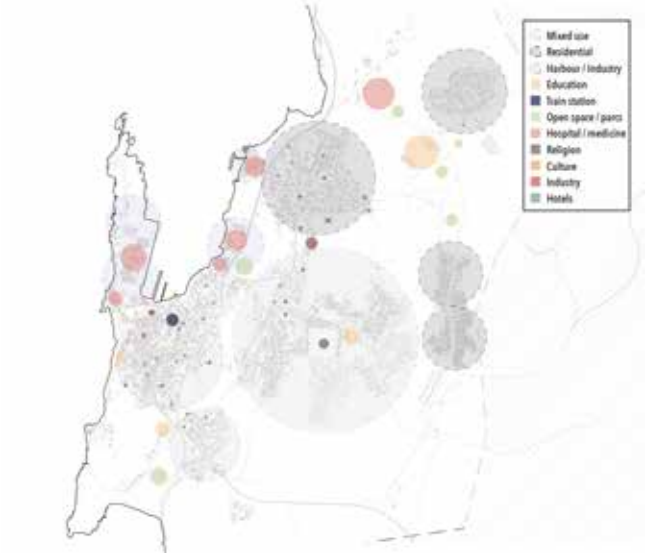
In terms of city structure, Lüderitz's urban landscape is characterized by distinct neighborhoods. These include smaller-scale, dense self-built settlements in the eastern part, traditional residential and mixed-use areas in the central part of the city, the old town, and large-scale industrial buildings around the harbor. As a result, the overall cityscape appears quite fragmented. Regarding land use, it is interesting to note that there is a significant mix of residential, hotel, and commercial uses along the B4 highway. The areas towards the east are predominantly residential neighborhoods, but there is also a larger school center located outside the city in the northeast.

The previously mentioned fragmented architectural structure and its origins become evident and comprehensible when considering the topographical situation. The city was built around numerous topographical high points, which led to its division into various neighborhoods.

Additionally, Lüderitz lacks extensively planned communal open spaces. While there is a lot of greenery visible on the map, it mainly consists of private yard greenery that is not publicly accessible. It's important to note, especially for the architectural



City Structure



Location of Social infrastructure

structure, that Lüderitz experiences strong south winds and has an overall dry climate, with minimal rainfall and instead, very high solar radiation.

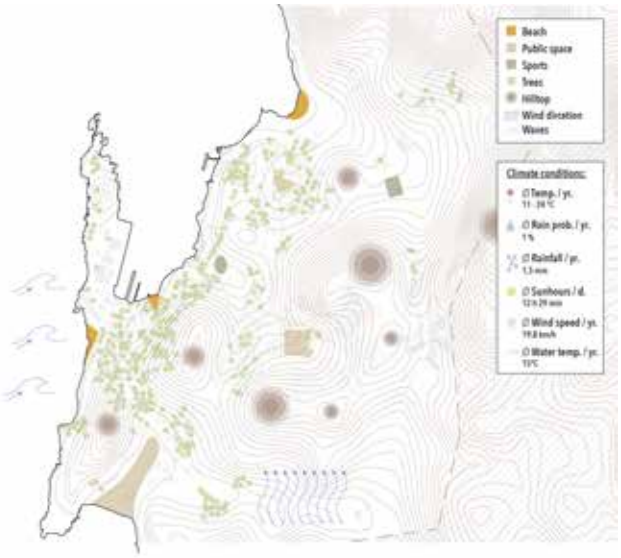
CONCEPTUAL APPROACH

The first concept clearly shows the location of the new planning area and, above all, its pivotal function. The fragmented structure of Lüderitz is intended to be unified, with the new city quarter serving as a link or connection between the various disjointed existing areas. Another important aspect of the concept is to establish and reinforce the connection to the coastline.

Upon analyzing the city neighborhoods, it has been noted that there are several city squares along the waterfront, particularly in the old town, such as the Felsenkirche, the university, the waterfront, and the old town itself. This is an element that should be embraced and further amplified through the new planning area. The goal is to activate the high-quality harbor area and the coastline. Thus, our theme is: Harbour Horizon.

Lüderitz is intended to reorient itself towards the coast and water, leveraging its high-quality harbor location. Additionally, the new planning area serves as a connection between the new city quarter, both internally and with the old town, through the creation of squares and communal open spaces, which have been lacking thus far.

The vision for the future is that we see Hyphen and the Net Zero project as an opportunity to make Lüderitz an accessible city despite its isolated location. We aim to create an urban center for new residents, making Lüderitz vibrant and appealing beyond the scope of the hydrogen project.



Geographical Classification

Concept of the New Area Placing

Concept of the New Area City Structure

FRAMEWORK PLAN

The total area of the new planning area is approximately 54 hectares. The harbor quarter covers a size of 23 hectares, while the slightly larger city quarter spans an area of 31 hectares. Within the new area, various public open spaces are being developed. Towards the harbor, there are notably more public landscaped areas.

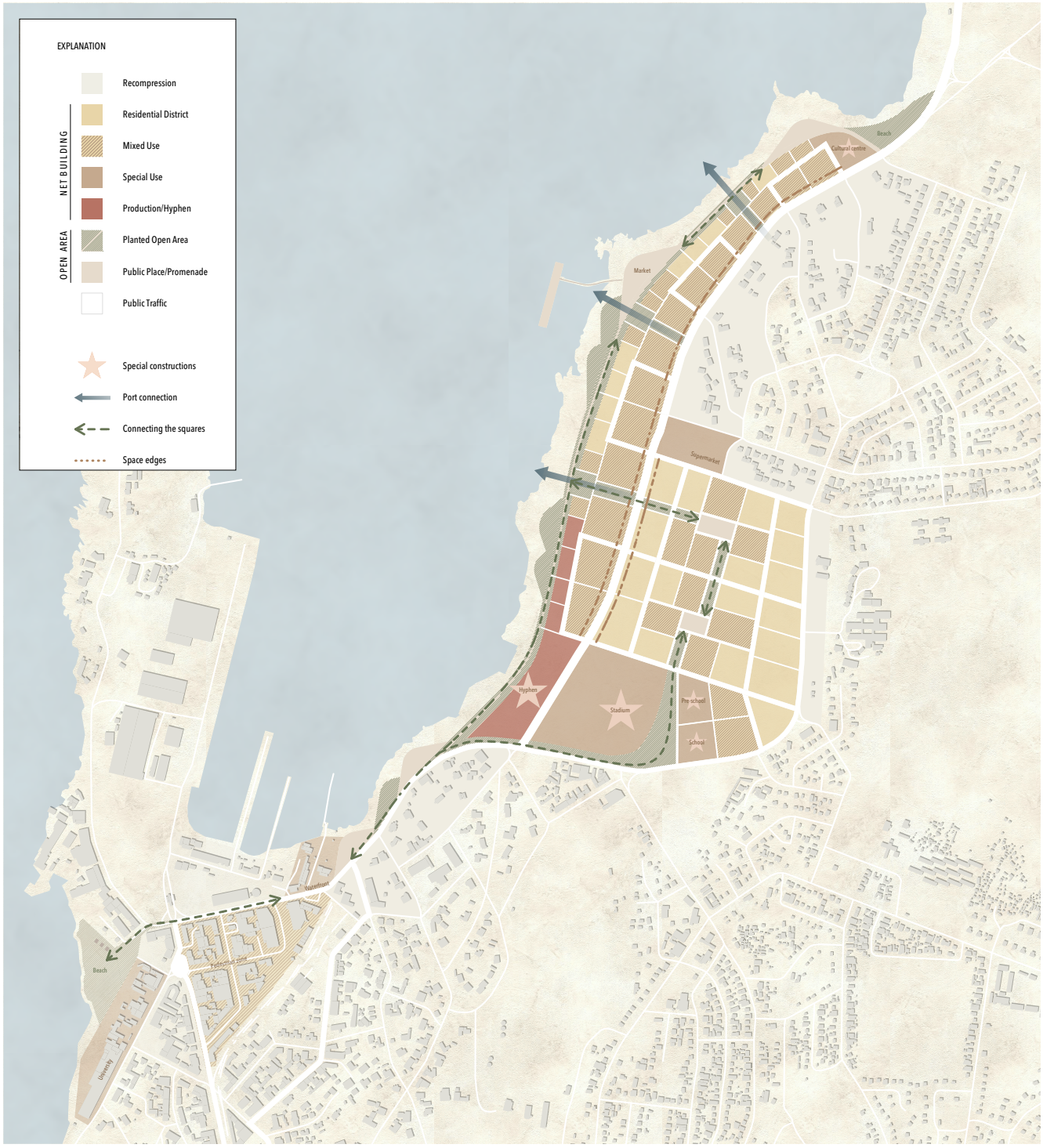
Firstly, there are open spaces expanding towards the water and the coastline. They offer high-quality recreational areas and some are equipped with playgrounds. Along the coast, there are additional public squares like the marketplace or the cultural center, providing space for various types of gatherings.

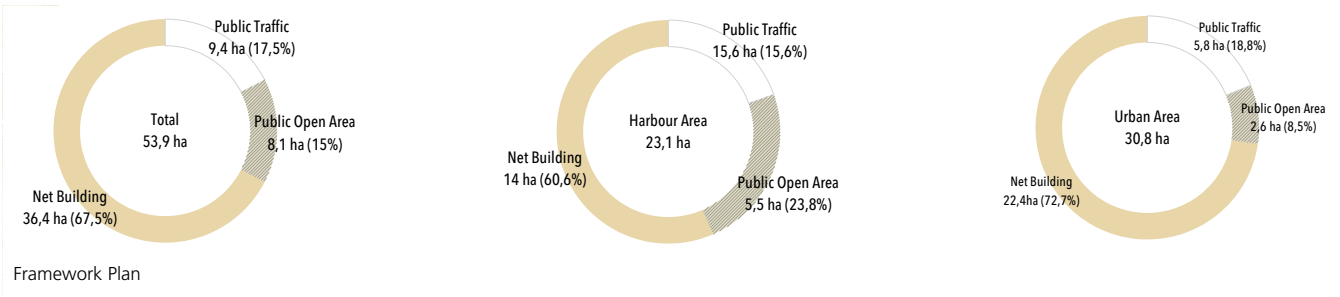
In the city quarter, there are two smaller city squares accessible to both, residents of the quarter and visitors. All these squares are connected through the newly established greenway and the promenade. Coming from the old town, there are also special buildings. In the southern part of the new planning area, there is a sports and education center that serves as a link between the new area and the existing zones.

In the north, directly by the harbor as mentioned earlier, the cultural center serves as a special feature. Through the typologies, new street edges are formed along the road, creating a fine transition to the mostly significantly smaller existing structures. Continuing the greenway that connects the new squares is still a focal point, with the aim of extending it to the old town, thereby linking the old squares together. This approach ensures that the old town can be equally integrated.

This collage creates a memorable impression of the harbor quarter and how the promenade is intended to be utilized. Among other things, cafes and small boutiques are planned to be situated here, revitalizing this coastal area. The greenway, also present along the promenade, serves as a park-like gathering place right by the water and in proximity to commercial and cultural centers. To enhance the quality of stay, the coastal sections are accessible only to pedestrians and cyclists.

Collage Coastline





Framework Plan

THE NEW AREA

The figure ground plan illustrates how the new large-scale typologies integrate into the open space and the gap between the existing buildings. New typologies emerge with dissolved blocks and point blocks along the coastline. Especially along the main access axis, new spatial edges are formed in transition to the existing structures.

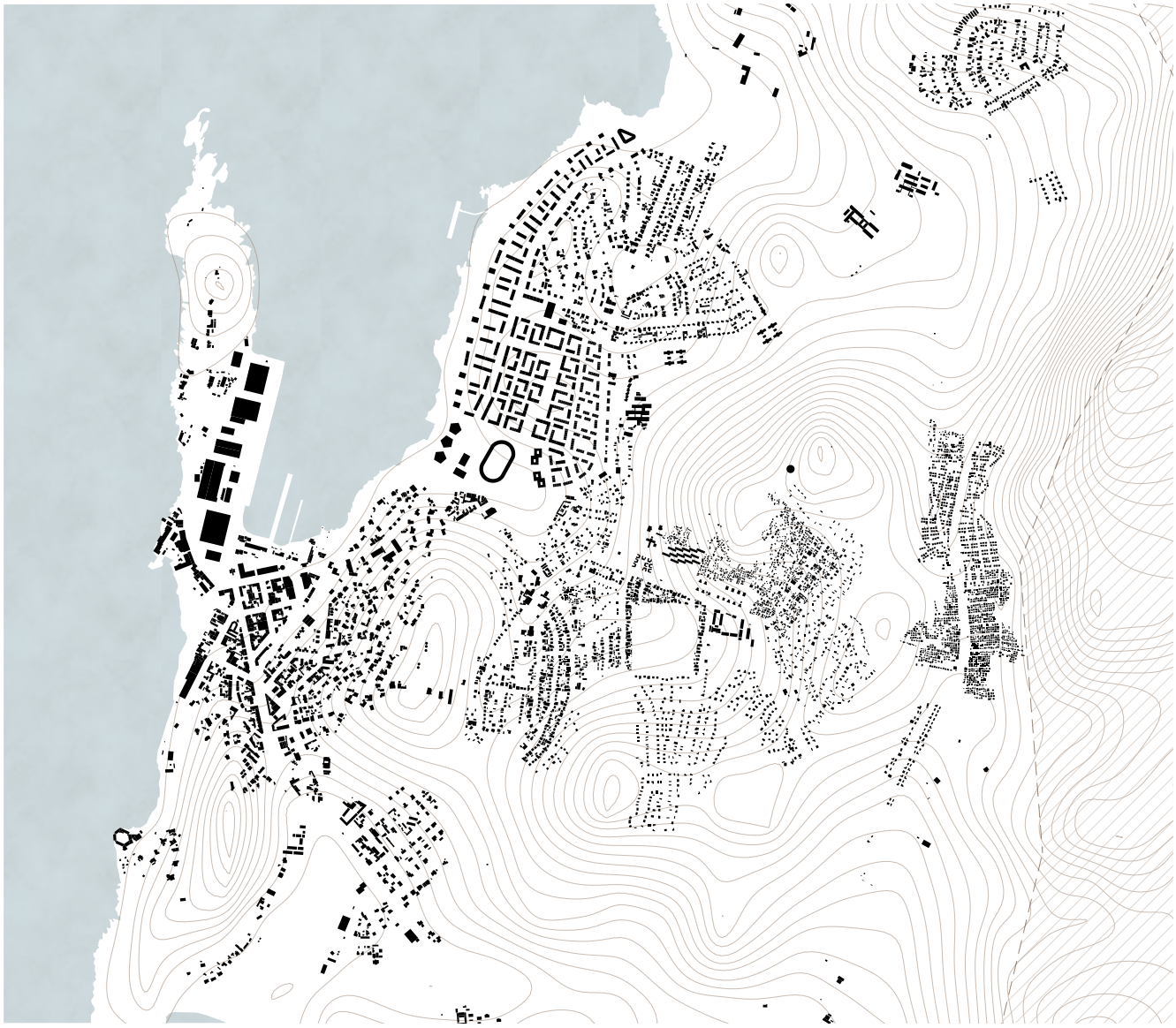


Figure Ground Analysis

RELOCATION AND DEMOLITION PLAN

For the concept of the new quarter, existing harbor-based businesses need to be relocated, and certain residential units need to be deconstructed, with their area being compensated within the new city quarter.

Large-scale commercial structures will be shifted to Shark Island in the west, where buildings of a similar scale already exist. Smaller, non-disruptive businesses will be seamlessly integrated into the new planning area.

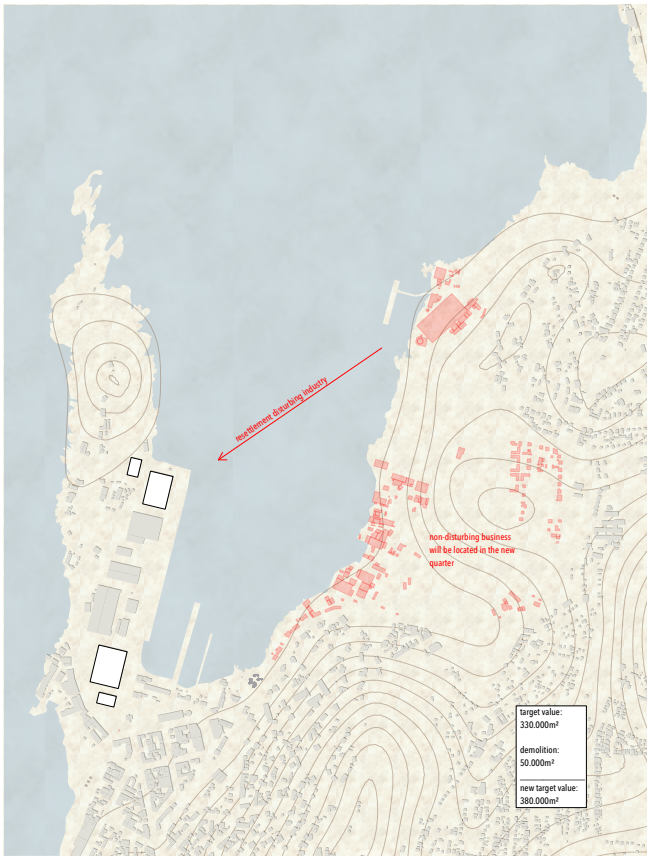
CALCULATION OF AREAS

The area calculation is provided for the entire area as well as for each individual quarter. Both quarters are approximately the same size, although the harbor quarter has slightly more open space than the city quarter and significantly more commercial space. This is intentional, as the surplus commercial activities in the harbor quarter allow for a reduction of such activities in the city quarter, leaving space primarily for smaller local services.

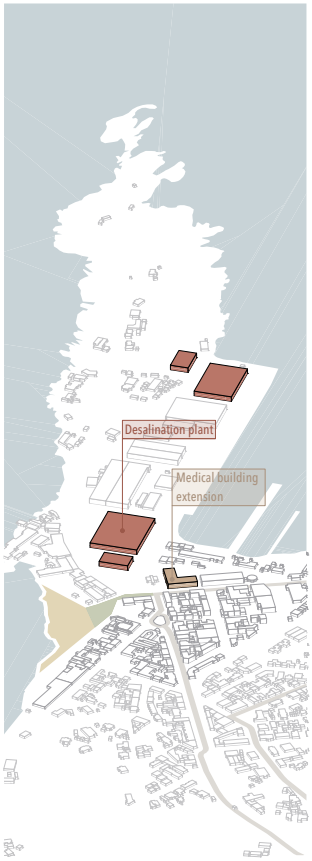
Overall, these measures help adhere closely to the requirements. Concerning the buildings structures, in the harbor district, the block structures will gradually disperse towards the coast and along the coast solitary high-rise buildings with five to six stories will arise. Commercial facilities such as hotels and restaurants will be located along the neighborhood streets of the harbor district, while industries and production will be relocated to Shark Island to avoid conflicts with residential areas. The urban district will remain free of commercial use.

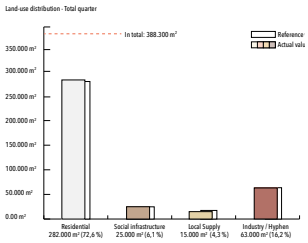
Overall, the development aims to achieve a FSI/FAR ratio in terms of density and footprint:

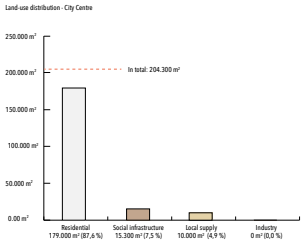
Floor space index (FSI):	Harbour quarter	0.27
	City centre	0.31
Floor area ratio (FAR):	Harbour quarter	0.73
	City centre	0.80

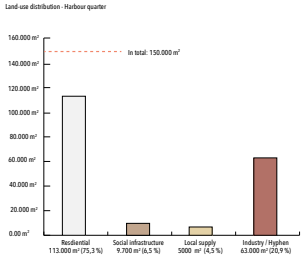


Demolition Plan









DISTRIBUTION OF USES

Regarding land uses and distribution, it can be noted that local service facilities are primarily located along the B4 and around the parking areas. A central provision for the entire quarter is ensured by a large supermarket situated in the middle of the area. The newly established community facilities are designed to mediate between the poles of the quarter, such as the special buildings of the sports and education center. Additional facilities are situated along the expanding greenway in the harbor quarter.

The headquarters of the green hydrogen company, Hyphen, also serves as a unique component with a distinctive form, positioned as a link between the old town and the new planning area, directly connected to the harbor and coastline. This connecting position and proximity to the old town serve as identity markers for the future urban development promoted by Hyphen. Regarding commercial activities, non-disruptive businesses are situated along the quarter streets of the harbor area and along the promenade (such as gastronomy and hotels). This includes cafes, restaurants, and hotels.

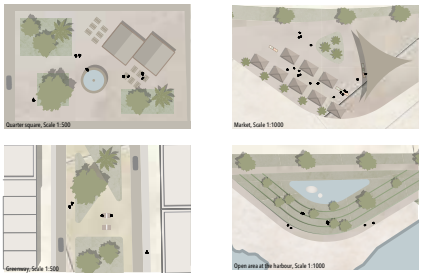
Another large industrial facility is intended to be relocated to Shark Island, where it will create space for a planned desalination plant. This plant is essential to efficiently irrigate the newly planned green and open spaces. The social infrastructure and services are evenly distributed in both areas, with the exception of industry, which is exclusively concentrated in the harbor area.

Distribution of Usage

PUBLIC OPEN SPACES

Among the newly planned public open spaces, there is a differentiation between the squares, each with distinct characteristics. From south to north, the greenway connects all of those elements. This strip also provides smaller sports and recreational opportunities at regular intervals. Additionally, there are city squares within the downtown quarter, which also accommodate adjacent gastronomy or small businesses. This creates small gathering spaces within the quarter where people can come together. To provide shading, all these spaces are equipped with vegetation and pavilions.

Along the coastline, these spaces occasionally open up to small consumption-free recreational areas and also to two larger gathering spaces. Firstly, there's the marketplace at the harbor, offering space for various stalls and featuring a larger market hall inspired by African traditions. Furthermore, the boat docking station is located here. Secondly, in the northern part of the planning area, there's the cultural center with adjacent cultural uses. This space provides room for events like concerts, performances, or other public gatherings.



Public Open Area

MOBILITY CONCEPT

The mobility concept involves the introduction of new public transportation options. This includes two new bus routes, that operate in opposite directions on a 30-minute interval along the new route. This connects all the quarters together, with each bus stop within a radius of 500 meters, making them easily accessible for all residents. During peak hours, such as mornings and evenings when a significant portion of the population commutes to work or school, extra buses will run every 15 minutes. Additionally, there will be sharing options available at the bus stops, allowing for the rental of cars or mopeds.

The commuting routes to the new workplaces established by Hyphen are ensured. This is achieved through the train to Tsaukaib, which takes approximately 45 minutes, and buses to Angra Point, which take about 30 minutes. Angra Point is also accessible by car. For a more efficient route from the marketplace to the docking station, there will be a shuttle boat waterway that significantly reduces travel time, taking about 10 minutes to reach Angra Point.

Mobility Concept

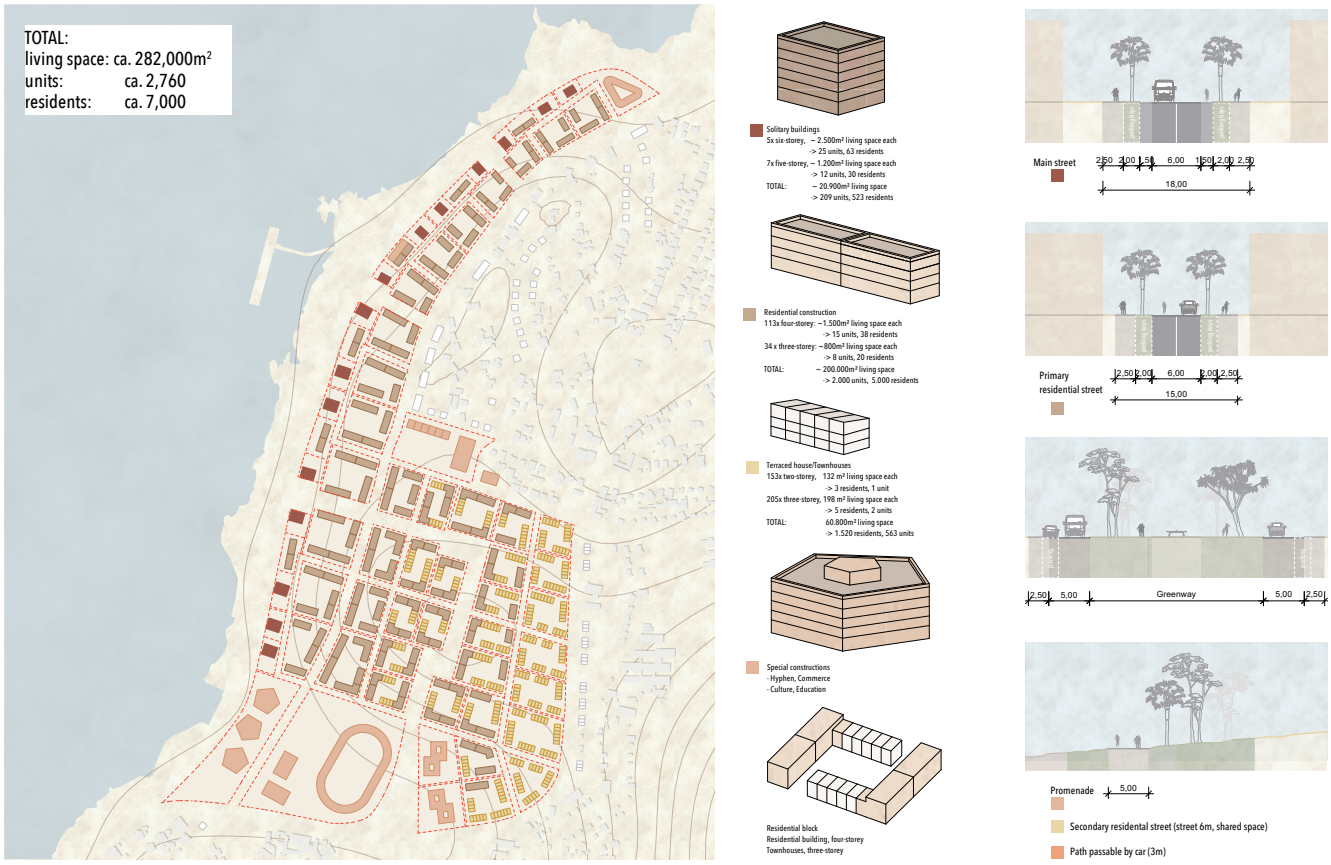
NEW TYPOLOGIES IN LÜDERITZ

The urban planning concept can be summarized as block structures with shared courtyards. These new typologies aim to strengthen the formation of communities by creating spaces where residents can come together. Additionally, the buildings provide protection from the sun and wind, which is crucial in this area.

In the city quarter, a denser development is planned. Facing the street, there will be four-story residential buildings that transition into four-story apartment buildings and then into three-story townhouses. The transition to the existing structures is facilitated by two-story row houses, primarily intended for families. In the harbor quarter, the block structures dissolve towards the harbor. Moving northward, the buildings become smaller and lower, transitioning from four to three stories. Along the promenade, new focal points arise in the form of point buildings with five to six stories. Overall, the new development maintains a sufficient distance from the rugged harbor.

The new Hyphen headquarters serves as a distinctive component with a notable structure, acting as a mediator between the old and new parts of the city. The new planning area accommodates around 7,000 new residents, distributed across approximately 2,800 new housing units. The introduction of new typologies promotes social diversity, bringing together different users with various needs. For instance, families reside in row houses, while singles and couples inhabit the apartments, all within close proximity in the planning area. Half of the residential buildings are planned as subsidized housing.

The collage illustrates how residents in the city quarter share a property and the communal courtyard created by the typology. This fosters quality and lively inner courtyards that bring people together.



Building Structure

Traffic Infrastructure / Street System

Courtyard Collage

TRANSPORT INFRASTRUCTURE

In terms of infrastructure, there are different road hierarchies in place. Firstly, there is a major main road that is landscaped with greenery and features an additional bicycle lane. Secondly, there are neighborhood streets, which are asphalted and have a separate sidewalk. This type of road is designed as a ribbon in the harbor area. Thirdly, there are subordinate streets with cobblestone or gravel surfaces. This implies that this type of road is defined by minimal paving and serves as a shared space, where all types of traffic participants share the same path.

Regarding parking, parking bays are established along the streets. These are situated alongside the greenway or at the edge of the road. Additional communal parking areas are located near the retail and service centre and to the north of the old town, compensating for the car-free pedestrian zone.

Traffic Infrastructure

A SUSTAINABLE CITY

For the sustainability concept, building vertically is one of the most important aspects. Opting for vertical construction instead of spreading horizontally leads to a smaller ecological footprint, reduced land consumption, and significantly less land sealing. The Floor Space Index (FSI) in both areas is approximately 0.3. The Floor Area Ratio (FAR) is 0.8 in the city area and 0.7 in the harbor area. The urban density fosters a city of short distances, and due to the high utilization density, a single space can serve multiple functions, resulting in more efficient usage.

Central facilities for services can be reached by foot from the new quarters within 10 minutes, eliminating the need for cars. This significantly reduces the CO2 footprint. Communities and social diversity are promoted through the new green spaces and typologies, making the city sustainably attractive. Additionally, climate-conscious construction using regional and traditional materials is foreseen, as this reduces the need for foreign imports. The emerging green areas and water expanse contribute to a pleasant urban climate and they support biodiversity.

The aforementioned new desalination plant serves the purpose of irrigating the greenway, thereby reducing the inefficient need for import.

MASTERPLAN

In the master plan, it becomes evident how the new concept seamlessly integrates and, most important, how the existing areas connect with the new planning area. The green elements serve as the main link between the poles, with the greenway starting in the old town with a beach section and ending in the north of the new planning area with another beach section. Furthermore, there are squares along the greenway from south to north. First, parking spaces for the car-free old town, followed by various consumption-free recreational areas for sports activities and relaxation, leading up to the marketplace. To the south of the new planning area, a larger playground is created between the education and sports center.

Sustainability Concept

Social
Lüderitz already has a very young society, and this will be promoted through job creation and other benefits (cultural, social). The exchange among people, for example, during cultural events like concerts at the marketplace, promotes participation and inclusion, and creates a sense of connection between Lüderitz and its population. In our development concept, social diversity also plays a central role, bringing together people of all ages, backgrounds, and financial means to live together.

Resources
Resource conservation and energy efficiency are key topics in terms of sustainability. This includes good waste and water management. For example, it means efficient irrigation of public green spaces in dry regions like Lüderitz or a controlled recycling system.

Buildings
The type of development is adapted to the Namibian climatic conditions, especially wind and sun. This means smaller windows, courtyard situations, and protection against sand encroachment. Appropriate building density (up to 6 stories) contributes immensely to this. Building upwards rather than outwards is emphasized. Furthermore, the mix of usages plays an important role, allowing for market stalls and cultural events to take place, for example, on the marketplace. Local materials (clay, stone) are self-explanatory in terms of sustainability and short transportation distances.

Education
A qualified education in the new southern school center promotes the sustainable development of skilled workers who are better remunerated and, in turn, strengthen the economy later on.

Infrastructure
A climate neutral infrastructure, for example, with green hydrogen-powered buses, helps alleviate climate impact. Furthermore, a thoughtful arrangement of residential, work, and leisure areas leads to short walking distances, rendering combustion engines obsolete. Additionally, Lüderitz aims to provide more space for services such as car or bike sharing.

Economy
With Hyphen as a major economic and trading partner in Lüderitz, the city becomes attractive to other business partners. This, in turn, leads to trade agreements, ideally on a global scale, enabling Lüderitz to establish extensive networks. Within the city itself, improved education and expanded commercial offerings lead to economic diversification, which promotes sustainable and secure economic growth.

Ecology
Parks, green spaces, and the extensive, new green corridor through Lüderitz promote local biodiversity and species richness. The compact building design (2-6 stories) minimizes land sealing in relation to the ground area. Adequate resource efficiency (appropriate building measures) and resource management (land, water, and air quality) further support the ecologically sustainable urban development of Lüderitz.

The special components, including the sports center, Hyphen headquarters, and education center in the south, along with the cultural stage in the north, skillfully frame the newly designed area.

MODEL

The planned greening concept with the continuous greenway and the numerous communal open spaces can be clearly seen in the model images, extending all the way to the old town and featuring distinctive focal points along the promenade. The objective and vision for this urban project in Lüderitz is to create a thriving global city where urban life is seamlessly integrated in an innovative manner, enhancing the quality of life for its residents.

Model - View from North

Model - View from South

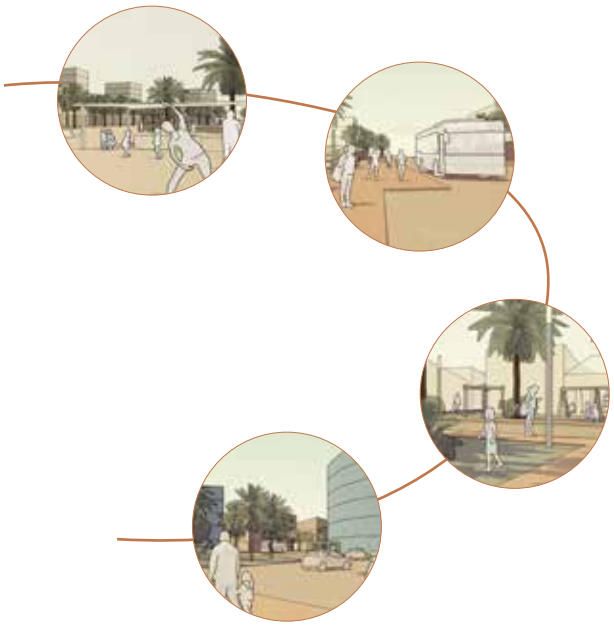
Master Plan

String of Urban Pearls

Raminta Horst, Claudia Lehmann

CONCEPTUAL APPROACH

The urban development concept "String of urban pearls" draws a realistic vision of the future for the Namibian port city of Lüderitz at the South Atlantic Ocean. Respect for the existing and its careful further development are at the center of the considerations. In the "String of urban pearls" concept, the ring road stands for the chain, while the urban quarters are strung along it as pearls. This chain can be supplemented by further pearls in the future. The current planning proposes four different planning areas, three of them further develop existing areas and one of them forms a new representative city entrance. These areas should be impulse generators and initiators for future developments. Each district has its own special focus and thus contributes to a harmonious and diverse city.



String of Urban Pearls

SOCIAL INFRASTRUCTURE

The existing social infrastructure in Lüderitz is concentrated in the historic city center, while educational institutions such as primary schools, secundary schools and also kindergardens were distributed equally over the hole city.
Looking from outside the story, you find a missing context between the residential settlements and the historic city center.

In the future the loose settlements should come together as connective quaters with individual emphasis on housing and social activities. Therefore every pearl along the string has its own attraction points. Some of them already exist, four new ones will be added with that concept and some of them need to be developed further in the future.

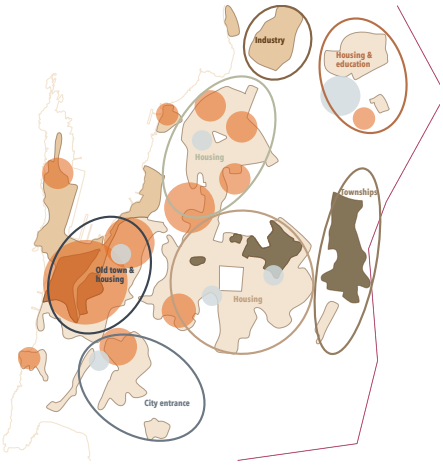
MOBILITY

Existing roads will be upgraded to a ring road to ensure a seamless connection between all neighborhoods. The disused rail network will also be reactivated and extended to the port to optimize the import and export of goods.
The new neighborhoods will be complemented by new public parking spaces. A new bus connection along the ring road will foster environmentally friendly transportation. It will allow residents to conveniently get to their work in the city or to the Mobility Hub. From there, other bus connections to the various workplaces outside the city will be established. New bicycle and pedestrian paths are being created to act as shortcuts between the various quarters.

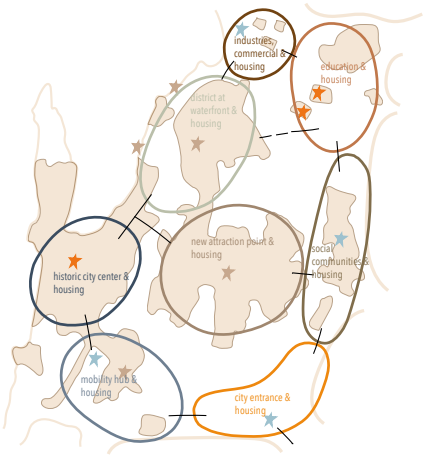
LANDSCAPE AND OPEN SPACES

The landscape around the Lüderitz is hilly and characterized by rocky formations. The existing settlements are therefore located in the flatter areas between the rocky hills and look disjointed in the aerial view. Urban growth is limited by strong topography and rocks around the settlements.

To guide and limit future urban growth, the natural topographic boundary is introduced as a belt that limits urban growth. Open spaces within the belt are preserved and can later be used for sustainable urban development and redensification of the city.

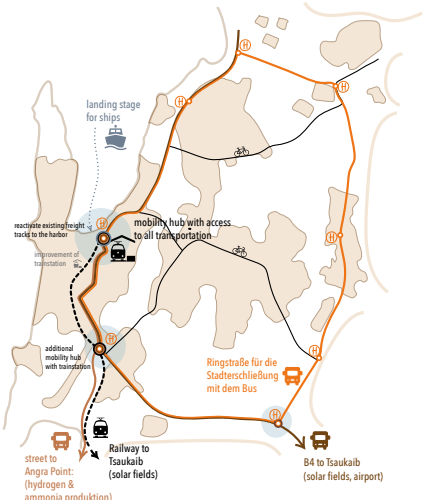


Analysis Social Infrastructure



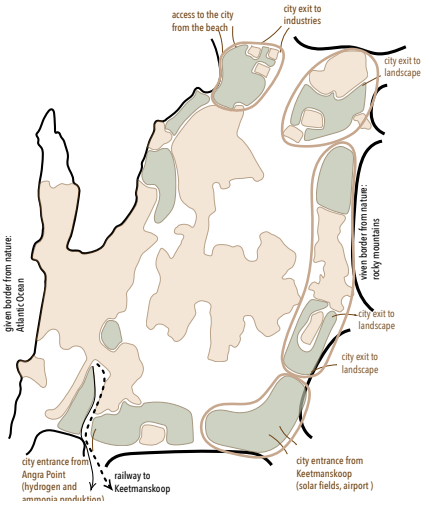
Design Goal Social Infrastructure

Analysis Mobility



Design Goal Mobility

Analysis Landscape



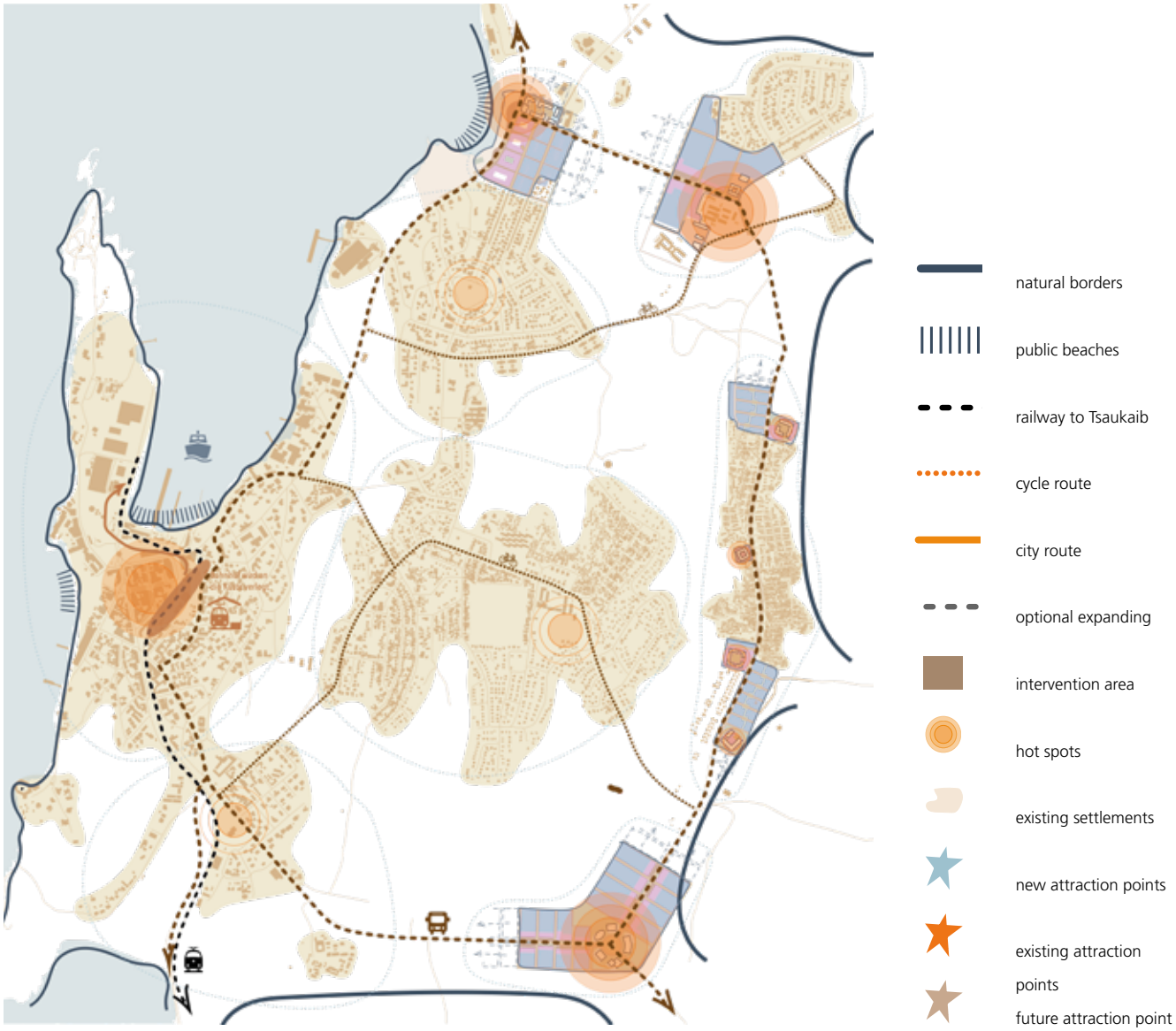
Design Goal Landscape

URBAN DESIGN

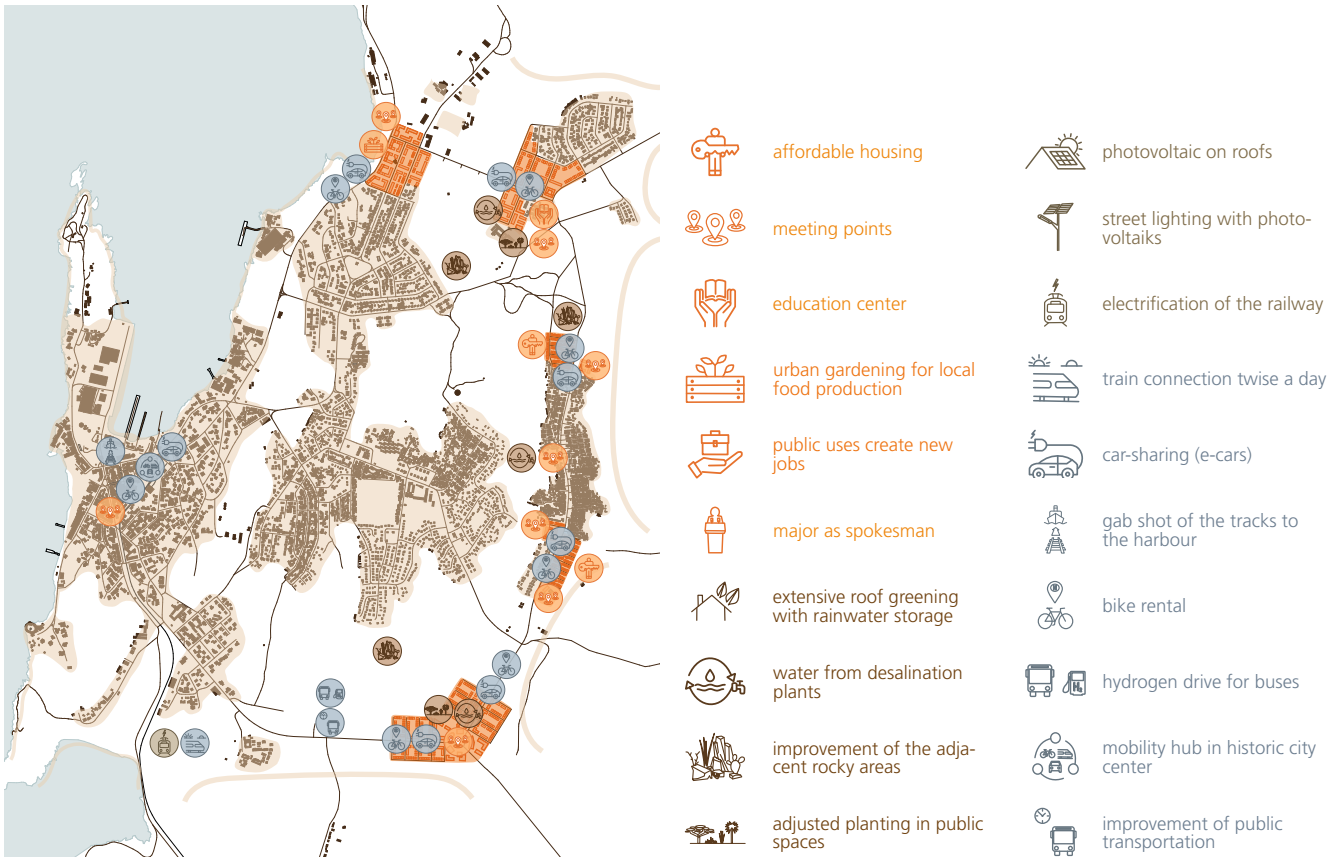
Four new neighborhoods are envisioned within the topographic ring, each with its own thematic focus: Innovation, Education, Self-Building with social communities, and City Entrance. These neighborhoods are designed to grow in the future, as indicated by the dashed lines in the plan. Also new neigbourhoods along the ring road can be established in the future.

Local amenities will be evenly distributed among all neighborhoods so that residents can find all necessary goods and services in their vicinity. Public facilities are organized along the ring road to meet the needs of the new neighborhoods and provide an easily accessible infrastructure. The arrangement of the buildings helps to provide a certain intimacy to the residential areas located in the rear. By creating new points of attraction in neighborhoods, they become initiators for their development. The targeted focus on innovation, education, self-building with social communities, and urban city entry fosters a diverse and vibrant environment that can develop organically and sustainably.

This holistic concept will make Lüderitz a place that not only blends harmoniously with its natural surroundings, but also represents a vibrant city with clear identities and attractive offerings for its residents and visitors. Its role as a major center will thus be strengthened, enriching the region and radiating out to the surrounding towns and settlements.



Concept Plan



Sustainability Concept

SUSTAINABILITY CONCEPT

The sustainability concept for Lüderitz comprises four overarching themes: Energy, Social affairs, Ecology and Mobility. These topics are intended to help leading Lüderitz sustainably into the future and improve the quality of life of the population.
In the field of energy, renewable energy sources are used to ensure sustainable self-sufficiency. The use of solar and wind energy or other renewable sources helps to reduce dependence on non-renewable resources and minimize environmental impact. The one-time investment enables the permanent use of the infinite resource of the sun and thus creates a stable basis for further urban development.

The topic of social affairs includes various offers and assistance for the population of Lüderitz. Social support and integration programs are being established to strengthen the social fabric and promote equitable coexistence. Educational and health facilities are being expanded to meet the needs of the residents.
In the area of ecology, emphasis is placed on the sustainable use of local resources. This means using local plants and materials for exterior design and landscaping to preserve and enhance the natural beauty of the surroundings.

In terms of mobility, various sustainable means of transport are offered to make traffic more environmentally friendly. These include bicycle rental, hydrogen buses and electric trains, which are an environmentally friendly alternative to conventional individual transportation by car.

Overall, the sustainability concept for Lüderitz is intended to contribute to making the city ecologically compatible, socially just and economically viable for the future. The aim is to achieve a sustainable balance between the needs of the population and the protection of natural resources in order to create a livable and sustainable city for future generations.

FOUR QUARTERS:
INNOVATION HUB

In the Innovation quarter, which is the only neighborhood with access to the sea, public amenities will be created to further enhance the attractiveness of the coastal area. This will enable residents and visitors to fully enjoy the proximity to the sea and participate in a wide range of activities.
The architecture on the waterfront shows a repetitive design, which is completed by the distinctive buildings of the Hyphen consortium, creating a harmonious overall picture.
The Hyphen headquarters, located to the north, serves as an important ring road diversion point. The street structure of the residential streets has been absorbed and adapted from the existing residential neighborhood to ensure fluid connectivity and interlocking as well as optimal accessibility.
The courtyards along the ring road, which are flanked by commercial buildings, are lively meeting places that are used in many different ways. They are open to the public and provide space for meetings, activities and events that make the neighborhood a vibrant center.

Overall, this design creates a lively innovation quarter with a unique maritime charm, while the Hyphen Quartier acts as a linking point between outlying industry and housing. The mixture of uses enhances sustainable and broad further development for a modern urban quarter.

Visualisation Waterfront Innovation Hub

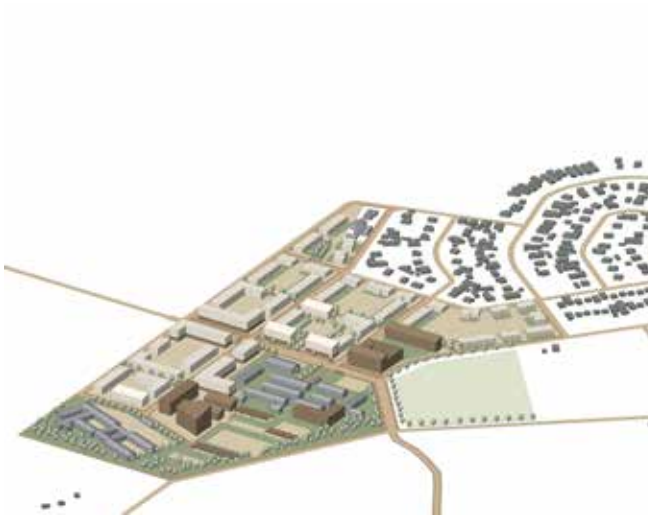
Concept Layers

Masterplan Innovation Hub

FOUR QUARTERS:
EDUCATION CENTER

The education center was integrated into the new concept, with the existing schools remaining with a central role and supplemented by additional educational facilities. The generous open space was used to enhance the outdoor space with various recreational activities and sports fields. This creates a vibrant place that inspires students and teachers alike and provides a diverse educational environment both indoors and out.

The utilities have been strategically placed along the ring road to ensure convenient accessibility for residents. Behind this zone extends the residential development, which buildings lose height in the direction towards the existing buildings and thus adapts to them. This creates a harmonious connection to the existing residential area and at the same time a pleasant living atmosphere in the back of the public buildings that blends seamlessly into the surroundings.

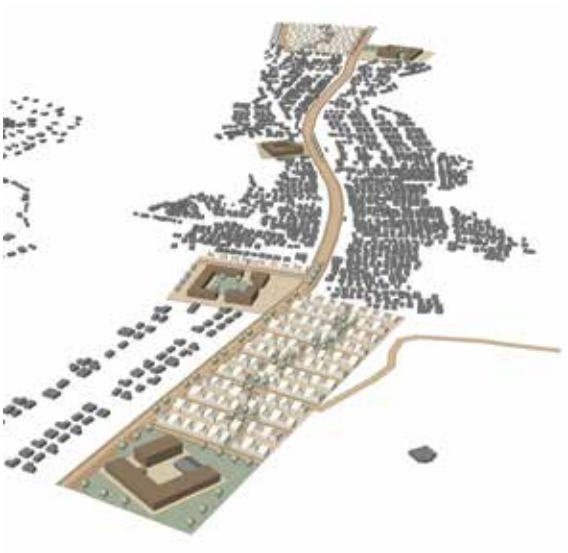


The education center thus becomes a vibrant place of knowledge exchange, creativity and togetherness, while the residential development offers a quiet and pleasant retreat. At the same time, the educational offering is not limited to pure schooling, but also includes a professional training center and opportunities for professional development.

Visualisation Bus Stop at the Education Center

Concept Layers

FOUR QUARTERS: TOWNSHIP



The township is dominated by single-storey residential buildings, which dock directly onto the existing self-built houses and develop them further in an intelligent and modern way to create interactive neigbourhoods. In addition, there are four special buildings with service facilities that stand out strikingly from the surroundings due to their block structure. These special buildings offer various social services and serve as important contact points for residents.

An important feature of the self-build settlement is the integration of social facilities, which can also be used by the residents who already live there. This creates a harmonious and inclusive community in which all residents can support and interact with each other. The main goal of the self-build neighborhood is to provide affordable housing for low-income people. This neighborhood was deliberately designed to meet the needs and opportunities of this group of people and to provide an affordable quality of life.

The self-build settlement thus becomes a place of solidarity and social cohesion, where people from different backgrounds find a home, support each other and live together. This diverse and inclusive community enriches the entire urban fabric and contributes to the social and economic stability of the city of Lüderitz.

Visualisation Neigbourhood Square in the Township

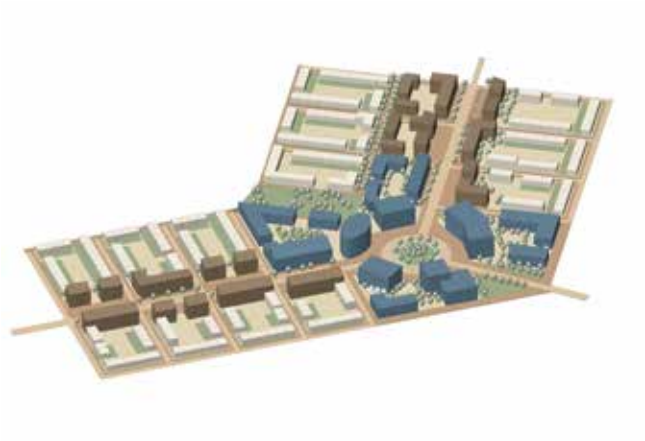
Concept Layers

Master Plan Township

FOUR QUARTERS:
CITY ENTERANCE

In contrast to other quarters, the city entrance of Lüderitz will be completely newly built, as there are no existing structures here. This quarter should to be characterized by a higher density and an urban character. Furthermore it will introduce a new city gate to represent a developing and flourishing african city on the base of a environmentally friendly concept.

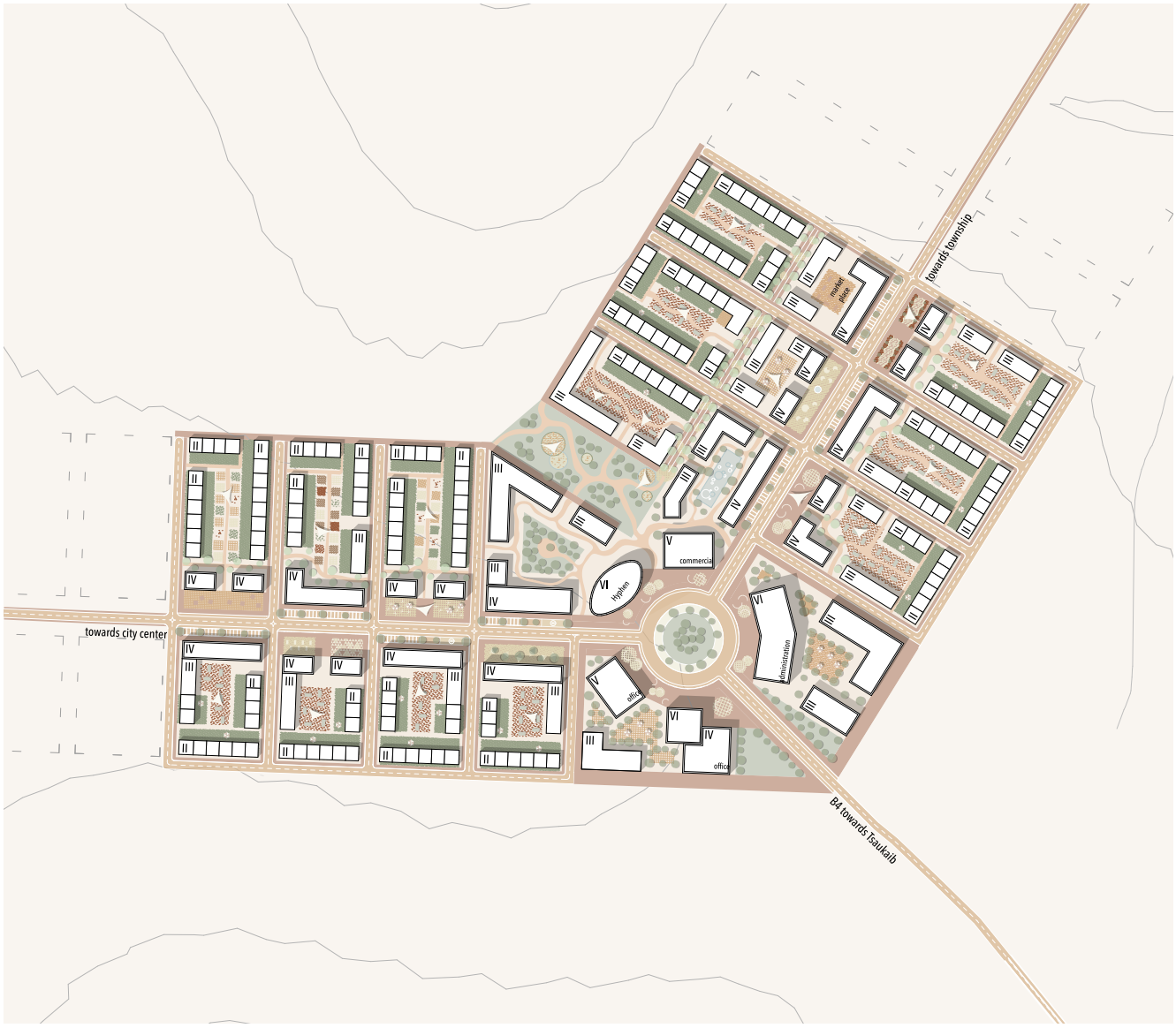
Along the roundabout which marks the entrance to the city, prestigious office buildings will be built to create an impressive backdrop and welcome visitors upon their arrival. These architectural structures will represent the city and leave a lasting impression on visitors. Social infrastructures will be located along the two main streets which are part of the ring road. Public institutions such as restaurants, cafes or shops are located on the ground floor. They will make the street a vibrant place of social interaction and communication right next to environmentally friendly traffic on the base of green hydrogen.



This quarter will show how a future city can combine green mobility with livable streets and neigbourhoods. The quarter at the entrance to the city will thus become an important flagship for the city, reflecting its cultural diversity, economic strength and open hospitality. It is intended to impress visitors and residents alike and help ensure that Lüderitz is perceived as an attractive and cosmopolitan destination.

Visualisation Representative Buildings at the Roundabout in the new City Entrance

Concept Layers



Master Plan City Entrance

Imprint

NET ZERO CITY - A City for Green Hydrogen in Namibia

MASTER STUDIO SUMMER TERM 2023

EDITORS

Prof. Markus Neppl, Dr. Manuel Giralt

STUDENTS

Alexander Hubert Albiez, Aimée Marie Issaka, Anne Birgit Maas, Atanaska Rosenova Chausheva, Claudia Lehmann, David Tarrago, Johannes Peter Kautzmann, Kyra Weis, Lisa Podkalicki, Luisa Clara Weber, Madalina Maria Posea, Marcel Manuel Erdmann, Mario Pitschmann, Nicolas Matthias Klemm, Niklas Wittig, Raminta Horst, Sabine Franziska Tröger

LAYOUT

Dr. Manuel Giralt, B. Sc. Jiyoung In

With the exception of photos and graphics with source references, all presented work is made by architecture students at Karlsruhe Institue of Technologie (KIT).

CONTACT

Karlsruhe Institute of Technology (KIT)
Institute for Urban and Landscape Design
Chair of Urban Housing and Development
Prof. Markus Neppl

Dr. Manuel Giralt
Architect and Urban Planner AKNW
Senior Lecturer and Researcher (KIT)

Englerstraße 11
Building 11.40, Room 016
76131 Karlsruhe

Tel: +49 721 608- 4 2181
E-Mail: manuel.giralt@kit.edu
Web: http://stqp.iesl.kit.edu/
Web: http://www.kit.edu/index.php

DOI: 10.5445/IR/1000168301

Karlsruhe, 21.09.2023

Europe has pledged to take the lead in climate protection. Germany has also set ambitious targets to meet this commitment, aiming to be carbon neutral by 2045. For the foreseeable future, however, there will not be enough renewable energy generation and storage capacity to meet domestic demand. Therefore, additional alternative energy sources from abroad will have to be used. Green hydrogen is a promising option for importing renewable energy. For this reason, large-scale green hydrogen projects are being initiated in several countries. One of these projects, which has received much media attention, is located in the south of Namibia, in the hinterland of the port city of Lüderitz, a windy and sunny region which offers favourable climatic conditions for producing renewable energy.

Within a few years, the project is expected to create up to 3,000 jobs in Lüderitz and increase the population by around half. The dynamic growth of the town, combined with the ambitious goals of the overall project, is an opportunity to develop the expansion of Lüderitz as a model carbon-neutral town.

This documentation of the urban design master studio in 2023 summarises innovative concepts for a Net Zero City, combining a diverse mix of uses and sustainable urban development. In „what if?"-scenarios, these projects demonstrate the qualities that carbon-neutral urban expansions can offer and the potential synergies that could be realised in interaction with existing urban structures.