Urban Design

Thesis project May 2024

Refshaleøen

Quintessentiel Copenhagen?

MSc04 URB 2024
Group 06

Abstract

This thesis explores the sustainable transformation of Refshaleøen, and urban area in Copenhagen with a rich industrial heritage, into a dynamic and resilient urban district. Through a four-month intensive study, we have engaged with the complexities of urban design, integrating environmental sustainability with urban development. The project was inspired by an idea competition for Refshaløen´s development. The potential construction of Lynetteholmen, which presented both challenges and opportunities for sustainable urban design.

Our methodology included desktop analysis, field studies, case studies, mappings, and theory research, focusing on urban transformation through the lenses of Catalytic Design, Public Domain, and Sustainability. We examined the balance between dense urban development and the preservation of open spaces, proposing innovative solutions such as green roofs and blue transition zones to enhance biodiversity and contribute to the green shift.

The thesis presents a vision for Refshaleøen that respects its industrial past while fostering a community-centric and nature-inclusive future. We propose strategies for environmental sustainability, such as creating green footprints and restoring blue transition zones, to support marine life and enhance the urban experience. The project underscores the importance of cultural preservation, community engagement, end environmental stewardship in creating functional urban spaces that resonate with their inhabitants.

In conclusion, this thesis contributes to the discourse on urban design by offering insights and recommendations for the sustainable evolution of Refshaleøen and similar urban environments. Our work reflects a commitment to designing cities that meet the needs of both people and the planet, emphasizing the integration of culture, community, and ecology in urban spaces.

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Authors	Frederikke Tvermoes Høgild Contact: frede.tvermoes@gmail.com Tomas Olsen Contact: tomas.ol@hotmail.com

Frederikke Tvermoes Høgild

Tomas Olsen

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Etymology

The name Refshaleøen originates from the Danish word 'refshale'. It is originally the name for a piece of land, in Danish 'rævs-hale' (fox-tail), with an elongated shape (Ejlersen, 2024). In English, a similar term would be peninsula (a type of island that is connected to a larger landmass through a smaller point).

01

Introduction

Chapter Introduction

This chapter sets the scene for the thesis by introducing its background, framework, and methodology. Additionally, it will also presents the problem statement that guides the research.

The Story Behind

Introduction

This report is the result of two people's work on a master's thesis of 30 ECTS credits within Urban Design at Aalborg University. The work on this thesis began in early autumn of 2023, earlier than the usual start of the semester in February. During an internship, one of the authors was introduced to a project through an open competition (see pp. 12 for more information). Inspired by the competition's focal point, both authors decided to embark on a project on a much larger scale than previously undertaken in their respective programmes. Together, they chose to transform and develop Refshaleøen for their final master's project.

The following sections will elaborate on the motivation behind their shared interest in large-scale design, particularly in relation to Refshaleøen. The thesis will also present the specific framework of the project, including the competition that forms its basis, and describe how they managed the extensive scope within a four-month period.

Motivation

Initially, there was some uncertainty about the theme of our master's thesis project, but we found our direction upon encountering the idea competition for Refshaleøen's development in autumn 2023 (By & Havn, 2024). This competition sparked our interest and provided a framework that aligned with our desire to work on a large-scale project. As a result, we decided to go for developing a masterplan, of some sort, for Refshaleøen, with the aim of being able to contribute to the next competition focused on the island's structure plan.

The potential development of Lynetteholmen as a neighbour to Refshaleøen (despite its probable environmental challenges), further motivated us. Recognising that this might not be the most sustainable solution for addressing space constraints and sea level rise (Cortzen, 2023), we focused our project on more sustainable strategies for Refshaleøen. These strategies could not only benefit Refshaleøen but also serve as a guiding framework for the Lynetteholmen project. Our goal is to mitigate the adverse effects of land reclamation in the Øresund, which could have severe repercussions for the Baltic Sea (Cortzen, 2023).

In essence, our project aims to explore sustainable development practices for Refshaleøen that can also inform the ongoing development of Lynetteholmen. By prioritising environmental considerations, we hope to uncover methods for advancing urban development and transformations in a way that is both responsible and forward-thinking.

If we do not change our way of thinking today, how will we be in the position to live responsibly tomorrow?

We kindly ask...

Thesis Framework

Copenhagen is constantly undergoing a major transformation and has been expanding and developing at a rapid pace for many years now. The time has now come for the development of Refshaleøen, once one of the world's largest shipyards, to now being a cultural mecca right in the middle of Copenhagen's harbour.

Based on the rapid growth, an idea competition for the development of Refshaleøen was held in the autumn of 2023. It is this competition that serves as the starting point for this project. In addition, another of Copenhagen's major development projects – Lynetteholmen – also forms the framework for this project.

This future island will be located as an extension of Refshaleøen and will occupy large parts of Øresund. Both the island's close location and the associated side effects of its establishment are the reasons why it is relevant to know about the Lynetteholmen project in connection with the development of Refshaleøen. In the future, these islands will have to be able to function as a unified whole, which is why for example the location of roads and their capacity on Refshaleøen is not without importance.

The Idea Competition 2023

Back in the autumn of 2023, By & Havn, in collaboration with Refshaleøens Ejendomsselskaber A/S (Refshaleøen´s real-estate company), hosted an idea competition regarding the future of Refshaleøen. (For a map of the specific competition area, see appendix 01 on pp. 130). The idea competition is part of a three-phase development process aimed at creating a development plan for the 80-hectare area (By & Havn, 2023; By & Havn, 2024). The three phases involve;

1. Citizen involvement in the form of "Input for Refshaleøen" (March 2023)
2. An open idea competition (autumn 2023)
3. A structure plan competition in the autumn of 2024*

* The conditions for this competition have not yet been released, and whether it will be a 'open' competition is therefore unknown. The conditions are first expected to be released around August 2024.

In connection with the citizen involvement, several visions (see pp. 13) for the island's development were subsequently formulated and written down in the document "Refshaleøen makes Copenhagen bigger – Vision" (org. "Refshaleøen gør København større – Vision" (By & Havn, 2024)). These visions were refined and thus highlighted a range of challenges and questions. The CEO of Refshaleøens Ejendomsselskab, Jes Transbøl, stated in connection with these challenges the following;

> ***We need the best ideas to handle them so that we can prepare to ensure the best possible structure plan for Refshaleøen as the next major step***
>
> (By & Havn, 2023)

His statement leads to the following idea competition, the challenges of which became the basis for the competition's five categories in which entries could be submitted;

I. Developing Refshaleøen's creative environment
II. Transformation of Refshaleøen's buildings
III. Development of Refshaleøen's urban nature and biodiversity
IV. Development of Refshaleøen as a mixed neighbourhood
V. Open category

The idea competition was officially closed on the 26 January with a reception at Øens Have (a self-sufficient agricultural company at Refshaleøen). Here, the 23 awarded proposals were revealed and celebrated as the start of the subsequent Ideas Festival, where the 75 submitted idea proposals were exhibited and presented in connection with several small events during the following days of the festival (By & Havn, 2024; Refshaleøens Ejendomsselskab A/S, 2024).

Visions From By & Havn

In January 2023, Refshaleøens Ejendomsselskab and By & Havn jointly presented seven basic principles as a preliminary vision for the development of their combined areas on Refshaleøen. This marked the beginning of a two-year development project for the Refshaleøen (Refshaleøens Ejendomsselskab A/S & By & Havn, 2023).

Interested parties were invited to participate in public workshop meetings and contribute their own ideas and suggestions. At the same time, subject matter experts were invited to challenge the preliminary vision and make their own recommendations. The two companies ended up with a revised vision, now divided into four themes. These four visions formed the basis for the idea competition (autumn 2023) and will be carried forward into the upcoming competition for a structural plan in autumn 2024 (Refshaleøens Ejendomsselskab A/S & By & Havn, 2023). Ideally, the vision will be carried throughout the island's transformation as a guide and direction for the island's development.

1 We want to be able to recognise Refshaleøen in the new neighbourhood!

The creative environment and cultural activities are a focal point for Refshaleøen today and in the future. We preserve and transform all existing buildings, unless special circumstances dictate otherwise.

2 We will take an ambitious approach to the green transition!

We have the ambition to build at least within the voluntary sustainability class and eventually create a new city within the planetary boundaries. We will create a 'forward looking' neighbourhood with public and local services that support CO2 reduction, and an infrastructure where cycling and public transport are attractive and the natural first choice.

3 We want to develop with room for urban nature, movement and strong communities!

We create a neighbourhood where green and blue qualities are prominent in the plan, where there is a focus on biodiversity, and where we establish varied, high-quality urban spaces with access for all. We provide space for sports and movement, support social diversity and work community-orientated with a focus on physical and mental health.

4 We will create an quintessential CPH neighbourhood!

We create a dense and mixed neighbourhood with quirky street patterns, a diverse urban and commercial life, architectural quality and site-specific neighbourhoods with originality, character and urban hierarchy. We develop housing and commercial premises in different sizes, types and ownership forms so that more business, population and income groups can establish themselves on Refshaleøen.

ill. 1 Translated extract from the document "Refshaleøen Gør København Større – Vision", pp. 9

Lynetteholmen – The Salvation of Copenhagen?

Lynetteholmen is planned to be a new artificial island located as an extension of Refshaleøen (see pp. 17) towards Nordhavn. It is planned to have the capacity for 35.000 new inhabitants of Copenhagen and create lots of new workplaces besides acting as new security against future stormwater problems. This is how the politicians and By & Havn sells the project. On the other hand, there are several more sceptical experts, journalists and compatriots, including the southern Swedish region of Skåne (Therkildsen, 2022). One of these sceptical people is the Danish architect Ane Cortzen, whose book "Tænk Os Om" (Think Us Through) (2023) highlights various challenges and major problems with the project. These are largely about nature and the environment, and she questions the credibility of the underlying studies and calculations on which the project is based.

Basically, the project aims to create 2.8 square kilometres of new land in Øresund. It will be used to solve three main problems within the municipality: rising water levels and associated storm surges; increasing traffic congestion; and population growth. Financially, it will be possible by using leftover soil from the municipality's many other construction projects. This is how it was described back in October 2018, when then Prime Minister Lars Løkke Rasmussen and Lord Mayor Frank Jensen presented the visionary project (Cortzen, 2023; Therkildsen, 2022). In the vernacular, however, the project is often much more about politics and status, which often emphasises an underlying political power struggle. The project is forced through politically, while multiple citizens, professionals, neighbouring municipalities, and even other countries are against the project.

The positive and negative aspects

Looking at the effects the project could potentially create, it will naturally alleviate population growth and ease traffic congestion by expanding the transport infrastructure, which will undoubtedly help to facilitate the city´s growth and development. And if incorporated in the structure plan for the island, the new landmass will also create more space for nature on land, making an extension of the green corridor possible, although at the expense of marine habitats.

As most people know, nothing here in life comes for free, and the creation of such a large artificial island does not happen without some kind of environmental effects. Among the more self-explanatory ones is the destruction of a larger marine environment through habitat loss and degraded water quality. In addition, Cortzen also mentions increased CO_2 emissions that will occur in response to the removal of large areas of seaweed (see the paragraph "Blue biodiversity" on pp. 36) (Cortzen, 2023). In addition, around two million cubic metres of sludge or, more precisely, "gytje" (soft seabed material) will be removed from the seabed. This will then be dumped a little further south in Køge bay. It is this dumping that has been criticized by many, including Skåne, as they are concerned about the effect of the dumping onto the seabed in Køge bay, which will ultimately also affect them (Therkildsen, 2022).

An even more important effect in this debate is the consequences of filling up "Kongedybet" (Kings Deep). This is one of two deep channels in the seabed of the Øresund that continues far into the Baltic Ocean. With its underwater stream, Kongedybet brings important salt (saline water) into the Baltic Ocean that is already low on salt in the water. According to Cortzen and several other experts, a deterioration or, in the worst case, termination of this underlying ocean stream could lead to the death of species. Animals and plants that are relying on the salt in the sea to live there. If it leads to a species in the Baltic Ocean going extinct or even just close to, this will then also affect the other countries surrounding the ocean (Cortzen, 2023).

Is it then even worth creating Lynetteholmen if the possible risk Denmark would have to take, can cost the existence of species?

Lynetteholmen as a design factor

A solution to the many negative effects would simply be not to create the island or at least make it a lot smaller and not placed on top of Kongedybet. But since this thesis is not about whether the Lynetteholmen project will happen or not, it only makes sense to assume that the Lynetteholm en will happen, and work with the effects of that. In the further work with Lynetteholmen and its effect on the environment in and around the port of Copenhagen (including Refshaleøen), an important factor will therefore be the incorporation of initiatives, strategies and general design solutions that can help to have a beneficial effect on the environment. This whether the beneficial effects are in the sea, on land or in the air.

ill. 2 Size and location of the future Lynetteholmen island - Scale 1:20.000

Problem Statement

From Framework to Statement

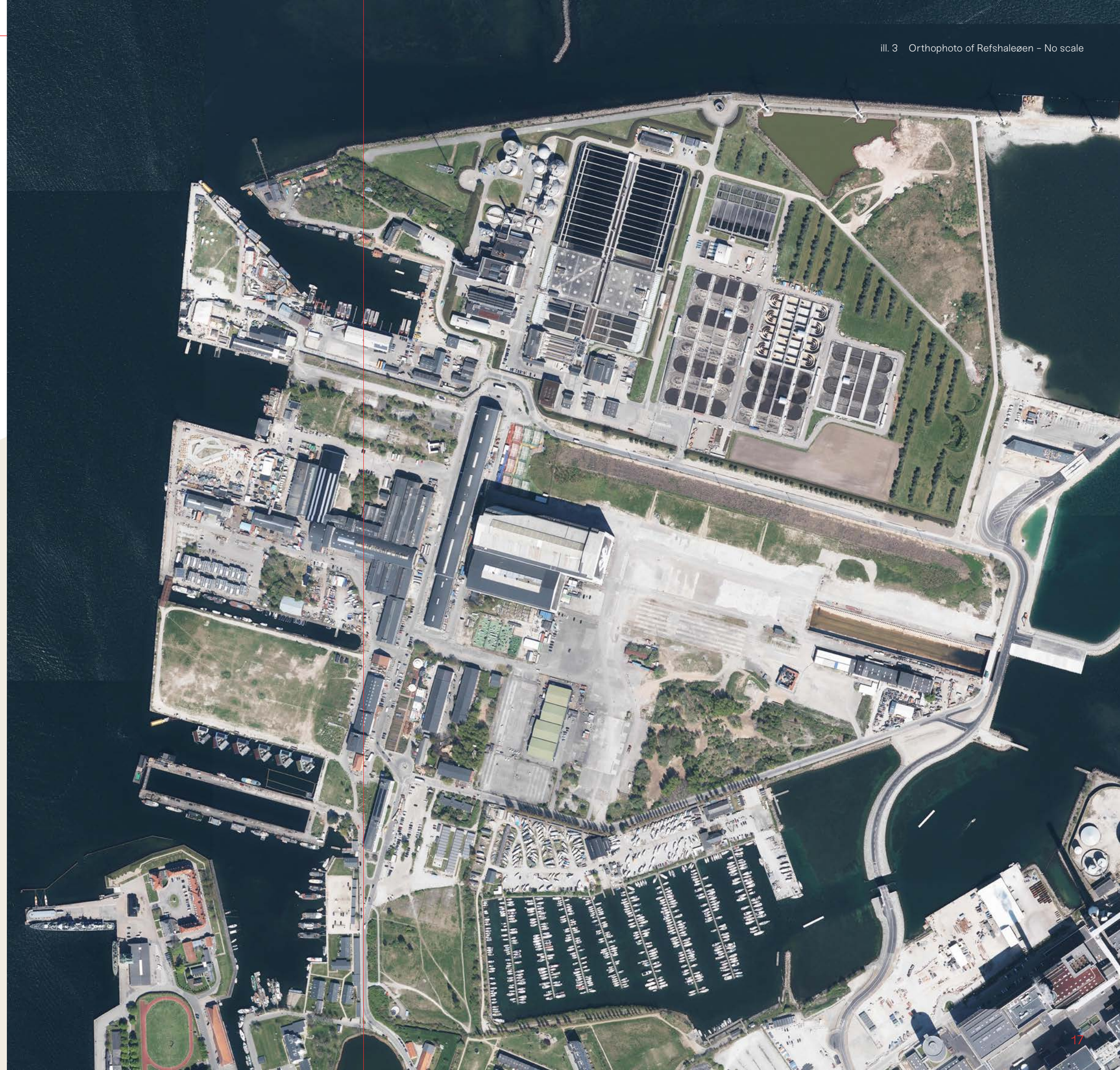
After reviewing materials from the idea competition, studying the Lynetteholmen project, and conducting a thorough analysis of Refshaleøen, this thesis has identified the project area's key challenges and priorities. This process of exploration and analysis has provided a comprehensive understanding of Refshaleøen's context and future vision.

Preserving Refshaleøen's cultural identity while simultaneously fostering sustainability and vibrancy presents a multifaceted challenge. To address this challenge, this thesis aims to explore innovative urban design strategies and community engagement initiatives. By synthesizing theoretical frameworks with empirical research and drawing insights from relevant case studies, the study seeks to develop practical recommendations. Additionally, involving well-founded knowledge and insight understanding in the planning processes will be crucial in ensuring the cultural continuity of Refshaleøen while facilitating its transformation into a sustainable and inclusive urban environment.

”

How can Refshaleøen maintain its cultural identity while becoming a sustainable, vibrant district that attracts a diverse population?

“



ill. 3 Orthophoto of Refshaleøen – No scale

The Approach and Methodology

The Integrated Design Process

The following section will introduce the methods and approaches used in the process to solve the identified problem. The method employed is called the Integrated Design Process (IDP). However, it's important to note that IDP is not simply a method, but also a tool for facilitating the whole process.

The IDP comprises five key phases: problem, analysis, sketching, synthesis, and presentation. One of its key features is its iterative nature, allowing for continual reassessment and integration of new insights by guiding the designer through repeated cycles of these phases (Knudstrup, 2004). How these repeated cycles look like, and which phase(s) is most revisited can vary a lot from project to project. The ideal process would be a straight line but in reality, it is more likely to look like a doodle or a mess.

In this project there have been a special weight on the bond between the analysis and synthesis phase, where the remaining phase have been less in focus.

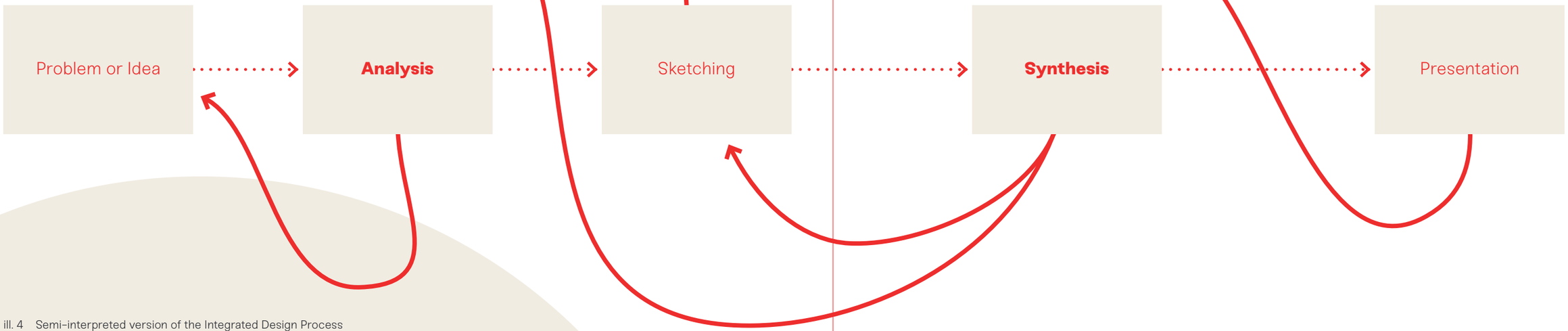
In the *problem phase*, the focus lies on defining the problem statement and vision, with an emphasis on creating a cohesive environment, enhancing site accessibility, and addressing issues related to vacant spaces beneath the tracks.

During the *analysis phase*, studies, site visits, and thorough analyses are conducted to gain insights into the potentials and challenges of the project area. This involves examining structural elements, user demographics, and the phenomenological aspects of the site. Additionally, case studies are reviewed to draw lessons from successful strategies of different kind. It is also in this phase the needed knowledge and theoretical foundation is build.

Moving to the *sketching phase*, design solutions are developed and evaluated, considering both smaller and bigger scales, how they work together and which outcome it may create, positive as well as negative. The aim is to maintain and evolve the identity established at Refshaleøen, while also aligning with plans from the municipality and the outcome from the latest Idea competition about the island.

In the *synthesis phase*, findings from the earlier stages are synthesized to form a cohesive design proposal. This involves revising and refining the proposal to address any inconsistencies or conflicts and incorporating newly acquired knowledge as necessary.

Finally, in the presentation phase, the final (or newest) design proposal is communicated through a written report and visualizations such as renderings, diagrams, plans, and illustrations, etc. The project's solution to the problem statement is articulated across various scales and levels of detail, including physical models, to effectively convey its vision.



ill. 4 Semi-interpreted version of the Integrated Design Process

Methods Employed

When it comes to the used methods in this report, a variety of methods have been employed to comprehensively investigate and address the challenges and opportunities associated with Refshaleøen. Each method has been selected and applied with the aim of gathering essential insights and inform the design process and solutions effectively.

Desktop Analysis

Desktop analysis involves examining existing documentation, data, and information without being physically present at the project site. This includes reviewing existing reports, maps, photographs, the material from the idea competition (see pp. 12 for the competition) and other available resources to gain an understanding of Refshaleøens characteristics, history, planned developments, etc.

Field Study / Site Visit

A field study or site visit involves physically visiting the project area to gain first hand insights and observations. This includes recording structural conditions, topography, existing activities, and usage patterns, as well as interacting with users and stakeholders on-site. In this case, this method was applied several times through spring. Each time with new knowledge and a new purpose, reflecting upon the impressions and observations of previous visits with, for example, new knowledge about user functions, the character of the area or general changes over time.

Case Studies

Case studies involve examining similar projects or situations to learn from past successes or failures. This involved analysing other similar urban areas, former industrial facilities, and experimental design projects to identify effective strategies and best practices.

Mappings

Mapping is the process of visualising and organising spatial data and information. This involved creating maps of the area's infrastructure, usage patterns, social interactions, stakholders and other relevant factors to gain a deeper understanding of the Refshaleøen's dynamics.

Theory Research

Theory research involves exploring relevant theoretical concepts, principles, and approaches within areas such as urban planning, architecture, social sciences, and design, among other things. This included exploring the theoretical framework of urban planning (in general) and what a sustainable understanding is. From these, several other theoretical concepts and theories emerged and were further elaborated, such as temporary design, catalytic architecture and Urban Heat Island Effect (UHI). All this to inform the design process and identify relevant guidelines and trends.

02

Theory

Chapter Introduction

This chapter introduces the theoretical framework that underpins the final outcome of this thesis. From this, the main theme Urban transformation will be presented and elaborated through three underlying theories. The chapter will end with a conclusion on how to handle urban transformation.

Sustainable Urban Transformation

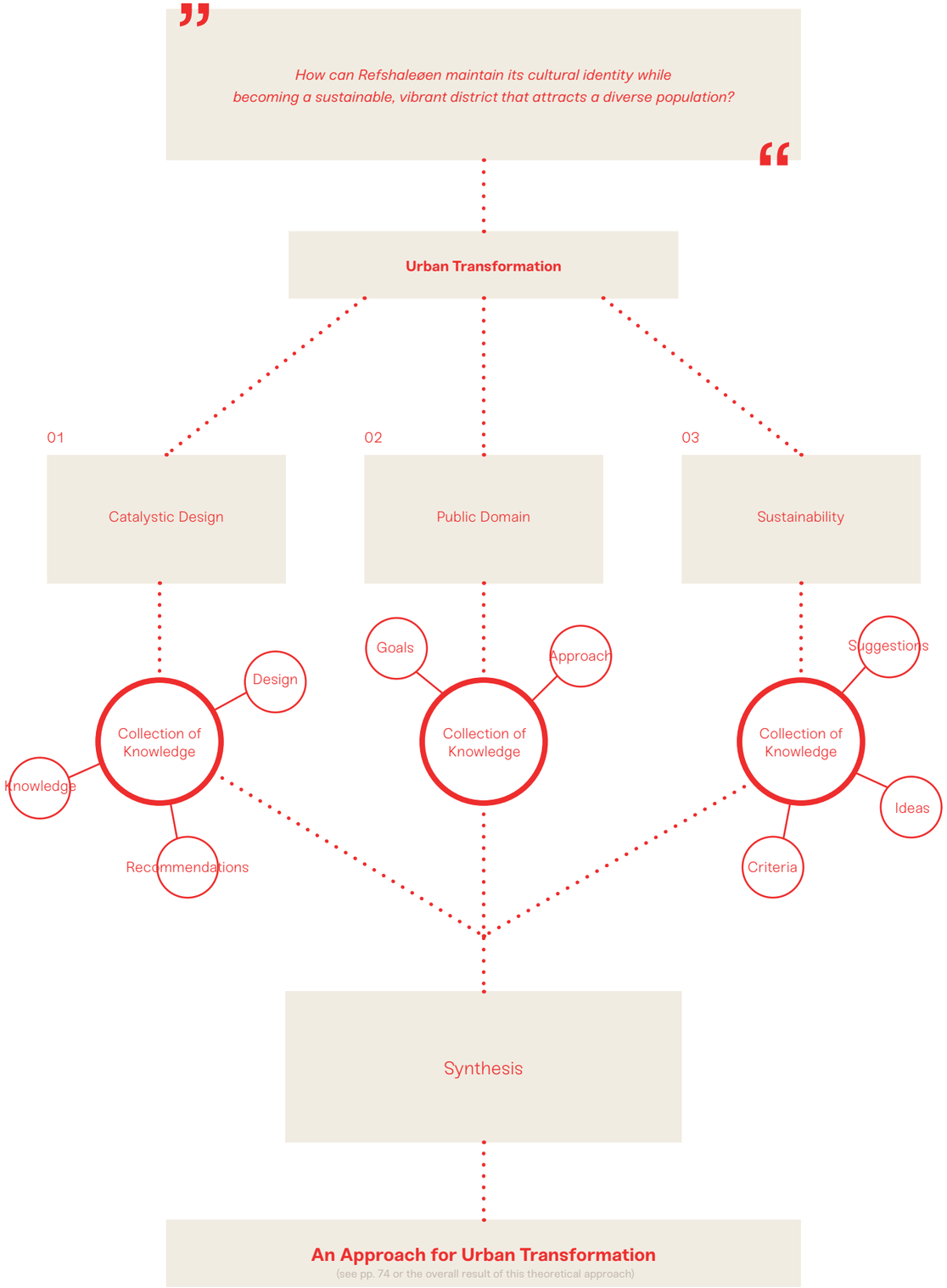
What is An Urban Transformation?

Urban Transformation is a multifaceted concept that lies at the heart of how cities evolve. This chapter delves into the complexities of Urban Transformation, which is necessary to understand, to be able to fulfil the problem statement outlined in the previous section. It narrows the problem statement to its core and highlights the three key aspects Catalytic Design, Public Domain, and Sustainability that are central to this exploration. This is also illustrated by the diagram on the opposite page.

These aspects serve as essential tools in orchestrating successful urban transformations. Catalytic Design draws from principles of Catalyst Architecture and temporary design, while Public Domain encompasses considerations of community engagement and public space. Sustainability extends beyond environmental concerns to encompass social and economic dimensions as well.

This introduction sets the stage for an in-depth examination of these critical areas. Subsequent sections will delve into the details of Catalytic Design, Public Domain, and Sustainability, providing insights and practical applications. Each section will culminate in a concise summary, highlighting the nuances of applying these theories effectively in the design process.

ill. 5 Diagrammatic understanding of the theoritical chapter's structure



Catalytic Design

Catalytic Design, a term forged to encapsulate the potential of temporary interventions in urban development, serves as a catalyst for positive change and innovation in urban spaces. Drawing inspiration from concepts like Catalyst Architecture and Temporary Design, Catalytic Design is rooted in the transformative power of temporary interventions.

This section delves into the theory and practise of Catalytic Design, exploring its role in urban transformation through relevant works and case studies. The examination is informed by texts such as "*Catalyst Architecture*" (2015) by Hans Kiib and Gitte Marling, "*Temporary Urban Spaces*" (2006) by Florian Haydn and Robert Temel, and "*Performative Urban Design*" (2010) by Hans Kiib, et.al. Additionally, references will be made to research reports like "*Urban Catalyst – Strategies for temporary uses*" (n.d.) by Studio Urban Catalyst to illustrate the practical application of Catalytic Design principles.

Throughout this exploration, the focus will be on uncovering how Catalytic Design, together with temporary interventions, can facilitate development and transformation in urban environments.

Catalyst Architecture

A catalyst, originating from chemistry, is a substance that accelerates a chemical reaction or facilitates a process without undergoing any change itself (Kiib & Marling, 2015). In architectural terms, a catalyst refers to the capacity of an intervention, such as a building or urban space, to engage with its environment, establish new frameworks, or catalyse transformations in both physical and social realms.

The effects of catalyst architecture

Kiib and Marling´s book "Catalyst Architecture" (2015) explores how architectural projects can work as catalysts for positive changes within urban environments. It talks about the potential of architecture to act as a 'power of change' within urban environments

Central to their thesis is the concept of "Architecture as a Catalyst", which refers to the idea that architectural interventions have the power to trigger social, economic, and environmental changes in the urban settings. This approach views buildings and urban spaces as platforms for engagement, interaction, and community development, challenging traditional notions of design and calls for a more integrated and strategic approach to urban planning.

A key insight from the book is the emphasis on 'transition zones', spaces between different districts, neighbourhoods, or social groups – as key sites for catalytic architecture. These zones, characterized by their location on the edges or boundaries of urban areas, have the potential to foster new demographic spaces and promote diverse social groups. Here, architecture operates as a mediator, creating platforms where diverse social groups can interact, thus contributing to the social fabric of cities.

Sociologist Richard Sennett's argues for a similar effect. His argument is that urban spaces and transition zones offer great opportunities to create democratic spaces and emphasises the importance of these areas. Sennett suggests that by enabling interactions between strangers, these spaces can create a sense of community and shared urban life (Kiib & Marling, 2015, pp. 25–26)

As an example of the catalyst architectures effects, a reference can be made to 'Superkilen'. An urban space in Copenhagen.

Case study: Superkilen – Copenhagen

"Superkilen, located in Copenhagen's inner Nørrebro neighbourhood, embodies the concept of 'Architecture as a Catalyst.' Designed by Danish firm BIG in collaboration with Superflex and Topotek1, it was opened in 2012 through innovative collaboration with architects, artists, and the local community (Dansk Arkitektur Center, n.d.)

The urban space is divided into three zones: The Red Square representing modern life, The Black Square celebrating Copenhagen's history, and The Green Park for recreation. Superkilen integrates objects from different cultures, creating a multicultural environment reflecting Copenhagen's diversity.

It has quickly become one of the city's most popular urban spaces, attracting both locals and visitors for social, sports, and cultural events, hence, showing how architecture not only is physical structures, but also potent tools to promote, social, economic, and environmental change in the urban environment.

ill. 6 "Neon sign from Doha, Qatar, at the Black Square" in Superkilen. Photo: Mike Magnussen

Temporary Design

The notion of '*temporary*' design within architecture and related fields challenges the conventional idea that architecture is meant to be long-lasting, while the rise of temporary design reflects a shift towards flexible, adaptable urban spaces. Temporary design encompasses various aspects, from installation to function, catering to diverse needs and contexts.

Robert Temel states in his book *Temporary Urban Spaces* (2006) that »*temporality offers its own qualities*« where the idea of using 'design' for short term uses can offer a strategic tool for process development (Olsen, 2022). In short, it is an approach to urban planning, design and architecture that focuses on temporary actions to create change or new belonging in the urban environment, as well as being an approach, it is also something that can occur unprovoked. An area where the existing function ends, but with no plans for what happens to the area next, the area is left empty. There is a »*Gap in utilization*« as Mirko Pogoreutz describes it in his essay Urban Intelligence from the book Temporary Urban Spaces (2006).

Haydn and Temel introduce the concept and explore various examples of temporary installations and call them »*Alternative planning methods*«. These temporary elements can include everything from parks and squares to art installations, performance, and festivals, besides housing, flea markets or other social events. In short, almost everything can act as temporary depending on the time frame it is seen in. An example of this is discussed by Hans Kiib and Gitte Marling in their book *Instant City@Roskilde Festival* (2011), which describes the largest temporary city in Denmark with more than 130.000 people. The festival serves as a testing ground for innovative urban furniture, experimental architecture, and creative spatial layouts. However, unlike other physical structures, the temporary city has less focus on the durability and material quality of the intervention due to it being a temporary construction. Instead, there is a much greater focus on speed of assembly, site-specific usability, and the ability to generate experimental environments and spaces. In short, Roskilde festival becomes a laboratory and test site for all sorts of urban interventions, which is at the very core of the concept of temporariness.

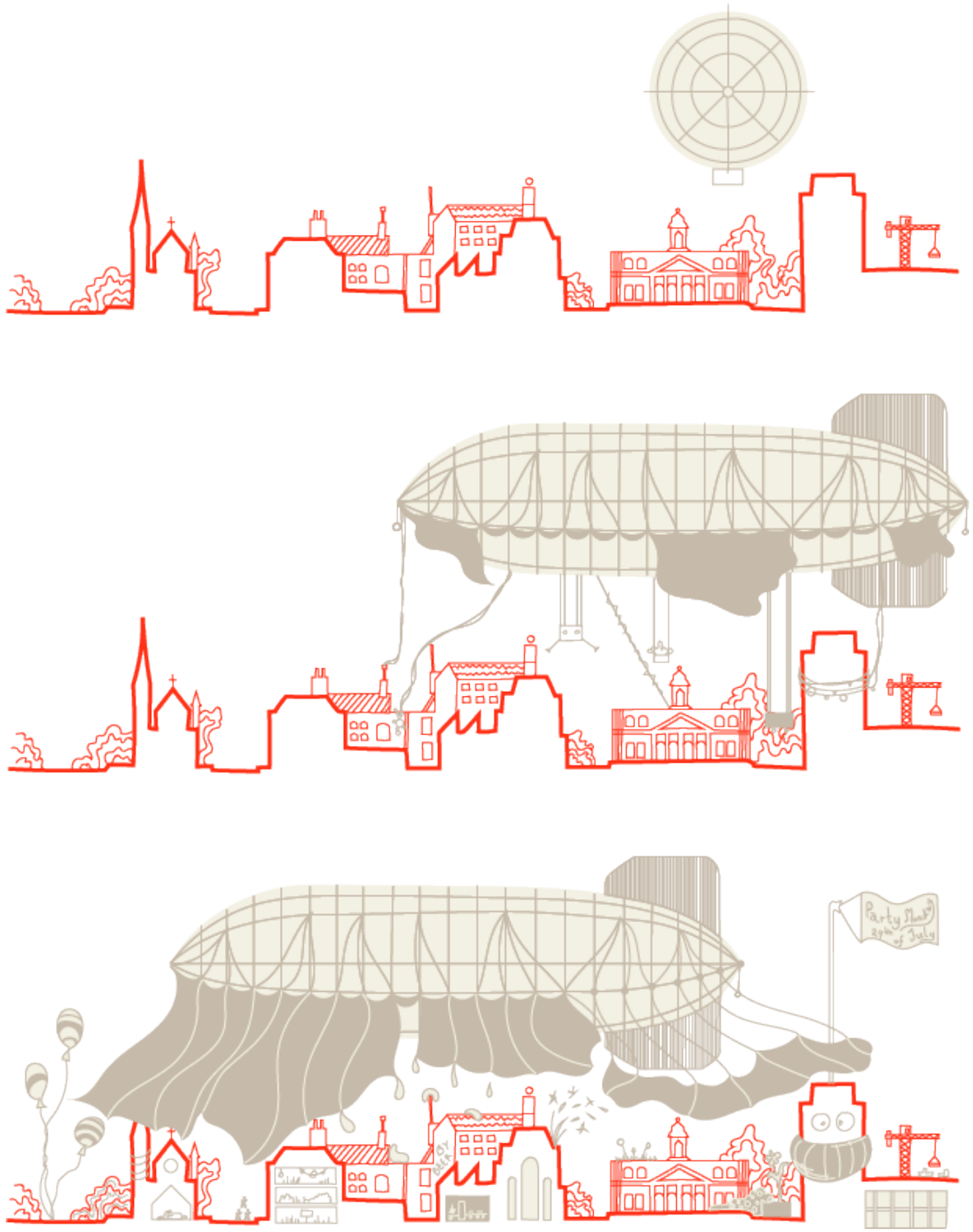
Temporality as A Catalyst

The report *Urban Catalyst - Strategies for temporary uses* (n.d.), conducted by Studio Urban Catalyst, presents a comprehensive database of concepts, definitions, programming, etc. all related to the concept of temporary use. At the core of the concept is the understanding of how temporary use creates breeding grounds for urban laboratories and creative testing areas because the »*experiments can be carried out with low financial risk*« (Studio Urban Catalyst, n.d.) that can help facilitate and promote urban development. In other words, an urban catalyst.

The report is an older case, but nevertheless talks about the time up to when temporary design became a popular and commonly used term. It gives an insight into how broad the concept truly is. The report discusses a wide range of temporary users, including criminals, refugees, activists, start-ups, cultural institutions, and small communities (Studio Urban Catalyst, n.d.). The first mentioned help tell a story about the neglected areas of the city, which is some of the typical places for the temporariness to arise, again bringing us back to the term »*Gap in utilization*«. It also presents various strategies, tactics, typologies, and guides for implementing temporary interventions.

One key observation is how temporary design promotes social cohesion and inclusion through networking. This network occurs in two ways: forced togetherness, by simply being in the same temporary location for a longer period, a sense of unity is created among users. The second way is based on an unstable and experimental nature of temporary activities. Because they often change or become relocated and new activities arise, this leads to networking across the different activities, connecting different users. (Studio Urban Catalyst, n.d.).

These networks often lead to the formation of clusters of temporary use that can become permanent fixtures in urban areas. Copenhagen's street food market, now known as Reffen Streetfood, serves as an excellent example of this phenomenon.



ill. 7 Inspired by: The Instant City concept explored by Archigram as "*ideas about temporary parasite architecture*"

Casestudy: CPH Street food, a.k.a. Reffen

Temporary activities such as pop-up stores, festivals, and flea markets are becoming increasingly popular. Temporary events and use of urban spaces has been shown to attract people and are now a strategic tool for designers and planners when to draw people to specific locations (Skytt-Larsen and Busck, 2020).

A notable example in Copenhagen is Copenhagen Street Food. Initially located at Papirøen, it became a major attraction, drawing attention to an underdeveloped area. The goal was to create urban life in previously inaccessible areas and to serve as a playground for new entrepreneurs, allowing them to start small with lower risks compared to traditional restaurants. It gave people who wanted to start their own business the opportunity to start small with a lower risk. This way, entrepreneurs lacking in experience, could try out having their own business to gain experience. Everybody involved in the project knew that it would be temporary and, in this way, knowing it was not going to be forever, the risk of starting a business was low (Skytt-Larsen and Busck, 2020).

Copenhagen Street Food was a big success, attracting around 1,5 million customers in 2017 and raising awareness of Papirøen. While the market was aslo dissolved in 2017, it was re-established on Refshaleøen as Reffen Street Food, becoming a key identity of the area, as evidenced by its popularity on social media, as can be seen on pp. 68 in this report (Skytt-Larsen and Busck, 2020).

Summary

Catalytic Design integrates architectural interventions with temporary actions to serve as catalysts for positive change. It strategically uses temporary interventions to stimulate innovation, foster social interaction, and develop new urban spaces. By harnessing the transformative power of temporary activities, Catalytic Design helps create dynamic, inclusive, and sustainable urban environments. This approach emphasizes the importance of innovation and collaboration in addressing contemporary urban challenges effectively. Through Catalytic Design, cities can evolve into vibrant, resilient spaces that reflect the diverse needs and aspirations of their inhabitants.

ill. 8 Copenhagen Street Food Market at Papirøen in 2015

Public Domain

Most people know about public space, but what about the notion of ‘Public Domain’? This concept is crucial in understanding how well-functioning urban spaces are created and maintained. According to Maarten Hajer and Arnold Reijndorp (2001), two experts in social sciences, architecture and urban planning, the concept of ’public domain’ extends beyond ‘public space’ by defining when a space is truly inclusive and used by everyone. A public space becomes a public domain only when it is utilized by all demographics, reflecting true inclusivity (Hajer & Reijndorp, 2001; Olsen, 2023).

The question arises: who is ‘everyone’? In urban spaces, this inclusivity often fails as certain areas may cater only to specific demographics, excluding others. For instance, wealthier neighbourhoods may not see the presence of homeless individuals, unlike more inclusive spaces such as Superkilen (see pp. 24).

Copenhagen Municipality has tried to counteract this trend by, among other things, breaking up the ‘anti-homeless design’ that exists in the city. This phenomenon is also known as Dark Design, and in short talks about ‘anti-homeless design´ - a concept introduced by, Ole B. Jensen, professor in urban theories and design (Broch, 2022). An example of a successful inclusive project is the temporary Enghave Minipark, which prioritized local users’ needs, creating a bridge between regular citizens and the homeless community.

Case study: Enghave Minipark
”Relocation of beer drinkers from Enghave Plads”

Enghave Minipark was a temporary urban space from 2010 to 2018, established during the construction of the Copenhagen metro ring. Its aim was to create an inclusive »outdoor living room« that particularly catered to the socially vulnerable. The project became a reality when the artist Kenneth A. Balfelt in collaboration with a range of different professionals, sociologists, artists, companies, local stakeholders and others, acted and created a new place for the local socially vulnerable. Among those who participated in the project was Spektrum Architects, Vesterbro Local Committee and most importantly: Vesterbro’s local beer drinkers (as they put it themselves) (Broch, 2022).

The initiative demonstrated the effectiveness of involving marginalized communities, such as the local beer drinkers, in urban development. This method integrates the perspectives of socially vulnerable individuals with those of other community members and promotes inclusive participation in the transformative process of urban spaces. (Balfelt & Hamou, 2012). An interesting observation in connection to the project is the difference it made to work so directly with the ’super users’, the homeless and socially vulnerable, of the temporary urban space. For instance, when facing resistance from the municipality regarding the installation of a urinal, the super users successfully argued its importance for all users, including dog walkers and passers-by (Balfelt & Hamou, 2012).

The project would not have achieved “public domain status” if it was not for the super user’s desire to cause as little inconvenience as possible to neighbours and the remaining users of the temporary space. The project was of great benefit for the socially vulnerable, as well as the rest of the population, and was maintained during the time it existed because of the collaboration with super users. This is due to the high sentimental value the park got for the ‘super users’, of which they therefore highly cherished their sanctuary where they could feel welcome and home (Balfelt & Hamou, 2012).

ill. 9 The public living room (pavilion) in Enghave Minipark

ill. 10 Two breastfeeding mums in Enghave Minipark

ill. 11 Locals maintaining the pavement at Enghave Minipark

Designing a Public Domain

Creating a public domain, as defined by Hajer and Reijndorp (2001), involves transforming a public space into one that is truly inclusive and accessible for all segments of society. This transformation requires design interventions that prioritize accessibility and inclusivity.

Accessibility entails ensuring physical accommodations all individuals, as noted in the mini case study about Enghave Minipark (Broch, 2022; Balfelt & Hamou, 2012), as well as in the text *Theories of the network city: Public domain* (Olsen, 2023). Implementing wheelchair ramps, elevators, and tactile paving are essential. Moreover, pathways and entrances should be designed to accommodate individuals with disabilities, elderly people, and parents with strollers, promoting universal access.

Inclusivity in design addresses the needs of diverse community demographics. This concept aligns with the principles of social equity and cohesion advocated in the temporary Enghave Minipark project. By creating multifunctional spaces that support a variety of activities and interests, such as recreational areas, cultural amenities, and seating zones, a sense of belonging and social interaction is fostered. This approach, like the design principles of Superkilen (see pp. 24), enhances community cohesion.

Promoting social interaction and cohesion is essential for vibrant public domains. Gathering spaces like plazas, community gardens, and event venues facilitate communal activities, fostering connections among residents. This aligns with the concepts discussed in *Theories of the network city: Public domain* (Olsen, 2023), which draws on the work of scholars like Hajer, Reijndorp, and Flusty to highlight the importance of communal spaces.

From a societal perspective, designing public spaces as public domains yields numerous benefits. By promoting social equity and well-being, well-designed public domains contribute to the overall quality of life and happiness of residents. Additionally, vibrant public domains attract visitors and tourists, bolstering local economies and enhancing community vitality (Olsen, 2023).

Summary

Creating successful public domains involves understanding the difference between a public space and a public domain, with the latter requiring active community participation. By designing spaces that are accessible and inclusive, and by promoting social interactions, public domains can enhance residents' quality of life, attract visitors, and strengthen community vitality, leading to positive neighbourhood-wide impacts.

IN SEARCH OF
NEW PUBLIC DOMAIN

ill. 12 Questioning the public domain

Sustainability

Sustainability, as a concept, is widely applicable but often lacks a concrete definition due to its broad scope. The term encompasses various topics, making a singular definition challenging. This section will conclude with a specific definition of sustainability for the context of this report.

In 1987, the United Nations Brundland Commission described the concept of sustainability as »*meeting the needs of the present without compromising the ability of future generations to meet their own needs*« (United Nations, n.d.). Others define the term as »*The ability to maintain and support a process continuously over time*« (Mollenkamp, 2023) and »*A design approach that seeks to minimize negative environmental, social and economic impact*« (Ecolife, 2022). Despite the differences, they all share a common theme: making present-day choices that can sustain themselves without negatively affecting the future. The last definition emphasizes the three main areas generally associated with sustainability: environmental, social, and economic impacts.

The Three Pillars

As the last definition states, sustainability is commonly divided into three dimensions: economy, social life, and environment. This simplification makes the concept more manageable and thus describes three aspects of sustainability: profit, people, and the planet (Mollenkamp, 2023). In principle, they are all weighted equally, but some believe that 'environmental sustainability' should be weighted higher, as the other two are not possible if the planet is not inhabitable. However, this perspective introduces a hierarchy that can divide the concept of sustainability.

If one agrees with this view, a hierarchy is created that prioritises one form of sustainability over another. This attitude also means that sustainability can no longer be defined as a unified term. However, as this text indicates, sustainability is seen here as a unified concept consisting of three equally important pillars, of which sustainability only takes place when all three pillars are in place. This is also expressed by the illustration. Here, sustainability only occurs when all three pillars overlap.

Economic sustainability

'*There is no such thing as a free lunch*' describes very precisely what economic sustainability is all about. Nothing is free and an economic aspect is therefore also necessary when talking about sustainability. As an example, if you want a new large residential area to be built exclusively with 'natural' building materials rather than steel and concrete, this could be financially expensive, it could require more knowledge, new techniques or more time to build. Economic sustainability emphasizes the importance of practices that support long-term economic growth without compromising environmental or social well-being. (University of Mary Washington, n.d.). It entails striking a balance between economic development and its impacts on the environment and society.

Social

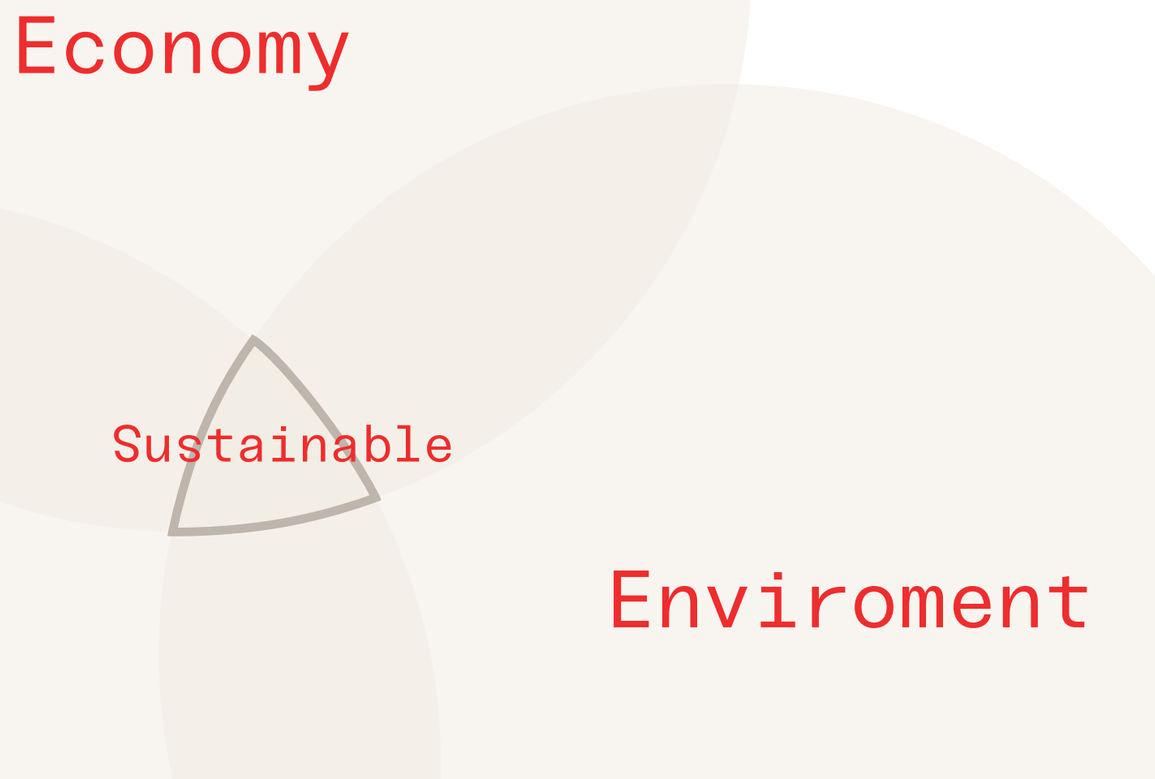
Social sustainability

Unlike environmental sustainability, socially orientated sustainability focuses only on a single race: humans. In essence, it aims to address inequality, which includes efforts to reduce, preferably eliminate, poverty and hunger (Mollenkamp, 2023). In a Danish context, this could mean reducing loneliness, creating equal opportunities for the socially vulnerable, or addressing issues related to parallel societies. The Danish government has among other things tried to do this by 'abolishing' the name 'ghetto' and replacing it with something like 'parallel society with development potential'.

Environmental sustainability

Environmental sustainability revolves around preserving the planet's ability to support diverse and healthy habitats for all living beings on both land and in water. It encompasses initiatives and actions aimed at protecting natural resources, reducing pollution, and mitigating the impacts of human activities on ecosystems.

ill. 13 The concept of sustainability shown as three overlapping elements. Only when these overlaps are joined does sustainability exist.



Urban Heat Island (UHI) Effect

Because Refshaleøen has an abundance of impermeable surfaces today, The Urban Heat Island (UHI) effect becomes relevant to delve into. It is a microclimatic phenomenon where urban areas experience higher temperatures than their rural surroundings due to human activities and urbanization. This effect is primarily driven by five factors: anthropogenic heat additions, albedo decrease, heat storage in infrastructure, reduced evapotranspiration, and hindered energy transfer between surfaces and the atmosphere (Olsen, 2024).

Urbanization leads to increased numbers of buildings, vehicles, and impermeable surfaces such as asphalt, which absorb and retain heat. Buildings and cars emit heat, while dark pavements absorb and retain solar energy, contributing significantly to the UHI effect. Moreover, tall buildings block wind flow, reducing natural ventilation and trapping heat in urban areas. The loss of vegetation and the introduction of impermeable surfaces diminish evapotranspiration, further exacerbating the UHI effect (Olsen, 2024).

Two primary indicators measure UHI: Surface UHI (SUHI), which is based on land surface temperatures, and Air UHI (AUHI), which is based on air temperatures. These indicators help assess the impact of urbanization on local climates. The SUHI is directly influenced by the surfaces introduced during urban development, such as dark pavements, which absorb more heat than natural landscapes (Olsen, 2024).

Mitigation strategies for UHI focus on increasing urban greenery, using reflective and permeable materials for pavements, and implementing green or white roofs. Green roofs enhance reflectivity and introduce transpiration, while white roofs significantly increase reflectivity, reducing heat absorption. These measures can lower urban temperatures, improve living conditions, and contribute to achieving sustainable urban development goals (Olsen, 2024).

Addressing the UHI effect is crucial for environmental sustainability and public health. Integrating UHI mitigation into urban planning and design from early stages can significantly reduce its impact, fostering healthier and more sustainable urban environments. By implementing mitigation strategies such as green roofs and more greenery from an early stage in the development of Refshaleøen, it could have a significant effect on the microclimate there (Olsen, 2024).

Elaboration of The Blue Enviroment

Since the Lynetteholmen project most likely is to be developed, and the effects of its establishment should therefore not be neglected, the following section will continue with an elaboration of blue (water related) environmental sustainability topics. This is because the establishment of Lynetteholmen will primarily affect the surrounding blue flora and fauna (the water environment), as stated on pp. 14. An in-depth knowledge of this is therefore necessary if this thesis is to solve the formulated problem on pp. 16.

Blue Biodiversity

Global sea levels are on the rise, accompanied by an increase in the frequency and intensity of storms and floods – a consequence of the ongoing climate changes. Denmark, with approximately 8000 km of coastline, faces immediate and future threats. Traditional 'hard' coastal defences like sea walls, dikes, and breakwaters, have been erected to safeguard inland areas. However, the ramifications of such mechanical barriers on biodiversity crisis beg scrutiny. How to protect the coastline without preventing semi-aquatic animals from thriving is an important element in the development of coastal communities (Larsen, et al., 2021; Høgild, et al., 2023).

So, when working with an island, or more precisely a peninsula like Refshaleøen as the project site, deciding how to work with the coastal zones is of great importance. In this project the coastal zone varies between rocks, sea walls, harbours, and a construction boarder of breakwaters that is currently under development (rocks). The most common may be the rocks, but the most important is the vertical sea walls that creates a hard and unfriendly boarder between land and water. This human-centric design solution has created a contradiction between land and water, where water is seen as something to be fought and controlled rather than an integral aspect of coastal life. Solutions based on rigid structures and vertical smooth coastlines have prevented invertebrates (like sea stars, crabs, snails, and clams) from moving between land and water, leading to habitat loss and a decline in biodiversity (Høgild, et al., 2023).

Historically, Denmark's coastal zones have undergone land reclamation over the past 200 years, resulting in lost landscape such as beaches and tidal areas. These areas make up only a small 0.2% of sea level, but account for 50% of the carbon uptake in ocean sediments. Furthermore, they act as critical transition zones that facilitate the movement of invertebrates between their aquatic and terrestrial habitats. It is therefore important to integrate and restore these zones as part of future coastal protection strategies in urban coastal areas (Ryu & Quintana, 2021). The best solution for this would be to work with nature-based solutions (NBS), that can act both as coastal protection while also acting as a transition zone for the lost habitats (Quintana, et al., 2021). But in areas where there is already a densely developed coastline and the more space-intensive NBS are not possible, such as with Refshaleøen, other alternatives must be found to mimic and support these vital transition zones. These alternatives will be called Non-nature-based solutions (NNBS).

Nature-Based Solutions (NBS)

Even though there is not much space on Refshaleøen for NBS, it is still important to address the topic, as the project indirectly touch on to the Lynetteholmen project, as stated in the motivation on pp. 11. Hence, understanding how NBS works may help with restoration of lost habitats. In addition, it also provides insight into how the non-nature-based solutions should work.

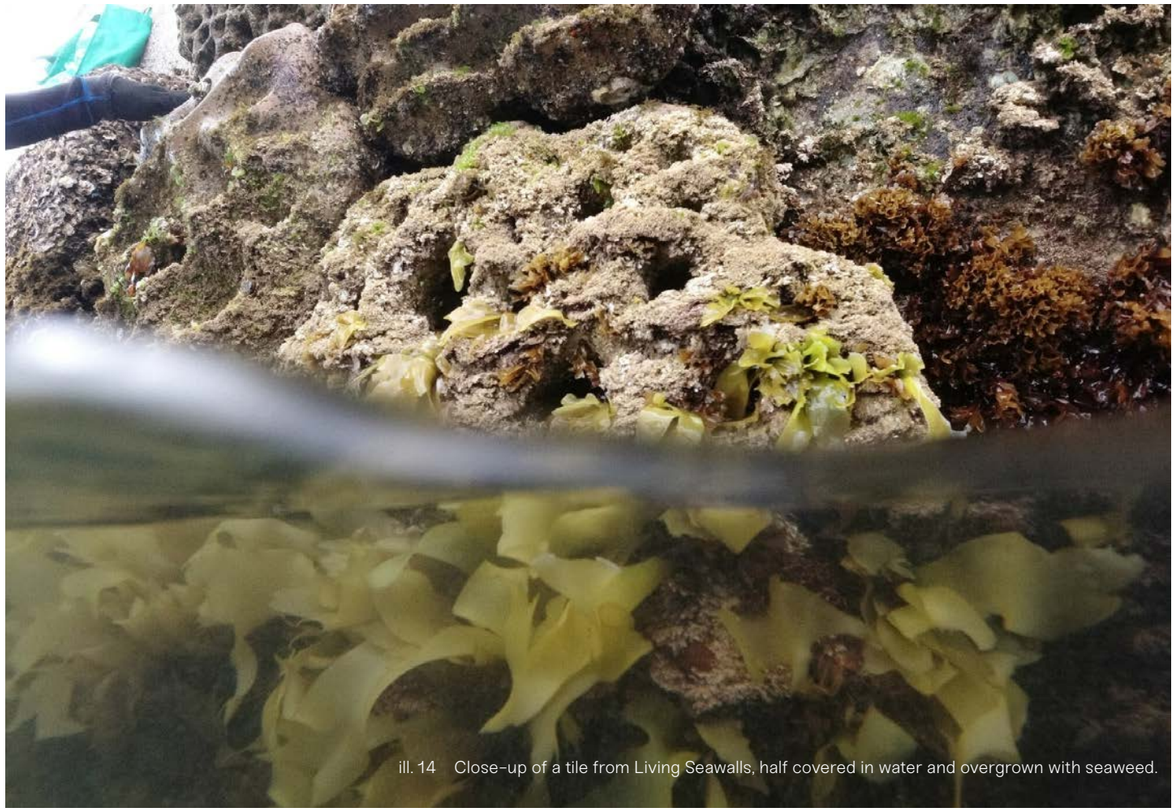
NBS are solutions for coastal protection that works in the same way as nature itself. It strengthens the environment by increasing the resilience of the ecosystem while at the same time also being cost efficient and can stimulate social life and economic benefits (Quintana, et al., 2021; Høgild, et al., 2023). By working with an approach where costal protection and the restoration of lost habitats is combined, the ecosystem humans have degraded can be recovered and help us live close together with the water, not against it. Initiatives focused on this ecological restoration through NBS have the potential to capture significant carbon quantities while simultaneously providing coastal protection, thereby benefiting biodiversity.

An example of this combined approach is the PhD project *Urban Seascaping*, from the School of Architecture in Aarhus, written by Soo Jung Rye (2022). Here she seeks to answer the problem with the question "*How to live not just by the sea but with the sea?*", as the main theme of her PhD. The answer is rather simple but still not something incorporated as a new standard, the answer lies in the title as a notion – *Urban Seascaping*, to which she says:

> *"Designing for humans and nonhumans and using seaweed as an ambassador. Just like we landscape with flowers and trees – why can't we seascape with seaweed and mussels? Seaweed has the capacity to reduce the strength of waves, improve water quality and enhance biodiversity and it has the potential to capture and store carbon, while providing food for humans and animals."*
> (Rye, 2022)

Non-Nature-Based Solutions (NNBS)

To call the alternative solutions to NBS for NNBS is partly incorrect. Both solutions are inspired by nature and work in the same way, but where the NBS work with recreating the landscape as the main thing, the alternatives instead work with imitating parts of the lost landscape. The two alternative solutions are the project Living Seawalls from Australia and the method Artificial Reefs, also called Super Rev (in English: Super Reef), from Denmark, which will be presented together with the strategic solutions later in the report.



ill. 14 Close-up of a tile from Living Seawalls, half covered in water and overgrown with seaweed.

ill. 15 Newly established artificial reef, 2022. Photo by: Lars Hestbæk

ill. 16 Artificial reef and a jellyfish, 2022. Photo by: Lars Hestbæk

Defining Sustainability

Defining sustainability is a complex task, as seen from the different perspectives presented in the texts. Although the term is widely used, it lacks a concrete and universally accepted definition due to its multifaceted nature, making it challenging to encapsulate it in a single sentence. Furthermore, the three pillars of sustainability emphasise that the different aspects of the concept are interconnected and that a holistic approach is needed.

Despite these challenges, there is a common thread. Essentially, it's about creating a harmonious balance between economic development, social justice, and environmental protection, without compromising opportunities the same possibilities in the future. Which in this thesis project is encapsulated in the following definition:

Sustainability is about meeting the needs of the present without compromising the ability of future generations. It involves balancing economic development, social justice, and environmental protection through innovative and nature-based solutions.

Summary

In summary, sustainability embodies a multifaceted concept that requires a holistic approach to address its complexities. Despite the absence of a universally accepted definition, it revolves around achieving a balance between economic development, social justice, and environmental protection. This balance is underscored by the interconnectedness of these pillars, emphasizing the need for integrated solutions.

Notably, within the realm of environmental protection, the imperative of safeguarding blue biodiversity is paramount, particularly considering projects like Lynetteholmen. Recognizing the impact of human activities on marine ecosystems, the integration of nature-based solutions, such as living seawalls and artificial reefs, emerges as crucial for preserving and rejuvenating marine habitats, thereby ensuring a sustainable future.

ill. 18 Jellyfish near the project Super Rev, 2022. Photographer: Lars Hestbæk

"Marine ecosystems are under pressure due to climate change, overfishing, reef degradation and excessive nutrients from agriculture and urbanisation. That's why we need to research innovative materials that can promote marine biodiversity."

ill. 17 Quote by Wolfgang Kunther, Material scientist at DTU Sustain. Translated from danish (Tækker, 2022)

Conclusion

Urban regeneration is a complex process that encompasses various aspects of change and development in urban environments. As described in the introduction (on pp. 22), this chapter has delved into the central issue of urban transformation, highlighting its complexity and the important tools needed to accomplish successful transformations. The identification of three key domains – catalytic design, the public domain and sustainability – emerge as crucial tools in this endeavour/effort.

Understanding urban transformation begins with recognising the challenges and opportunities presented by urbanisation, globalisation, and demographic change, as outlined in the discussion of what constitutes urban transformation (pp. 22). Refshaleøen is an example of current ongoing urban transformation, demonstrating the adaptive reuse of industrial heritage and the revitalisation of urban spaces to meet changing needs and aspirations. Each domain – Catalytic Design, Public Domain, and Sustainability – offers unique insights and approaches to urban transformation. Catalytic Design emphasises the strategic use of temporary interventions to stimulate innovation and promote social interaction, helping to create dynamic and sustainable urban environments. Public Domain underscores the importance of inclusive public spaces and community engagement, fostering social cohesion and collective ownership of urban spaces. Sustainability encompasses the balance between economic development, social justice, and environmental protection, with a particular focus on preserving blue biodiversity and integrating nature-based solutions.

In conclusion, the synthesis of theory and practice in this chapter equips urban designers, planners, and landscape architects with important tools and insights to navigate the complexities of urban change. By embracing Catalytic Design, Public Domain, and Sustainability, urban planners can cultivate holistic approaches to urban design that prioritise innovation, inclusion, and resilience. Ultimately, urban transformation becomes not just a process of physical change, but a journey towards creating vibrant, equitable, and sustainable urban spaces for current and future generations.

03

Context

Chapter Introduction

This chapter explores the context of project area, providing a comprehensive analysis of the factors influencing its development. This includes various subjects which are important for understanding the broader urban landscape and the specific context in which Refshaleøen lies.

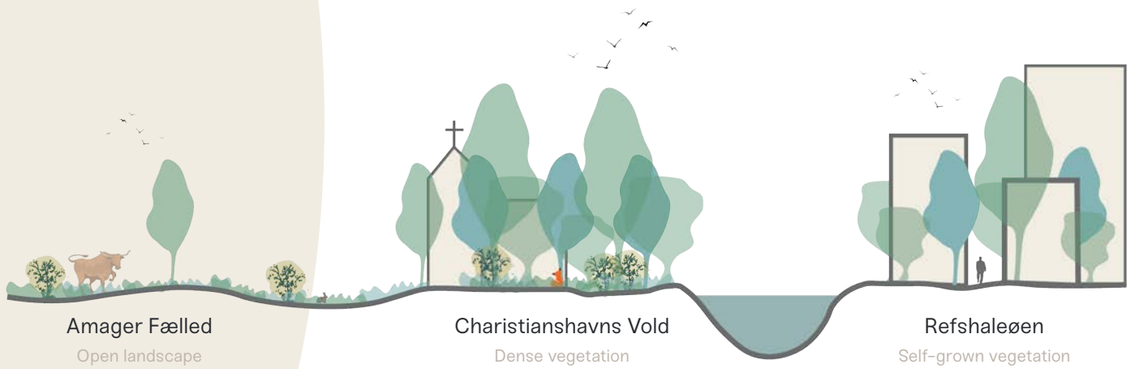
The Green Corridor

Keywords; Green Infrastructure, Environmental Sustainability, Biodiversity

The diagram illustrates the existing green areas surrounding the project site, with Refshaleøen potentially serving as an extension of these verdant spaces. It highlights the presence of a green and blue corridor from the south, touching onto Refshaleøen.

In terms of environmental sustainability, integrating green and blue infrastructure into new development is essential. This approach not only boosts vegetation to purify the air and regulate temperatures but also fosters habitats for various wildlife, thereby enhancing biodiversity. Refshaleøen already has some green spaces that could be obvious to connect with the corridor. Strengthening these connections through vegetation would facilitate the movement of animals between areas, expanding their habitat and enriching biodiversity along the corridor.

This emphasizes the significance of extending the green corridor to the project site. Looking ahead to the construction of Lynetteholmen, it becomes imperative to extend the green corridor all the way there. By incorporating green infrastructure into the current project on Refshaleøen, it establishes a base from where an extension onto Lynetteholmen can start in the future, while at the same time contribute to mitigation of UHI. This not only promotes sustainability in the development of Refshaleøen but also lays the foundation for enhancing Lynetteholmen's sustainability. A robust green strategy for Refshaleøen could positively influence the development of Lynetteholmen, mitigating some of the potential environmental impacts and contributing to overall sustainability.



ill. 19 Analytical section of the green corridor from Amager Fælled to Refshaleøen

ill. 20 Representation of the green corridor from Amager Fælled to Lynetteholmen – No scale

Copenhagen: A Tale of Neighbourhoods

Keywords; Copenhagen, Urban diversity, Reclaimed Land

Copenhagen, the capital of Denmark, is known for its many cultural offerings, world-class architecture and countless small welcoming urban spaces, with a vibrant city life, many green breathing spaces and distinctive neighbourhoods. The city can be divided into several districts, each with their own special character and urban environment. These include the old bridge districts that once lay outside Copenhagen's city walls before the city grew. And newer districts such as Nordhavn, Amagerbro and Refshaleøen, all emerged from the sea as artificially reclaimed land, shaped from around the early 1800s (Historisk Atlas, 2022).

The City centre

The Inner City constitutes the historic centre with iconic landmarks such as the City Hall Square (org. Rådhuspladsen) and 'Nyhavn', and the main shopping street, 'Strøget'.

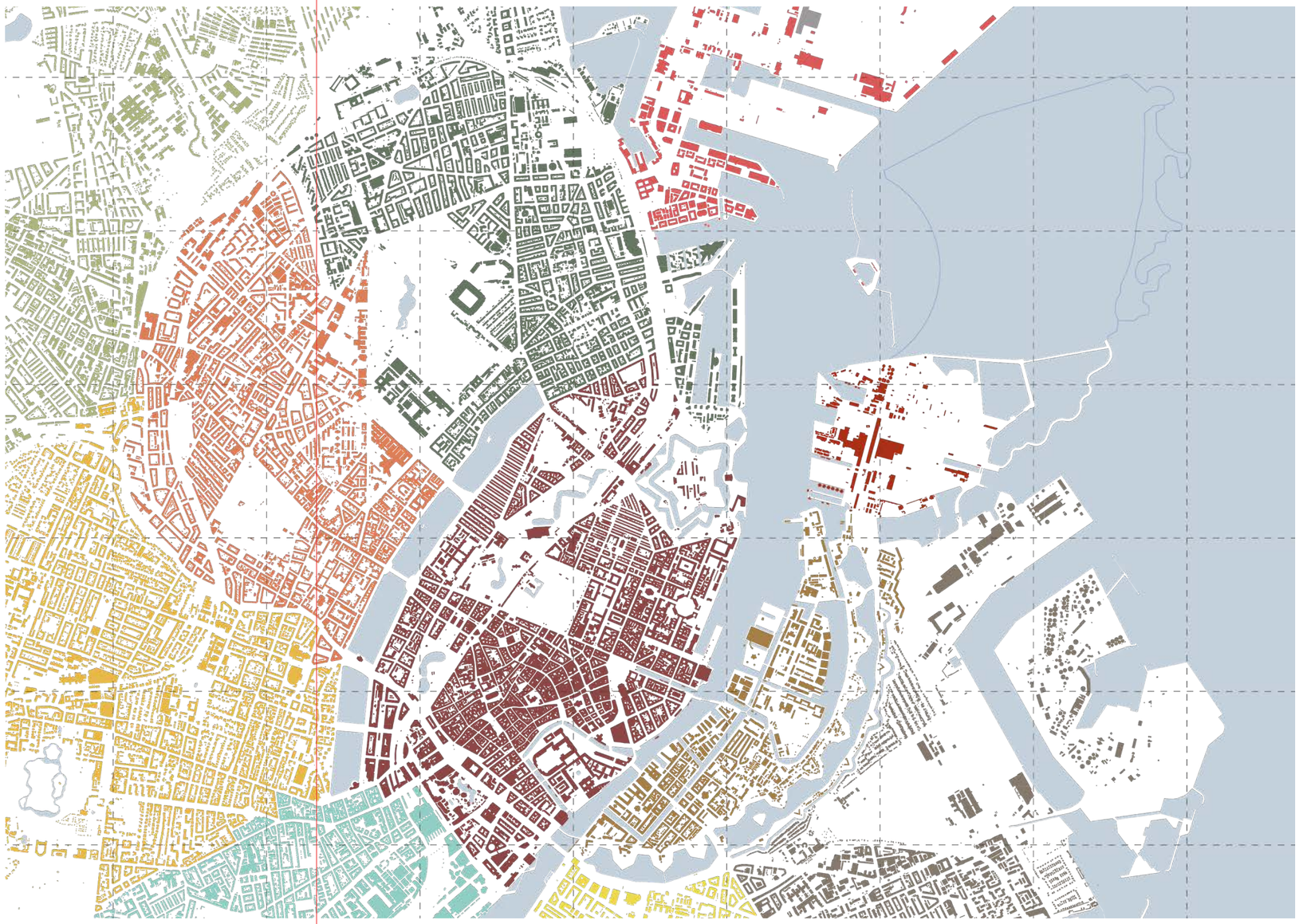
The Old bridge districts

'Vesterbro' is a trendy neighbourhood with a vibrant nightlife and artistic communities. 'Nørrebro' is multicultural with a lively street scene and ethnic eateries. 'Østerbro' offers elegant boulevards and tranquil residential areas. Frederiksberg is an independent municipality surrounded by Copenhagen, known for its graceful architecture and green spaces. 'Christianshavn', with its canals and cobblestone streets, is a charming district with a bohemian atmosphere and alternative lifestyle.

The Artificially reclaimed land districts

'Nordhavn' is a newly developed area known for its modern architecture and waterfront living. 'Amagerbro' is a diverse neighbourhood located on the island of 'Amager', featuring a mix of residential and commercial areas. Refshaleøen is an industrial-chic district known for its creative scene, including art galleries, restaurants, and cultural events.

Understanding the diversity and unique characteristics of Copenhagen's various districts, including Refshaleøen, is crucial for informed urban development strategies. By recognizing the distinct identities and offerings of each neighbourhood, stakeholders can ensure that the development of Refshaleøen complements the broader fabric of the city while preserving its authentic charm and fostering a vibrant community atmosphere.



ill. 21 Copenhagen neighbourhoods – Scale: 1 square = 1 km²

What is Quintessential Copenhagen?

Keywords; Cultural Scene, Cosmopolitan, Café Culture

'Quintessential Copenhagen' encapsulates the deeply ingrained uniqueness that reflects the city's distinctive cultural, social, and historical context. This term encompasses not only surface-level characteristics but also the underlying values, norms, and practices embedded in Copenhagen's society and identity.

A key aspect of quintessential Copenhagen is its cosmopolitan nature. As Denmark's capital and largest city, Copenhagen attracts a significant international population, fostering a diverse and multicultural atmosphere. This cosmopolitan character is evident in the city's language, food, art, architecture, and social interactions, creating an open and tolerant attitude towards diversity.

Additionally, Copenhagen is renowned for its strong urban lifestyle, including a love for cycling, coffee, culture, and socializing. Cycling is not just a means of transport but a lifestyle promoting sustainability, health, and community. The café culture is integral, providing spaces for people to connect and enjoy the city's vibrant atmosphere. Moreover, Copenhagen boasts a thriving cultural scene with art galleries, theatres, music venues, and festivals, offering residents and visitors a wealth of experiences and social engagement opportunities.

Finally, Copenhagen's historical and political context contributes to the quintessential Copenhagen character. As an old European capital, it has a rich heritage and tradition of political activism, particularly in areas like sustainability and social justice. This reflects a deep-rooted commitment to democratic values and an openness to progress. In essence, Quintessential Copenhagen is a cosmopolitan, relaxed, and culturally rich city that embraces diversity, innovation, and social engagement. It continually evolves while cherishing its history, identity, and unique place in Denmark and the world.

ill. 22 Collage of mixed quintessential Copenhagen images giving an insight into the daily life of a Copenhagener.

From Copenhagen to Refshaleøen

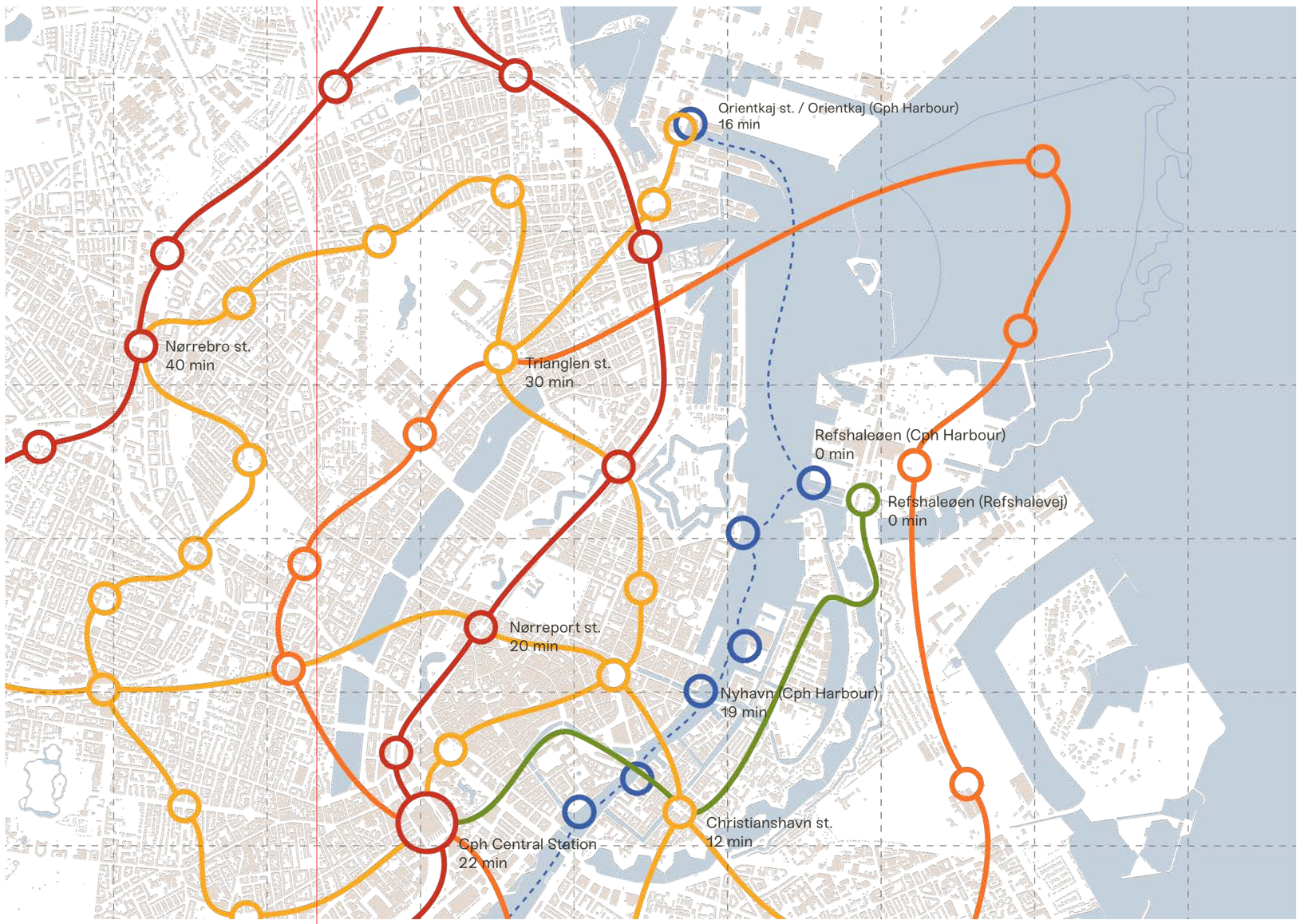
Keywords; Mobility, Sustainable Transport, Connection

The diagram depicts the present and the potential future public transportation options, along with estimated journey times from various Copenhagen locations to Refshaleøen, except for the Øresund train. It offers valuable insight into the limited direct connections available to Refshaleøen. Only the harbour ferries, bus 2A, and bicycle routes are depicted on the diagram, indicating the scarcity of direct routes.

Currently, accessing Refshaleøen presents challenges, primarily relying on car or bus transportation. Although the future addition of a metro line may relieve some of these challenges, it may not be enough to accommodate the anticipated population influx once both Refshaleøen and Lynetteholmen are fully developed. There is a planned underground highway that will connect these islands to the mainland in the future, this will improve accessibility by car, but it could result in encouraging increased car usage, contradicting the mobility objectives from the 2019 municipal plan of Copenhagen.

The municipal plan emphasizes promoting green mobility, prioritizing easy, healthy, and efficient modes of transportation within the city. It aims for at least 75% of all city transportation to be green mobility, with cars accounting for only a maximum of 25% (Copenhagen Municipality, 2019). Hence, ensuring convenient public transportation, well-designed bicycle lanes, and pedestrian access will be crucial for Refshaleøen's development. If these alternatives are not convenient enough, many people will end up using personal cars.

Strategic placement of the metro station on Refshaleøen, attractive and well-maintained bicycle lanes, and seamless connections with buses and ferries will be pivotal in encouraging sustainable transportation choices. This comprehensive approach aligns with the municipality's goals for green mobility and fosters a more sustainable and liveable urban environment.



ill. 23 Overview of public transport from various locations in Copenhagen to Refshaleøen – Scale: 1 square = 1 km²

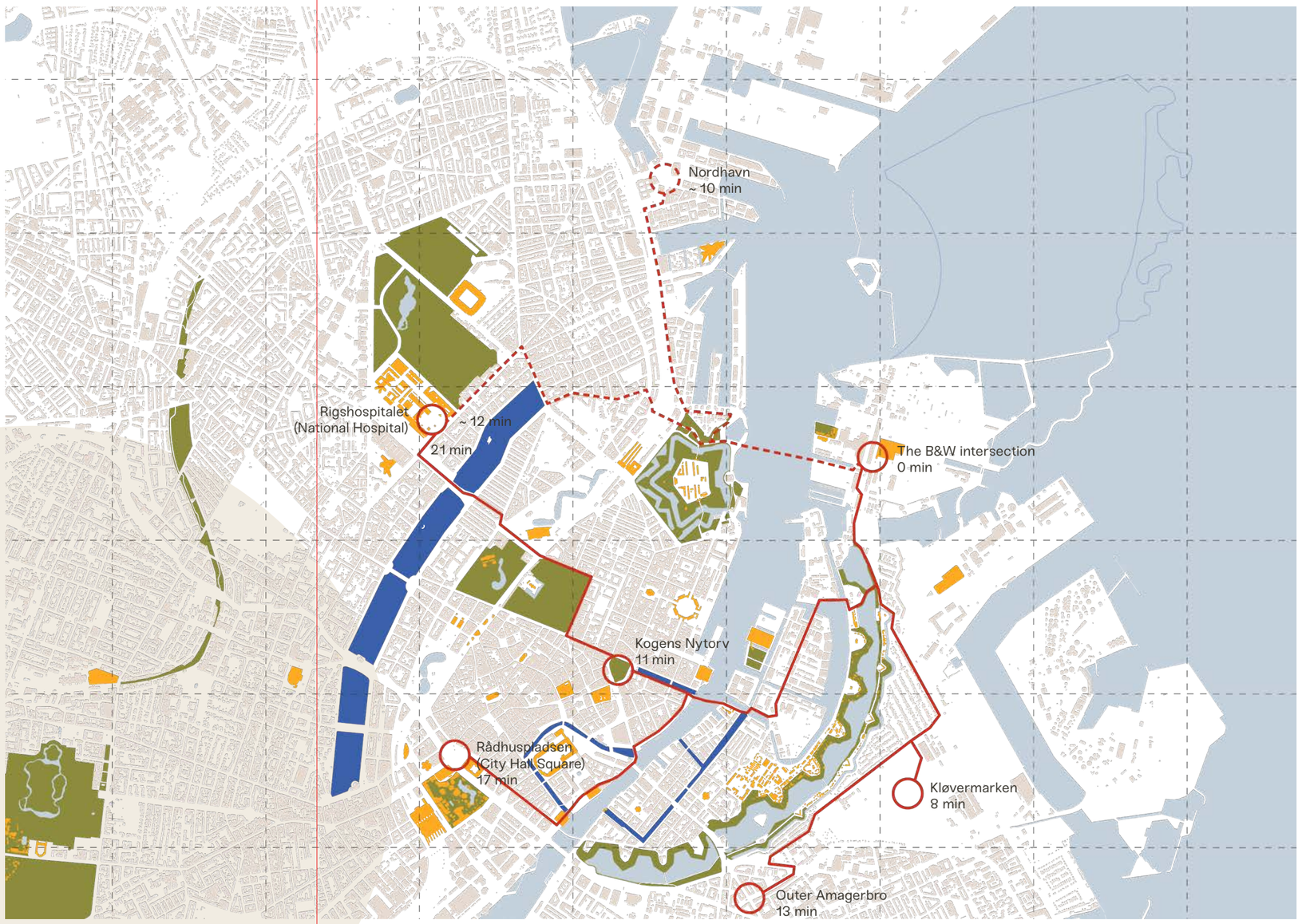
A Stroll Through The City

Keywords; Mobility, Soft Traffic, Urban Connectivity

The diagram is a combination of nodes of different kind and Google's recommended bike routes when departing from the centre of Refshaleøen. It provides a useful insight into distances and journey times as a traveller by bike, in combination with a map of different points of interest in the city.

The many highlighted areas range from Copenhagen Central Station and the four major famous lakes to various attractive urban spaces, green areas of special character, churches, iconic buildings, etc. In addition, six examples of destinations and estimated journey times are shown in the diagram as red lines, with the two dashed lines showing two of the desired future path connections and the expected journey time These two new routes are based on the desire for a new bridge connection that will serve and support the development of Refshaleøen as a new future 'bridge district' where cycling is the preferred mode of transport. These ideas emerge from Copenhagen's Municipality plan (2019), which talks about sustainable solutions, urban development with an edge and 'big cities' as being for people, not cars, as presented in the previous paragraph.

This diagram therefore speaks volumes about the importance of strengthening the connections for soft road users between the nodes of attraction in the city, especially with the development of Refshaleøen as a new residential area and even more so with the construction of a large artificial island like Lynetteholmen.



ill. 24 Map of Cph's nodes of attraction and recommanded bike paths from Refshaleøen – Scale: 1 square = 1 km²

Conclusion

The introduction to the context provides a comprehensive overview of various factors important for the development of Refshaleøen within the broader context of Copenhagen's urban landscape. It delves into key themes such as environmental sustainability, urban diversity, cultural identity, mobility infrastructure, and connectivity, offering valuable insights into the multifaceted nature of urban planning and development.

First and foremost, the discussion on the green corridor highlights the significance of integrating natural elements into urban spaces to enhance environmental quality and biodiversity. This sets the stage for understanding how Refshaleøen can contribute to the city's green infrastructure while promoting sustainability and ecological resilience. Additionally, the examination of the city's mobility plan underscores the importance of sustainable transportation infrastructure in fostering liveable and accessible urban environments. Strategic planning and investment in public transit, bike infrastructure, and pedestrian-friendly pathways are crucial for promoting green mobility options and reducing reliance on cars.

In conclusion, the introduction section provides a holistic understanding of the contextual factors shaping the development of Refshaleøen. By considering environmental sustainability, urban diversity, cultural identity, mobility infrastructure, and connectivity – stakeholders can work towards creating a vibrant, inclusive, and resilient urban district that enhances the overall quality of life in Copenhagen.

04

Site

Chapter Introduction

This chapter provides an overview of Refshaleøen's dynamic development, from its historical roots to its present-day cultural significance. It examines the island's transformation from a strategic military outpost to a diverse urban landscape of cultural and community, emphasizing the multifaceted nature of Refshaleøen's identity and its ongoing role in Copenhagen's urban fabric.

The Evolution Refshaleøen

Keywords; History, Development, Structure

Refshaleøen is an island shaped by changes over several decades of industrial activity and 'Quintessential Copenhagen' trends. From being a small artificial island with the purpose of defending Copenhagen's waterfront, the island has evolved to become the site of one of the world's largest shipyards (1843-1996), known as Burmeister & Wain (B&W) (Arkitema & COWI, 2023). At its peak, B&W employed up to tens of thousands of people and played a role in constructing Denmark's first domestically built steam-powered iron ship. It was this shipyard that, over the next fifty years, expanded the small artificial island of 'Lynetten' to become connected to Christianshavn's fortifications, ultimately becoming the Refshaleøen we know today (in 2024).

B&W subsequently went bankrupt in 1996 (Arkitema & COWI, 2023), after which the 'Quintessential Copenhagen' trends slowly began to take over the island. It particularly took off around 2014 in connection with the Eurovision Song Contest held in the large B&W halls which sparked a public debate about the island's use (Ejlersen, 2024).

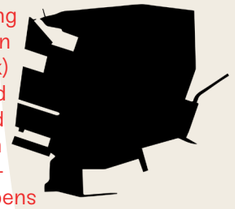
1

1825

Refshaleøen started out as the small artificial island 'Lynetten' on which the Lynette Fort was located. This island was part of the Copenhagen defence system of the time and was used first as a gun battery and later as a command station until 1962 (Jespersen, 2023).

1939

Lynetten island expands and becomes connected to Refshaleøen, which is further expanding with more harbour facilities and land areas.

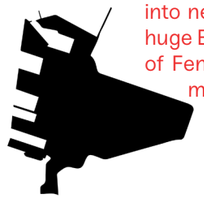


1986

On the eastern side of the island, the long construction dock (dry dock) is completed (in 1961) and Magretheholm Harbour, a self-build harbour, opens (in 1978) with space for more than 700 boats (Arkitema & COWI, 2023). Later (around 1985), the economy starts to become challenging, and B&W sells out of their property, only to rent instead.

1879

When Copenhagen's inner harbour was expanded, Refshaleøen was established (in 1868) as an extension of the B&W shipyard (in 1872), which was originally built in Christianshavn (in 1843) (Arkitema & COWI, 2023).



1953

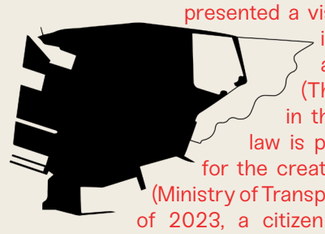
On the eastern side of Refshaleøen, large parts of the sea are being reclaimed into new land mass, where the huge B&W halls, with the image of Fenris the wolf from Norse mythology, are built.

ill. 25 Historic development of Refshaleøen's landmass

Trends worth mentioning are, temporary activities such as 'Reffen' street food (2018), the festival 'Copenhell' (2010), and the street party 'Destortion Ø' (2022), more permanent functions are the bio-based hardware store 'Havnens Hænder' (2019), the museum 'Copenhagen Contemporary' (2018), the public garden 'Øens Have' (2020), and the gourmet restaurant 'Alchemist' (2019), as well as several small workshops, studios, and ateliers of different kind.

2023

In the autumn of 2018, the prime minister presented a vision of a new artificial island, also known as 'Lynetteholmen' (Therkildsen, 2022). Later in the summer of 2021, a law is passed paving the way for the creation of 'Lynetteholmen' (Ministry of Transport, 2021). In the spring of 2023, a citizen involvement process regarding the development of Refshaleøen was completed, and in autumn the same year, an idea competition was held with the same focus. Here, both private individuals and companies could submit material (Arkitema & COWI, 2023).



2016

Parts of the island are registered as a "waste dump" (in 1990), due to the shipyard's pollution and use of urban waste for landfill. Six years later (in 1996), the B&W shipyard is declared bankrupt, and the area is closed to the public. A few years later (in 1999), a plan of action for Refshaleøen's development was drawn up (Arkitema & COWI, 2023) and more water was dammed to slowly be filled with excavated soil from other municipal projects.

Future...

During 2024, the tender, design and construction of the metro and the Eastern Ring Road around Copenhagen will be launched in connection with the Lynetteholmen project (Arkitema & COWI, 2023). In the autumnof 2024, a structural competition organized by By&Havn will help come up with concrete bids for the development of Refshaleøen (Refshaleøens Ejendomsselskab A/S & By & Havn, 2023). What happen next in relation to the development of Refshaleøen, and Lynetteholmen is unknown.

Burmeister & Wain's Creation of Identity

Keywords; Identity Markers, History, B&W Crosssection

The B&W shipyard stopped their business in 1996 and after this the buildings have become home for some new activities, mostly temporary. Some of the buildings are used in connection to 'Reffen' street food (a popular activity at the island), one is used in connection with festivals like Copenhell, when not as a marketplace or high-rope obstacle climbing. Some other buildings are used as offices or for storage, in addition to cultural attractions like museums and gourmet dining.

The buildings contribute to give Refshaleøen its current identity. They are conveying the history of the area and because of this, preserving them would help maintain the island´s current identity. Buildings at Refshaleøen should not be demolished if it is not necessary. One of the criteria from the visions in the idea competition (on pp. 13) is that they want Refshaleøen´s identity to still be recognisable in the future. This can among other things, be done by preserving as many buildings as possible, as the vision also states – "*We preserve and transform all existing buildings, unless special circumstances dictate otherwise.*". This will naturally help pave the way for another part of the vision, the criterion about "*quirky street patterns, … site-specific neighbourhoods with originality, [and] character*".

Buildings and characteristic pavement on Refshaleøen should not be demolished, to maintain the island´s identity. However, moving broken pavement to other places on the island to increase the quality of Refshaleøen as a whole and to reuse, that would be a welcome and sustainable measure for dealing with excess land mass.

ill. 26 Map of the remaining buildings left from the B&W shipyard

ill. 27 Selection of the remaining B&W buildings anno 2024

The Skin of Refshaleøen

Keywords; Pavement, UHI, Identity Markers

The current pavement across Refshaleøen predominantly comprises of asphalt and concrete, resulting in a lot of grey and hard surfaces throughout the area. While some roads have clearly defined boundaries, many areas with hard surfaces, suitable for driving, must be treated as shared spaces due to their lack of clear guides. This is also illustrated in the diagram on pp. 63, where the blue line marks the main road on the island, with clear markings of street and pedestrian zone and the green line functions as a main road, but in the form of shared space without clear markings. In contrast, most of the secondary roads, illustrated in yellow, often appear as shared spaces. In addition, there is currently only one publicly accessible road to and from Refshaleøen. While there is another access road, it is at the moment temporary and only for trucks on their way to unload soil at the Lynette depot. This sometimes causes chaotic situations, typically when major events are taking place. Buses cannot turn around, cars block each other, and hordes of cyclists block each other, slowing down the flow and overall speed.

Much of the existing pavement is aged and marked by cracks, with some vegetation managing to grow through them. While these cracks provide some degree of permeability, asphalt and concrete typically stop water from adequately seeping through. The road layout on the island, aside from some distinct roads, lacks clarity and could potentially lead to a hierarchy confusion when the island gets more developed and more traffic both soft and hard intensifies.

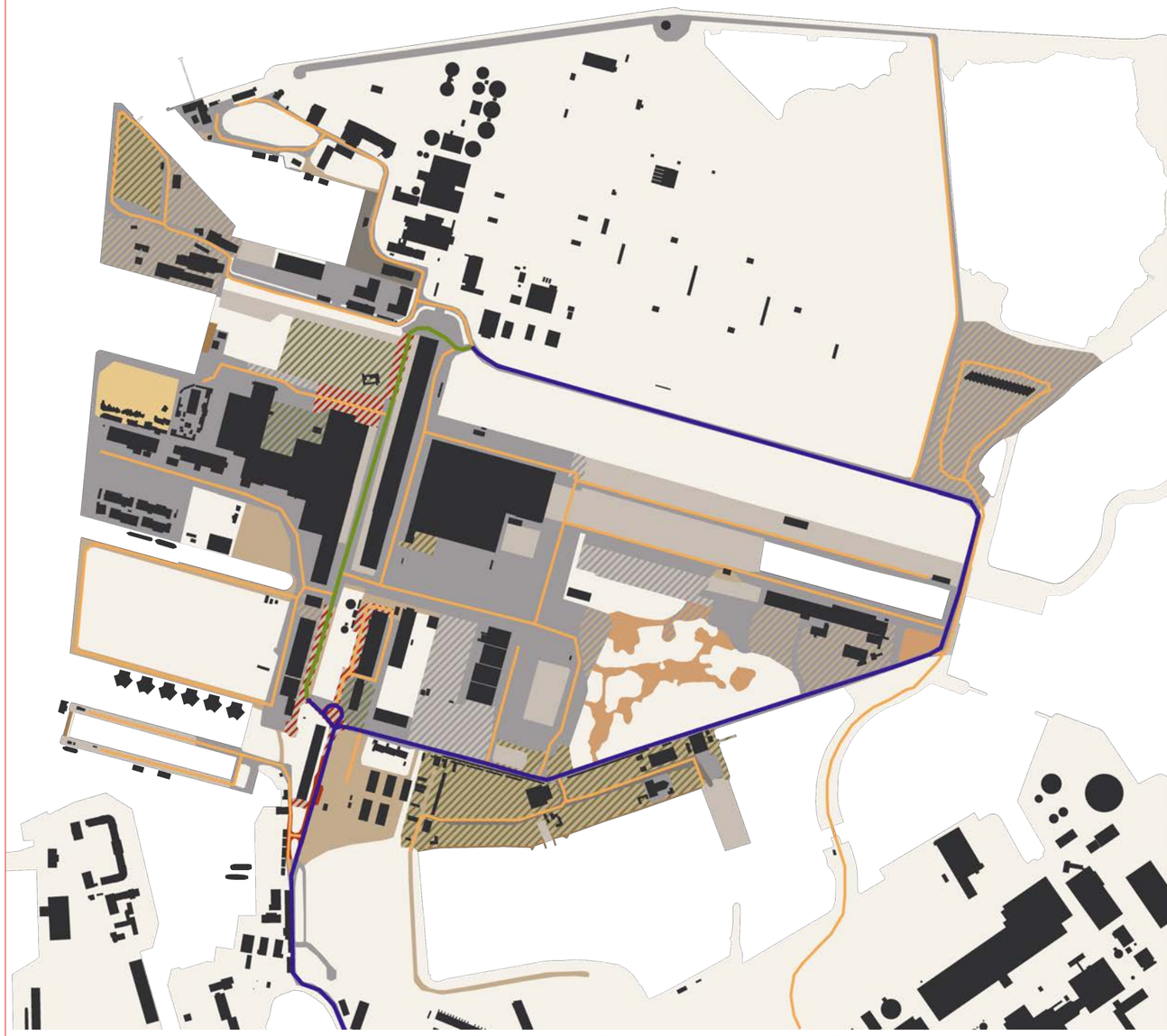
Preserving cracked concrete and asphalt where it makes sense, could serve as distinctive features contributing to maintaining the current identity, as mentioned. However, it is essential to address necessary repairs where needed. Additionally, introducing alternative paving solutions, such as some types of permeable pavement, could significantly benefit Refshaleøen. This type of paving allows water to permeate through, replenishing the groundwater which facilitating evapotranspiration through vegetation, thus aiding in mitigating Urban Heat Island (UHI) effects. The abundance of grey surfaces across the island currently restricts biodiversity and reduces the vibrancy of the area.

One way to enhance the mitigation of UHI on Refshaleøen, which does not compromise the identity by removing too much of the existing pavement, is to implement green roofs on buildings with a flat roof type. This will reduce the number of dark surfaces and leave more room for preserving the existing pavement, or “breaking it up” in other ways. By converting dark surfaces into green, not only can UHI effects be mitigated, but opportunities for flying organisms to migrate more freely will occur, strengthening biodiversity and enriching the overall environment.

By simply allowing native species of herbs, wildflowers and low vegetation to take over the roofs of buildings and sheds, small green footprints will be created in the city where insects, small birds and other small creatures can find refuge, food or a temporary stopover on a longer journey. The majority of these green footprints will probably not be visible from street level, so they should not have an impact on the overall expression and identity that Refshaleøen is known for.

ill. 28 Collage of different pavement types on Refshaleøen

ill. 29 Mapping of the different pavement types on Refshaleøen



A Self-Grown Nature

Keywords; Biodiversity, UHI, Green Connection

The diagram below shows the green pattern that exist on Refshaleøen today and presents the different types of nature. The darkest green colour represents dense overgrown nature in the form of a thicket that tends towards forest. As the colour lightens, the habitat type also becomes airier, moving from dense scrub to a manicured lawn. In addition, there are two colours outside the spectrum. One is the 'Islands Garden' (org. Øens Have) a public kitchen garden, and the other is Biofos.

The areas that have the highest value is the ones that should be prioritized when choosing what to preserve and what could be transformed. Among the highest valued areas, it's primarily the three darkest colours, but not exclusively them. The numbers in the diagram rank the areas according to their quality based on how biodiverse they are, with higher scores corresponding to higher quality (Habitats, 2023, p. 8).

As seen previously there are an abundance of impermeable, dark pavement at Refshaleøen, and some of this could benefit from being brighter and more permeable, for instance by introducing more vegetation along these stretches. Also, only some of the green areas are connected today, by strengthening the connections it would be possible to improve the overall quality of the island by continuing the green corridor that enters the site from the south. By doing so, the green areas would be more coherent and create better conditions for the wildlife in the city. It will give the species living there an easier and safer passage for travelling through the green structure. As mentioned by the idea nr 68956 from the idea competition (By&Havn & Øens Ejendomsselskab a/s, 2024, p. 34), "The Fox is now a city animal", which is why the green connection is so important.

By improving the green areas on Refshaleøen and strengthening the connection between them, and to the south, the biodiversity in the area can be improved. If this is then combined with the idea of green roofs mentioned in the chapter "The skin of Refshaleøen", more trees along roads and small spots with water and wildflowers, the effects of UHI can be counteracted while also improving life for bees, birds, and other species.

ill. 30 Green areas on Refshaleøen

Inaccessible Water

Keywords; Biodiversity, Marine Habitats, Water Access

In addition to showing the green contexts and the location of trees, the diagram also shows where access to the water is possible. These are shown as red markings and are few when not counting boat ramps and regular bridges as these are not designed with the intention of people swimming from them.

As Refshaleøen is an artificial peninsula, the meeting point between water and land primarily consists of vertical sea walls made from concrete and steel. These walls, lacking in natural features, are smooth and provide no shelter for the semi aquatic or invertebrate animals inhabiting the surrounding waters. Consequently, they hinder biodiversity in the area from flourishing and contribute little to the visual appeal of the landscape. Moreover, the transformation from ocean to land during the creation of Refshaleøen resulted in a significant loss of marine habitats. This loss is compounded by the forthcoming development of Lynetteholmen, which will further degrade underwater ecosystems (Cortzen, 2023). Thus, there is a pressing need to restore and enhance marine habitats.

Improving access to the water and restoring marine habitats on and along Refshaleøen are essential steps toward enhancing biodiversity and ecological health in the area. The scarcity of access points to the water, coupled with the lack of natural habitat along the artificial peninsula's vertical walls, highlights the pressing need for action. With the imminent development of Lynetteholmen further threatening marine ecosystems, addressing these issues becomes even more urgent. By prioritizing efforts to restore marine habitats and create more inclusive waterfront access, we can mitigate the adverse effects of human activity and support the resilience of marine biodiversity. These initiatives not only benefit the natural environment but also enrich the overall experience for residents and visitors alike.

Myriads of Shapes and Volumes

Keywords; Industrial Heritage, Urban Identity, Architecture

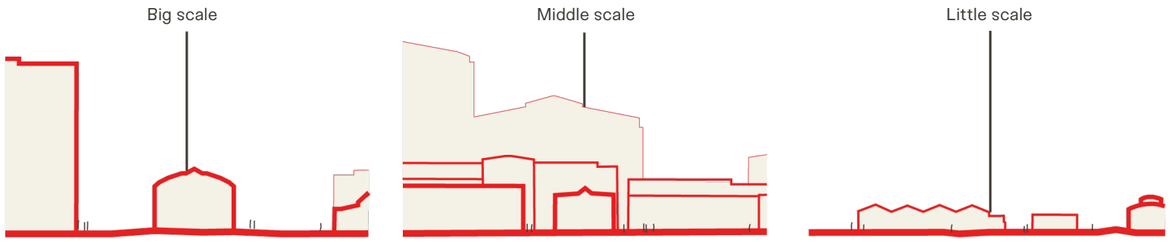
The identity of Refshaleøen is predominantly influenced by its historical shipyard heritage. Buildings and spaces, once strictly parts of B&W, now contribute to a diverse and vibrant atmosphere, creating an interesting area to explore.

The traces of the shipyard era, with its straight axis, functionality and preserved imprints in the pavement, delineate a linear movement structure. Nevertheless, when observed closely, one encounters an array of informal and irregular spaces, variations in extended facades, and gaps between buildings with narrow alleyways, inviting exploration. Consequently, significant disparities in the perception of space and scale also emerge. One moment an intimate urban space with vegetable garden and community, the next an open landscape dominated by a single giant – the Fenris wolf painted on one of the colossal B&W halls.

The building structure is defined by its interconnectedness, featuring long composite facades. Additionally, the iconic halls stand out in the cityscape, serving as landmarks across the island. There is also noticeable variation in the fleeting glimpses from one building to another, spanning from Refshaleøen to the inner city, which contrasts with the expansive views over Øresund.

It is safe to say that going to Refshaleøen does not feel like a visit to a conventional city. Many of the buildings are of enormous size. Almost all roads are shared space, sidewalks, trees along the streets and urban furniture typically found in a city are here in a completely different form. In many places, the original surface and pavement are visible, including cobblestones and steel rails, some of which have deep trenches between them down to the water. Other characteristic features are the external staircases on the facades and the different roof profiles.

Refshaleøen's industrial past shapes its unique urban identity, blending imposing structures with informal spaces. From interconnected facades to iconic halls, the island offers a diverse sensory experience, unlike traditional cities. Its unconventional elements showcase the transformative power of industrial heritage, creating a distinct urban landscape.



ill. 31 Comparison of the different types of spatial scales at Refshaleøen

ill. 32 Photo collage of the form study of the buildings found on Refshaleøen

The Calendar for Refshaleøen

Keywords; Cultural Events, Culinary Experiences, Recreational Activities

#Refshaleøen – 36.838 Times

Refshaleøen is probably best known for its many culinary haven – Reffen - a street food market that opened back in 2018, and Copenhell, an annual mid-June festival, that transforms the asphalt and concrete in front of the B&W halls into a vibrant gathering spot. These two activities are certainly the most popular of all the things that take place on Refshaleøen, based on the amount of #Hashtags they have built up on the social media Instagram. The numbers in the diagram are from April 16, 2024, and are therefore just a snapshot, however, it does provide a strong indication of the popularity level of different functions and events.

In addition to Reffen and Copenhell, there are also several other temporary and more permanent activities. Worth mentioning is, for example, the museum Copenhagen Contemporary, which is housed in the old B&W welding hall. Here they exhibit works by both new up coming artists and some of the biggest contemporary artists, with focus on senses and being able to interact with art (Copenhagen Contemporary, 2023).

Refshaleøen accommodates a variety of smaller offices, workshops, and creative studios, ranging from photography studios and ateliers to carpentry workshops, boat builders, and community spaces fostering social interaction. The island also hosts some mixed businesses, for instance "Havnens Hænder" (Hands of the harbour) who works exclusively with bio-based building materials. The company want to accelerate the green transition by reducing the climate footprint of the construction industry (Havnens Hænder, 2024).

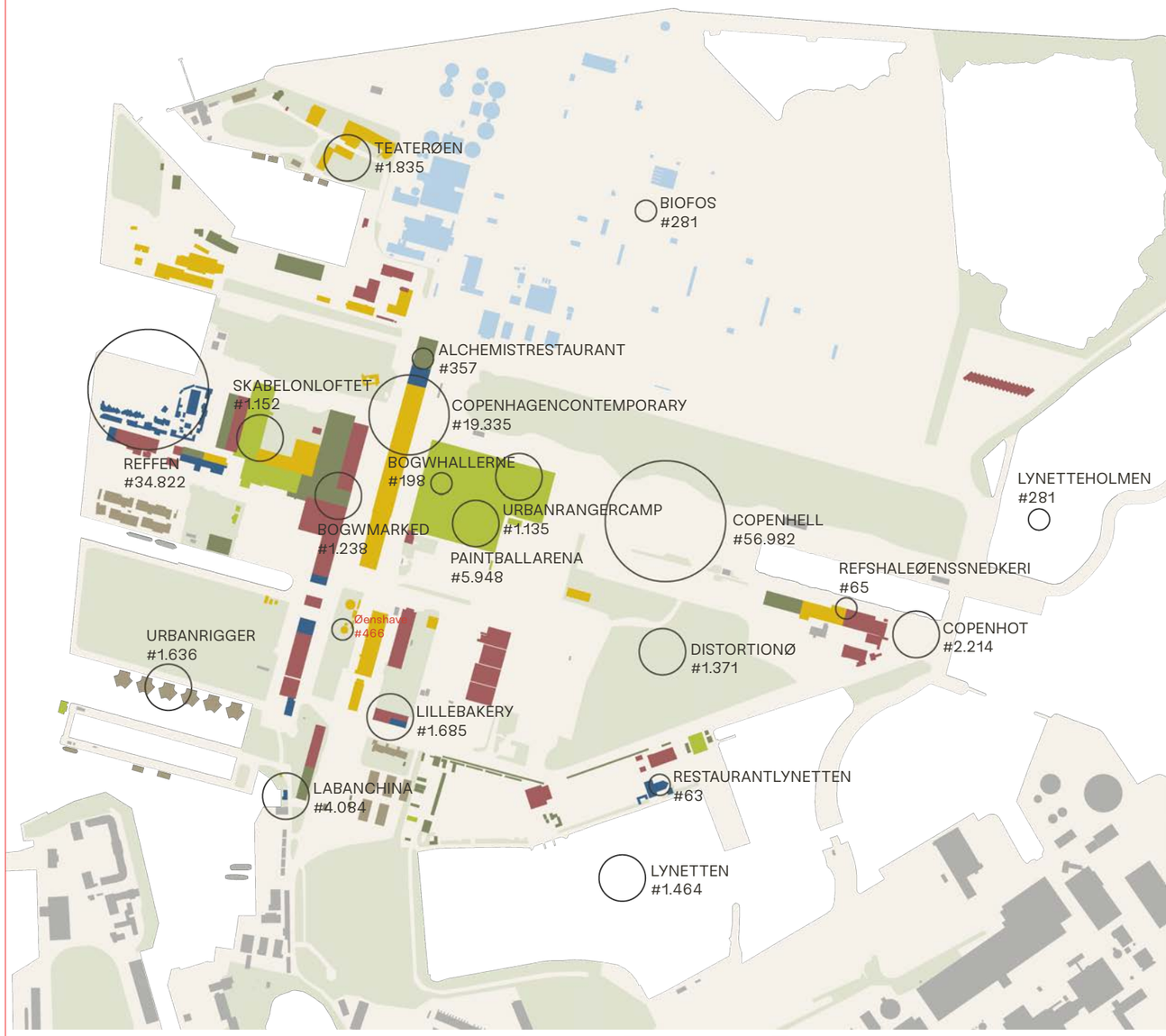
For the active minded, there are indoor and outdoor paddle tennis courts, a small harbour bath, a paintball arena, laser tag, bow combat, a huge indoor climbing wall, and bungy jump etc. In addition, the big attraction is the Urban Ranger Camp, which with the world's highest indoor high-roping courses manages to take full advantage of the dizzying 63-metre height of the B&W halls. Here it is possible to experience everything from free fall to obstacle courses high above the ground (Urban Ranger Camp, 2018).

For those seeking classic Danish pastry, there are places like LaBanchina and Lille Bakery, the first one most likely being the most popular, located on the southernmost part of Refshaleøen, the place has its own small, sheltered harbour dock, where Copenhageners come not only to eat but also to enjoy the harbour bath and sauna community. (La Banchina, 2023).

Refshaleøen's identity is shaped by a diversity of activities, ranging from culinary experiences at Reffen to cultural events like Copenhell and exhibitions at Copenhagen Contemporary. These activities, along with a plethora of smaller offices, workshops, and sports facilities, constitute an important part of the island's atmosphere and appeal. Preserving these activities is therefore crucial to maintaining and enhancing Refshaleøen's identity as a dynamic and vibrant destination.

ill. 33 Photo collage of the activities and events on Refshaleøen

ill. 34 A diagram of mixed functions and activities on Refshaleøen and some selected locations' hashtag scores from the social media Instagram



Conclusion

A holistic approach to the development of Refshaleøen is needed that considers both its physical environment and cultural identity. Through analysing the observed conditions on the island, including access to water and the lack of marine habitats, improvements are needed in several areas. By focusing on improving water access and restoring ecosystems, the island's natural environment can be strengthened, which will help to enhance biodiversity and create a more attractive destination for both residents and visitors.

At the same time, the studies of the island's cultural identity and architectural structure emphasise that there is a rich history and unique character that should be preserved and integrated into future development projects. The preservation and reuse of existing buildings and facilities can help to create an authentic atmosphere and maintain the unique aesthetic of the island.

It is also essential to emphasise the importance of preserving and supporting existing events and activities on the island, such as Reffen street food and the Copenhell festival. These not only contribute to the island's dynamic and cultural diversity throughout the year, but they also create a vibrant and lively environment that is attractive to both locals and tourists. By preserving activities like these, the development of Refshaleøen can build on existing strengths and create an even more diverse and vibrant destination.

05

Synthesis

Chapter Introduction

This chapter synthesizes key insights and findings from the analysis to guide the urban transformation of Refshaleøen. It explores sustainable strategies, cultural preservation, and community engagement, offering recommendations for a sustainable future.

The Approach for Urban Transformation

Introduction

Urban transformation involves careful consideration of environmental sustainability, social equity, and economic viability. In the case of Refshaleøen, an old artificial peninsula in Copenhagen undergoing redevelopment, balancing the preservation of existing structures with the integration of new developments is crucial. Refshaleøen's history as a former industrial site presents both challenges and opportunities for its transformation into a vibrant urban district. Innovative strategies, as highlighted in later case studies, are essential for enhancing the island's physical environment, celebrating its cultural heritage, and fostering community engagement. This synthesis aims to distil insights from diverse perspectives and propose actionable recommendations for realizing Refshaleøen's potential as a sustainable, inclusive, and dynamic urban space.

Analysis Findings

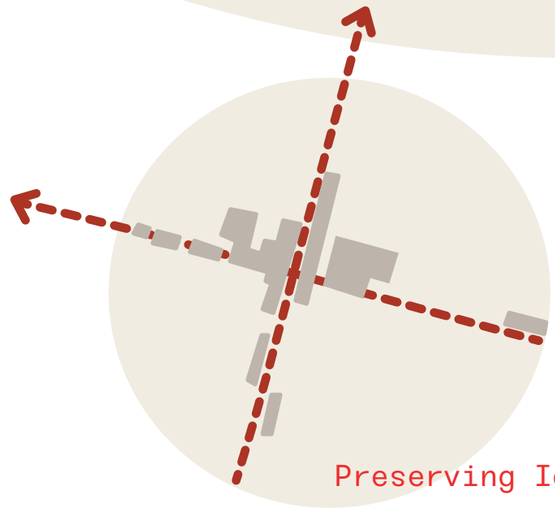
During the analysis, several crucial elements and challenges were identified for the development of Refshaleøen. One primary realization was the need to focus on the existing flora and fauna and improve water access for both people and wildlife, as water is essential for all life.

Preserving Refshaleøen's cultural identity and aesthetics is important to the local community and visitors. The island's unique architecture and historical heritage, including its distinctive industrial structures and cultural events, contribute to its charm. As future development increases density, efforts should be made to maintain space for large temporary structures and events.

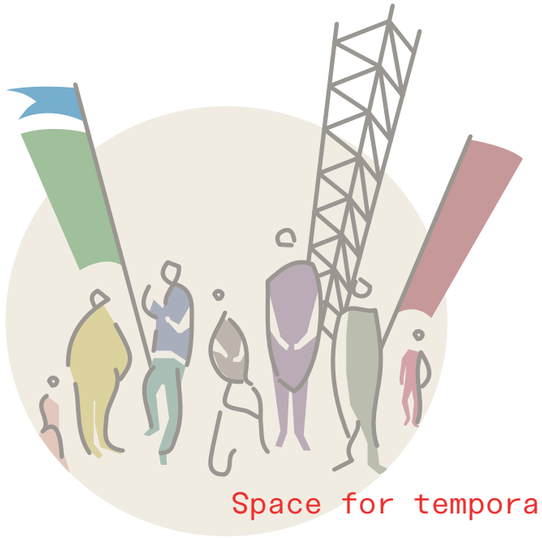
Based on these findings, Refshaleøen's development should prioritize strengthening its ecological integrity and cultural identity. This can be achieved through strategic planning and green initiatives, such as establishing more water access points, preserving existing buildings and facilities, and creating new green spaces. Additionally, supporting the island's cultural and social activities is vital to maintaining its dynamic atmosphere.

These reflections form the basis for recommendations in further developing Refshaleøen, aiming to integrate nature, culture, and society to create a sustainable and attractive future district.

A green strategy



Preserving Identity



Space for temporariness

ill. 35 Three essential findings from the analysis

Contributions From The Idea Competition

The analysis findings form a knowledge foundation for Refshaleøen's development. To enrich this foundation, drawing upon the diverse and innovative ideas submitted in the latest idea competition for Refshaleøen (on pp. 12)is beneficial. Examining these submissions, and the comments on the awarded entries, is an important part of this thesis, offering insights from various stakeholders.

Addressing all 75 submitted ideas provides an overview of perspectives from companies, professionals, and citizens regarding Refshaleøen's development. It has already been stated that the upcoming structural plan competition for Refshaleøen will partly rely on these submitted ideas (By & Havn & Øens Ejendomsselskab a/s, 2024), which is why an understanding of the awarded ideas is essential.

The following section will clarify which ideas this thesis has addressed for further development of Refshaleøen, presenting selected ideas and explaining their relevance.

General Thoughts and Ideas

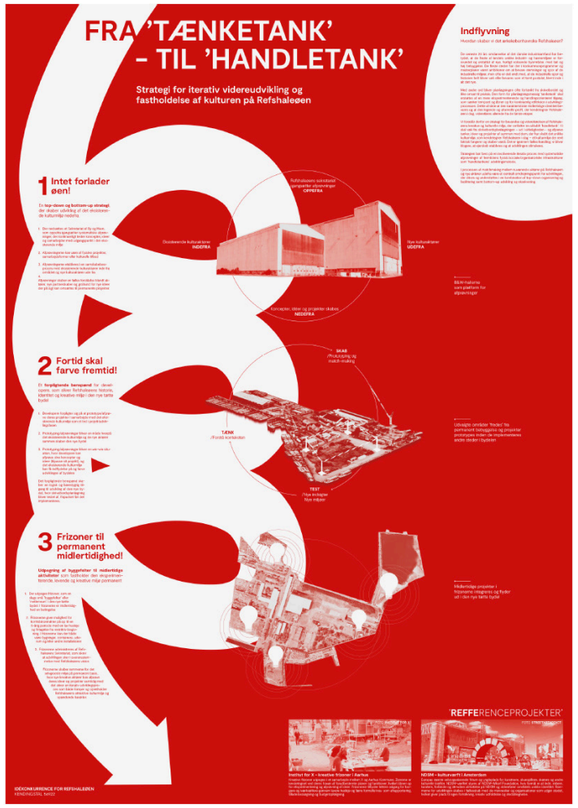
In addition to the ideas that have been worked with more directly in this project and which will be presented hereafter, this project has also worked with some of the most common similarities that appear among the remaining entries. Of the similarities that can be read among the many ideas, the following four have been worked with:

A slow development process.
There must be time to learn from the experience gained before building further. A structure plan must therefore be flexible to changes as new knowledge is gained.

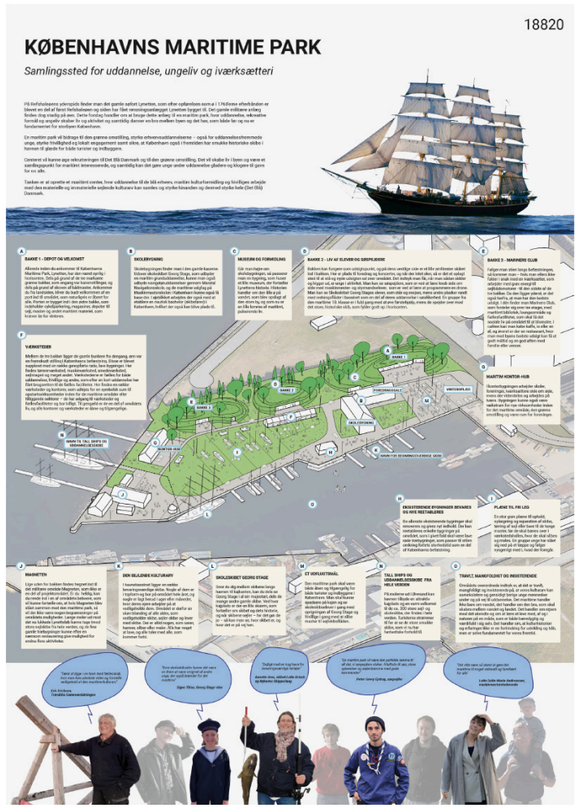
Preserving the self-grown nature.
Existing green spaces are a gift of biodiversity that should be preserved and enhanced.

Preservation of the existing.
Refshaleøen has a well-established identity, its DNA lies in the existing physical elements, functions, temporary constructions, and events.

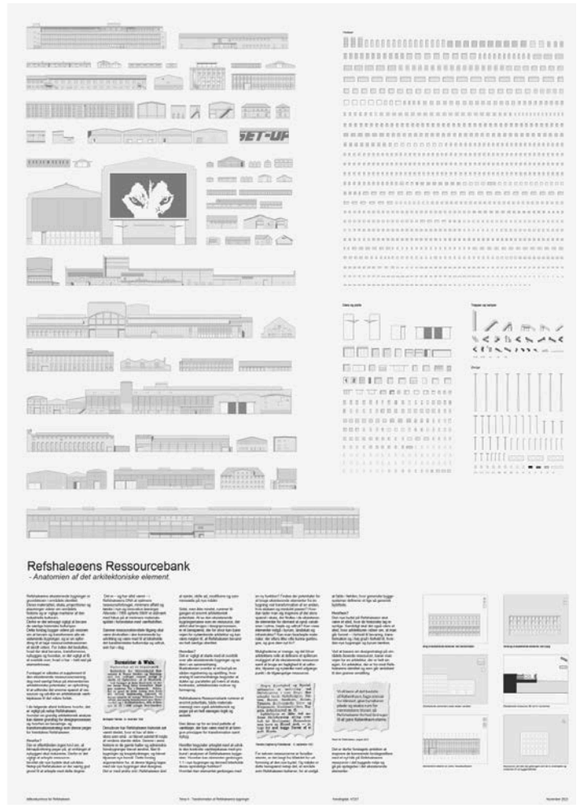
A new approach rather than classic.
In addition to the ideas *From 'Think Tank' to 'Action Tank'* and *A Playbook*, presented here, several other ideas suggest similar new approaches. It is simply not acceptable to follow a generic approach.



ill. 36 Idea proposal: *Fra 'Tænketank' til 'Handletank'*



ill. 37 Idea proposal: *Københavns Maritime Park*



ill. 38 Idea proposal: *Refshaleøens Ressourcebank*

Theme I – The Creative Environment

In this category, two ideas have been of special interest for the development of Refshaleøen.

Fra 'Tænketank' til 'Handletank'
The idea From 'Think Tank' to 'Action Tank' points out the need for careful consideration before initiating development on Refshaleøen. The emphasis is on slowing down the pace to allow for reflection. The idea involves three dogmas: *Nothing leaves the island*, *the legacy of the past must shape the future*, and *the creation of free zones for permanent temporariness*. The process should be iterative with continuous reflection on insights from testing.

In more specific terms, the idea proposes that a secretariat should be established on the Refshaleøen to handle the process and the three dogmas, developers should commit to testing their idea in collaboration with the secretariat and "gap spaces" should be established for permanent temporariness around the island.

The idea was chosen based on its considerations about how development should take place. "*We need to get started, but slowly*", as pointed out in the judges' report (By & Havn & Øens Ejendomsselskab a/s, 2024), of which this approach, the concrete proposals and dogmas, should be incorporated into the physical design.

Københavns Maritime Park
The idea Copenhagen Maritime Park describes the unique opportunity to optimally utilize the area around the Lynette Fort. The aim is to create a place that connects the sea and the city and attracts people with an interest in the maritime.

In more specific terms, the idea proposes to establish a maritime centre offering maritime education and recreation, in addition to workshops, offices and a museum with a maritime focus. The proposal also aims to strengthen vocational education, especially for young people who do not necessarily choose education as their first choice. This should increase interest in the 'Blue Denmark' and green transition.

The idea was chosen based on its concrete proposal for utilization of the area and the focus on life in and on the sea it could potentially create. A focus that is necessary with the distance to the sea that exists today.

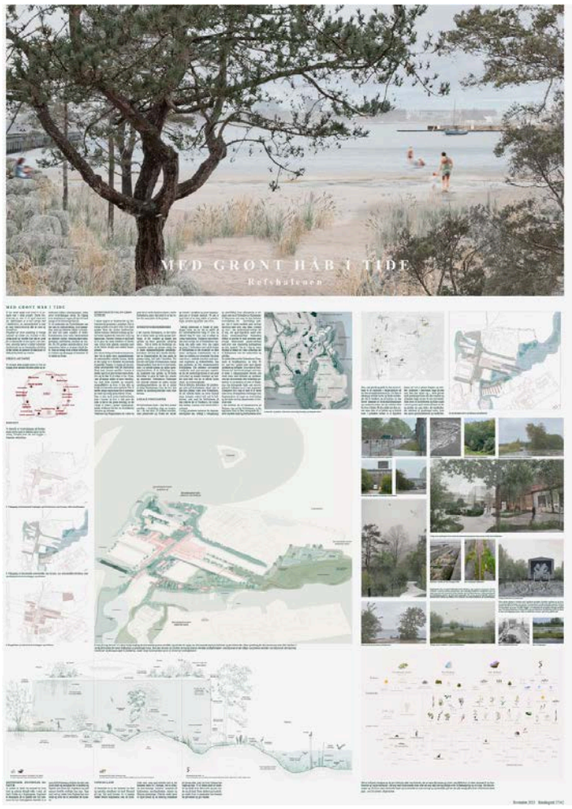
Theme II – Building Transformation

In this category, different ideas have been worked on, of which the most important is presented.

Refshaleøens Ressourcebank
The idea The Resource Bank of Refshaleøen is based on a concept of recycling and works with the same dogma "*Nothing leaves the island*" presented in the idea *From 'Think Tank' to 'Action Tank'*. The idea argues for the creative use of resources in the design process to maintain the unique identity of Refshaleøen.

In more specific terms, the idea is to establish a resource bank on the island that will serve as a large stockpile of recycled materials for the development of the area. An idea that refers to the history of B&W's resource-conscious approach in 1906.

The idea was chosen based on its manageable narrative of reusing materials to shape the development of Refshaleøen. Materials that can be reused to strengthen the island's identity in new creative ways.



ill. 39 Idea proposal: *Med grønt håb i tide*

ill. 40 Idea proposal: *1.000.000 m² .*

Theme III – Urban Nature and Biodiversity

In this category, three essential ideas were considered. "*The Blue Edge*" (org. "*Den blå kant*") offers tools for developing the harbour edge as a zone but is not further discussed. The next two ideas integrate the city and nature; only one is presented due to their similarities. "*The Fox is now an urban animal!*" (org. "*Ræven er nu et bydyr!*") is not further discussed.

Med grønt håb I tide

The idea of Green Hope In Time is based on the belief of a city where nature and people coexist as equals. It points to culturally historic layers and natural areas on Refshaleøen that should be connected and expanded to strengthen biodiversity.

In more specific terms, the idea proposes a strategy for urban development where nature, culture and people are prioritized as much as traditional urban considerations. Among other things, the meeting between nature and the industrial environment should be worked with, for example, by breaking up asphalt in which new plants will grow.

The idea was chosen based on its thorough and elaborate foundation. It talks about focus species as a tool to ensure the right habitats for animals and plants, so that a focus on something other than humans is also incorporated into a future structural plan.

Theme IV – A Mixed Neighbourhood

This category contains many well-argued and creative ideas on how to create the mixed city. Many with similar answers. *REFlectorium* (org. *REFlektorium*) suggests the same as the idea *From 'Think Tank' to 'Action Tank'*, to establish a physical place for handling deliberation, experimentation and facilitation. A different and important idea is about the needed building mass which is presented here.

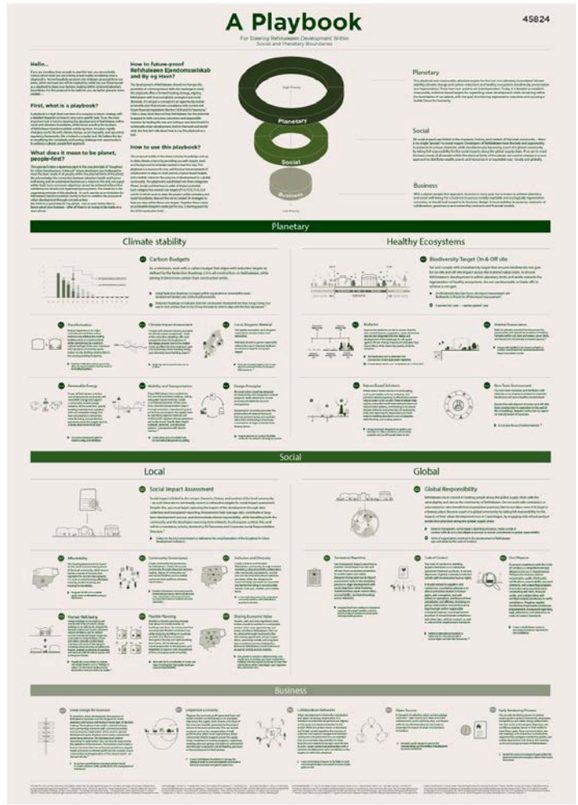
1.000.000 m²

The Idea 1,000,000 m² is about building the necessary number of square metres on Refshaleøen and no more than that. From here, a well-argued basis justifies the idea, with examples such as Copenhagen's growth rate and future required residential square metres.

In more specific terms, the idea proposes a density of 30 m² of housing per person. This will help reduce the carbon footprint and end up with 800,000 m² of necessary housing and 200,000 m² for mixed functions as the total building mass on Refshaleøen.

The idea was chosen based on its argumentation and reflective thoughts on what effect 30 m² per person would have on the surroundings. After all, "*Where is the balance between the dense city and the openness of Refshaleøen?*" as the judges notes in their report (By & Havn & Øens Ejendomsselskab a/s, 2024). The idea opens an important discussion for the thesis to work with.

ill. 41 Idea proposal: *Refshaleøen – et internationalt udstillingsvindue...*



ill. 42 Idea proposal: *A Playbook*

Theme V – Open Category

In this open category, there are many different ideas. One that is interesting is about using the existing B&W buildings as new 'factories' for home-grown fruit. Another idea shows 30 artificial polaroids talking about a future that can go in any direction, depending on our choices today. Of the many ideas, two in particular, have been of interest in relation to this thesis.

Refshaleøen – et internationalt udstillingsvindue for fremtidens blandede by

The idea Refshaleøen – an international... addresses all five themes of the competition. The idea aims to maintain the identity of the creative city, utilizing the industrial structure as the basis for the new city, while preserving the green and blue recreational and industrial nature and thus helping to create the mixed bridge district of the future.

In more specific terms, the idea proposes several concrete actions to promote all five categories. For example, student housing for arts and crafts students with shared workshops, artificial raised seabeds to increase the amount of seaweed habitats along the industrialized waterfront, and new zoning, including a self-build zone where new forms of housing can be tested.

The idea was chosen based on its comprehensive and coherent response to the five themes, especially its focus on a connection to the water and not just the greenery has been important. This opens for a more creative solution orientation in how the waterfront can go from an edge to a zone in the development of Refshaleøen.

A Playbook

The idea A Playbook is a comprehensive strategy-based idea or rather manual on how to plan, manage and execute the development of Refshaleøen. It builds on a Doughnut model which in short is about meeting the basic needs of all people within the physical limitations of the planet. It emphasizes the need for a new way of managing development in the face of the climate crisis, biodiversity crisis and social inequality, in addition to new legislative complexes like CSDR and the EU taxonomy.

In more specific terms, the idea does not propose specific solutions, but rather offers a manual for dealing with future developments. From this, a hierarchy is established, with planetary opportunities setting the upper limit, social life the middle and the need for business the lower limit. Under each level, well-argued strategies are developed (28 strategies in total) that relate to the problems of Refshaleøen and many of the other idea proposals.

The idea was chosen based on its comprehensive foundation and well-founded strategies that address all aspects of the upcoming structure plan. The manual is straightforward to use and is a great tool to use or at least become familiar with the extensive work it entails.

Environmental Strategies

When it comes to blue biodiversity (from pp. 36), two case studies of non-nature-based solutions (NNBS) are presented as strategies for the development of Refshaleøen. They are meant to enhance biodiversity as well as reestablish marine habitats to mitigate the negative effects building artificial islands has on the marine life. Further on, case studies about two green strategies are presented as strategies to enhance green biodiversity as well as mitigating measures for UHI.

Case study: Artificial Reefs

Artificial reefs, are man-made underwater structures designed to mimic natural reef environments. It focuses on recreating stone reefs as small islands and shelters for the marine life in the harbour. Of which, these structures service various purposes, including habitat restoration, biodiversity enhancement and potentially management of the fishing industry. By strategically placing artificial reefs in the marine environment, conservation efforts aim to provide additional habitat for marine organisms and mitigate the impact of habitat loss due to human activities.

Establishing an artificial reef is very simple. It can be done by stacking big rocks on top of each other until they reach the surface, the problem with this is that it requires a lot of space, which is typically not available in densely populated harbours. Another option is to create artificial “towers” with rough surfaces that can be secured to the seabed while reaching up into the air. The latter method is exactly what a project called ’Super Reef’ (org. Super Rev), from the Technical University of Denmark (DTU), utilises (Tækker, 2022).

The ’Super Reef’ project is a collaboration between the artist group Superflex and DTU to investigate the possibility of recreating stone reefs in newly developed concrete. The expectation is that the artificial reefs can eventually be used in various marine structures such as coastal defence projects, bridges, tunnels, offshore wind turbines, etc. This development implies that man-made structures can serve as habitats for ecosystems that human development has previously disrupted, thereby strengthening biodiversity (Tækker, 2022).

With their artistic approach, the project attempts to restore the estimated 55 square kilometres of habitat that has been destroyed or completely removed from Danish waters over the last 100 years (Tækker, 2022). The reefs that once existed have been used to make concrete or foundations for the expansion of new harbour areas and similar. When the rocks disappear, there are no hiding places for smaller fish and critters, places for mussels to attach and seaweed to grow. And when the seaweed disappears, so does a rich marine life, according to a study from DTU Aqua (Tækker, 2022).

Artificial reefs therefore play a crucial role in preserving and enhancing biodiversity in marine ecosystems. These structures serve as refuge in breeding grounds for a wide range of marine species, including fish, invertebrates, and all sort of plants. By providing alternative habitats, artificial reefs can enhance biodiversity and contribute to recreational opportunities such as diving or snorkelling. Contributing to local economies and promoting environmental stewardship, the artificial reef project ’Super Reef’ could be an investment in the future.

Case study: Living Seawalls

The Living Seawalls project, developed by the Sidney Institute of Marine Science in collaboration with Reef Design Lab, aims to mitigate the environmental impact of human activities on ocean ecosystems. Specifically, the project addresses the negative effects of manmade structures such as seawalls, pilings, pontoons, and marinas on surrounding marine life. These structures often disrupt natural habitats and decrease biodiversity along coastlines.

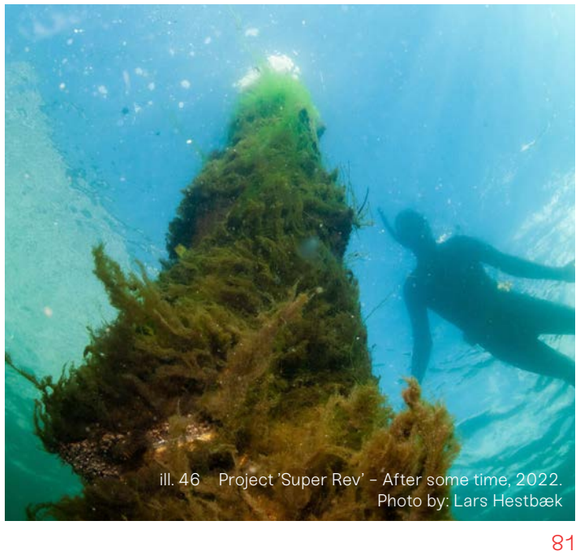
Living Seawalls is the culmination of over 20 years of scientific research, resulting in a modular system of ’tiles’ designed to resemble natural habitats along shorelines. These tiles provide artificial cracks and crevices that mimic lost habitats, offering refuge for species that thrive in such environments. In Sidney, where the panels were initially tested, reports indicate a significant increase of up to 36% in the number of fish, seaweeds, and invertebrates over a two-year testing period (Bishop et al., 2022). While the data originates from Australia, the tiles have been implemented in various locations, including Wales, England. Although the effectiveness of the tiles in Copenhagen’s harbour, particularly along the waterfront of Refshaleøen, may vary, their customized design tailored to mimic specific lost habitats suggests a promising outcome for enhancing local biodiversity.

The Living Seawalls project presents a promising solution for mitigating the adverse effects of manmade structures on marine ecosystems. By providing artificial habitats that mimic natural conditions, these innovative tiles have demonstrated the potential to increase biodiversity in coastal areas. Implementing such a solution along the waterfront of Refshaleøen in Copenhagen holds the promise of restoring lost habitats and supporting the thriving marine life essential for healthy ocean ecosystems.

ill. 43 Series of tiles from Living Seawalls on a harbourfront in Australia.

ill. 44 Close-up of a tile underwater from Living Seawalls, densely overgrown with seaweed.

ill. 45 Project 'Super Rev' - Newly built, 2022.
Photo by: Lars Hestbæk



ill. 46 Project 'Super Rev' - After some time, 2022.
Photo by: Lars Hestbæk

Green Challenges

This thesis aims to strike a balance between preserving existing structures and facilities while incorporating new buildings and green spaces. However, this integration presents challenges in terms of the allocation of room for green spaces. To solve this problem, two case studies about green solutions has been conducted where experience knowledge is gained through different methods. One is about other cities introducing a law for green spaces on roofs, while the other one introduces a new way of thinking urban nature.

Case study: A green law

In Paris, a law was recently passed requiring new buildings to have either solar panels, green roofs or a combination both (which scientifically has shown to be the best solution). The reason for this is that the city has set itself the goal of becoming one of Europe's greenest cities, with up to 60% of the city's surface being green by 2030 (Rousset-Rouvière, 2022; The fairly lame, 2022).

While solar panels utilise the energy from the sun to provide 'green energy' to buildings, the purpose of green roofs is to reduce the energy consumption of buildings. By replacing traditional roofing materials that absorb heat with green roofs that can instead insulate, buildings can become more energy efficient and therefore require less energy. Therefore, when solar panels and green roofs are combined, the plants not only cool the building, but also the array itself (the solar panels and associated equipment) that supplies the energy to the building. As a result, the array also becomes more efficient. The effects of this decision are therefore clear, but another important reason is also Paris' desire to counteract the city's UHI effect (Rousset-Rouvière, 2022).

Similarly, politicians in Toronto have called for green roofs as a tool to improve the sustainability of the city. This involves specific building projects that integrate green roofs. These can either be combined with solar panels or designed to handle increasing rainfall as part of the city's water management (Dyck, et al., 2015).

In Portland, USA, green roofs are advocated as a method to reduce stormwater runoff during rain events. To encourage their installation, property owners are required to pay a monthly fee per 1000 square feet of impermeable surface area. Moreover, all new city-owned buildings must have a minimum green roof coverage of 70%. Similarly, Chicago encourages green roof adoption to mitigate the urban heat island effect.

Case study: Garden of the Future

Year: 2018
Place: Ostrava, Czech Republic
Artist: Atelier Partero & Matyáš Chochola

In a collaboration between landscape architecture and artistic vision, the PLATO Garden project (also called: Garden of the future) emerged as a unique endeavour. Tasked with finding a temporary art base for PLATO, a contemporary visual arts platform in Ostrava, Czech Republic, the team stumbled upon an abandoned Hobby market with a 5.000 square metre hall, ripe with potential (Partero, 2018).

Teaming up with artist Matyáš Chochola, the Partero architecture studio envisioned an apocalyptic scene that symbolically reflected the decline of civilization juxtaposed with nature's regenerative power. The concept aimed to accelerate nature's reclamation of the space, turning it into a vibrant garden/stage for gallery activities (Partero, 2018).

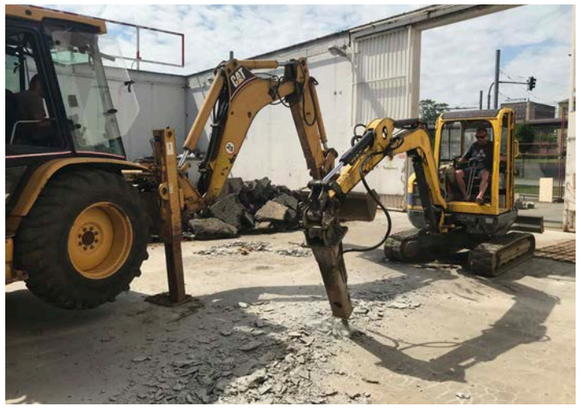
Facing various limitations, including time constraints and logistical challenges, the team improvised and collaborated creatively. Instead of removing concrete, they opted to bring in rubble to create the desired effect. The selection of trees, once considered undesirable, added to the project's narrative, highlighting the beauty in imperfection (Partero, 2018).

Despite the hectic schedule, with the combined efforts of the studio, artists, and construction workers, the garden was transformed in just two days. The opening, marked by an artistic performance, symbolized the birth of this conceptual space (Partero, 2018).

Beyond its conceptual origins, the PLATO Garden evolved into a functional and inspirational public space. Complete with a café, shaded areas, and versatile design, it caters to diverse age groups and activities. Its allure lies in its ability to spark curiosity and exploration, inviting visitors to engage with the space on multiple levels (Partero, 2018).

Since its opening, the garden has flourished beyond expectations, serving as a testament to the power of natural change. Located in Ostrava, Czech Republic, the PLATO Garden stands as a testament to the fusion of art, nature, and community (Partero, 2018).

ill. 47 PLATO Garden Project under construction and performance






Key Points to Remember

Summarised Recommendations

The analyses of Refshaleøen and its context, in addition to the idea proposals and strategic cases presented on the previous page, have provided important insights that can inform the strategic planning across different areas. Key recommendations include preserving space for large events, improving transport infrastructure, and implementing green roofs, -corridors and strategic blue structures, as part of a sustainable development strategy.

Implementing a green strategy, including green roof requirements for some types of new construction, can support sustainable development on Refshaleøen. This can help reduce the UHI effect, improve rainwater management and promote biodiversity, which harmonises with the goals of creating better and more sustainable urban environments. Especially if these are also combined with blue biodiversity improvements along the waterfront.

Maintaining space for large events and temporary structures is crucial to maintaining Refshaleøen's dynamic cultural atmosphere while leaving room for ongoing development. By not preserving an area for this kind of activity, there is a risk that the island will lose some of its character. In the worst-case scenario, it will attract a less mixed group of people, making the city less mixed and thus not achieving the status of a Public Domain.

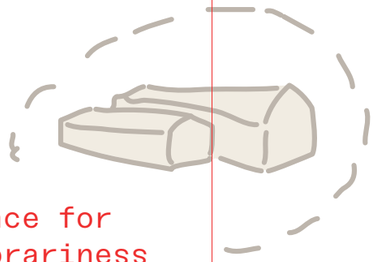
Improving the transport infrastructure to and from the island is essential to improve accessibility and reduce dependence on private cars. Exploring options for dispersed arrival points and sustainable transport links will not only reduce traffic congestion and pollution, but also promote a healthier lifestyle for residents.

A Vision to Set The Standard

An integrated vision aims for a slow and sustainable urban development that can reflect the historical heritage, support the native nature and utilise the popularity of existing activities and events. Social sustainability will help develop the city, while environmental sustainability will promote a healthier city and coexistence with flora and fauna. Economic sustainability will come from selected areas with space for development and other areas can be preserved for experimental laboratories and temporary test trials.

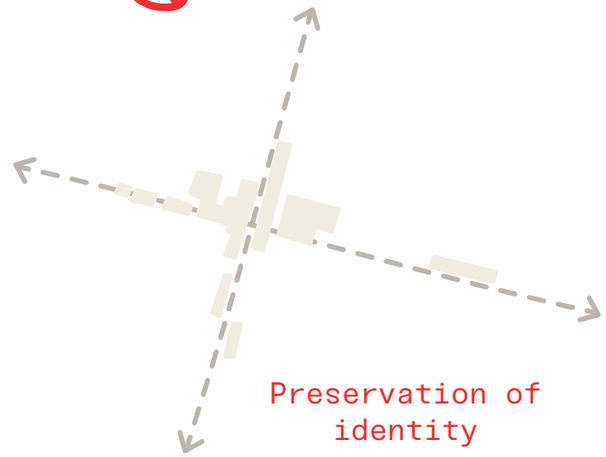
Refshaleøen will become a model for urban transformation, demonstrating innovative planning strategies and strong community engagement for a thriving and resilient neighbourhood.

Green strategies



Space for temporariness

An urban transformation



Preservation of identity

A Public Domain

ill. 48 Key elements presented in a diagrammatic form highlighting some strategic sub-elements

06

Presentation

Chapter Introduction

This chapter unveils the outcomes of the research efforts in response to the presented problem statement. It delves into different aspects of impact, design considerations, and specific details, providing an overview of the resulting design amassed over four months of work.

Three Key Phases

A Strategic Approach

To strategically and timely develop the large project area, it has been divided into three focus areas: The Central Axis of Identity, The Local Neighbourhood, and The Expansion Zone. Each area has its own potential based on current site characteristics. These areas are interconnected and provides an overview and direction for development on the island.

01 – The Central Axis of Identity

This focus area, a main transverse axis in the centre of the island, extends about 1 kilometre from the east to the west coast. It contains some of the last untouched elements of the island's shipyard history, making it the primary focus of this project. This phase concentrates on the central axis, integrating historical markers and newer elements that define Refshaleøen's identity. Key elements include:

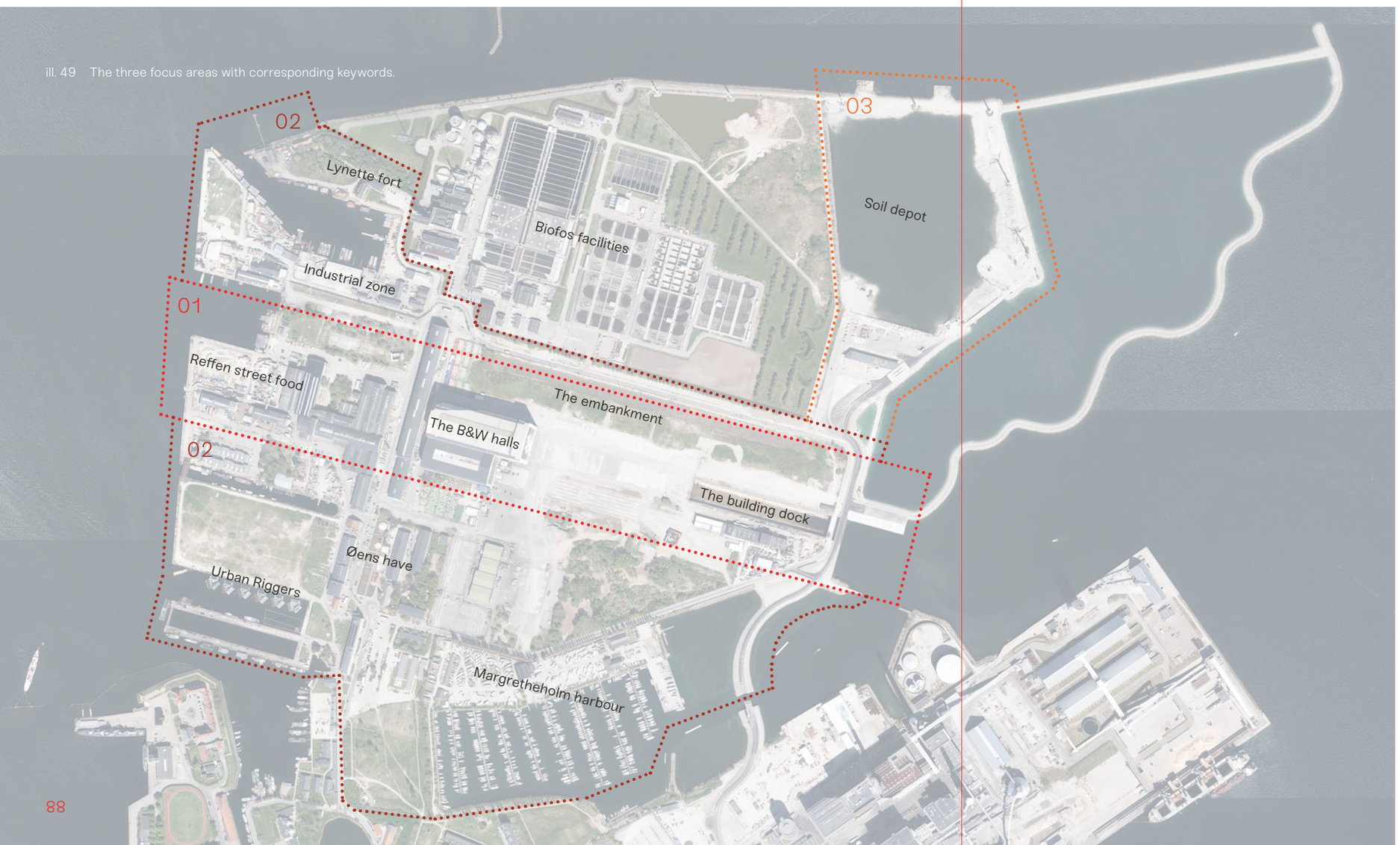
The B&W Halls - pp. 96

Iconic for its height, 63 metres, and the "Wolf of Copenhagen" mural, it retains its original expression and is a significant identity marker. A reference to its size, you could put 3x Kultorvet on the ground floor as well is fit the silos, Portland Towers, inside of the halls.

The Building Dock - pp. 104

When the large cargo ships were built and launched, this was done in connection to the building dock, often referred to as a dry dock. Its distinct feature is that it can still be emptied, unlike the other two old dry docks on the island, which are permanently under water. The exact depth of the dry dock is unknown, but an estimate is between 6 to 10 metres, comparable to others like the converted dry dock in Elsinore, now a maritime museum, is 7 metres deep (M/S Museet for Søfart, n.d.) . Keeping the building dock dry preserves its historical significance and allows visitors to appreciate is immence scale.

ill. 49 The three focus areas with corresponding keywords.



The Embankment - pp. 108

The green embankment, constructed back in 2000 to mark the north-eastern boundary for the planned future neighbourhood that was to be built over 10-20 years (Schollert, 2000), stands today as a 640-metre-long, 14-metre-high structure. It is clear today that the planned neighbourhood was not built, it does howver, serve various purposes from seating during festival to acting as a barrier against odours from Biofos. Its significance lies in its scale, balancing the presence of the B&W Halls, the construction dock and the open space between them.

Reffen Street food

The market is synonymous with Refshaleøen. Offering an array of culinary delights from all over the world alongside a skate park and seating facilities. It has become a beloved attraction, embodying quintessential Copenhagen trends while transforming the industrial landscape. Preserving the street food market´s identify is crucial., ensuring it retains its essence amidst ongoing development. This project aims not to change Reffen, but rather to create a counterpart can harvest the popularity of the area and share it with the rest of the island.

02 – The Local Neighbourhood

This area includes a large part of the existing housing, city life, and green space found on Refshaleøen, as well as Margretheholm harbour. Hence, this area requires a gentler approach that will involve several sub-phases when developing the area. Additionally, careful considerations are required as new buildings emerge and more people move in. While it is not the main focus of this thesis, its content and connections will be addressed.

In this area, some of the socially localised strategies proposed by the idea of 'A Playbook' should be considered. These include affordable housing, flexible planning through zoning and shared economic value by prioritising the small businesses that help create the mixed city.

A lower level of detail has been applied within this local neighbourhood, taking a more strategic approach. It's about highlighting the potential and possibilities of this area through a simple layout of urban spaces, building square metres and new ways of thinking urban nature.

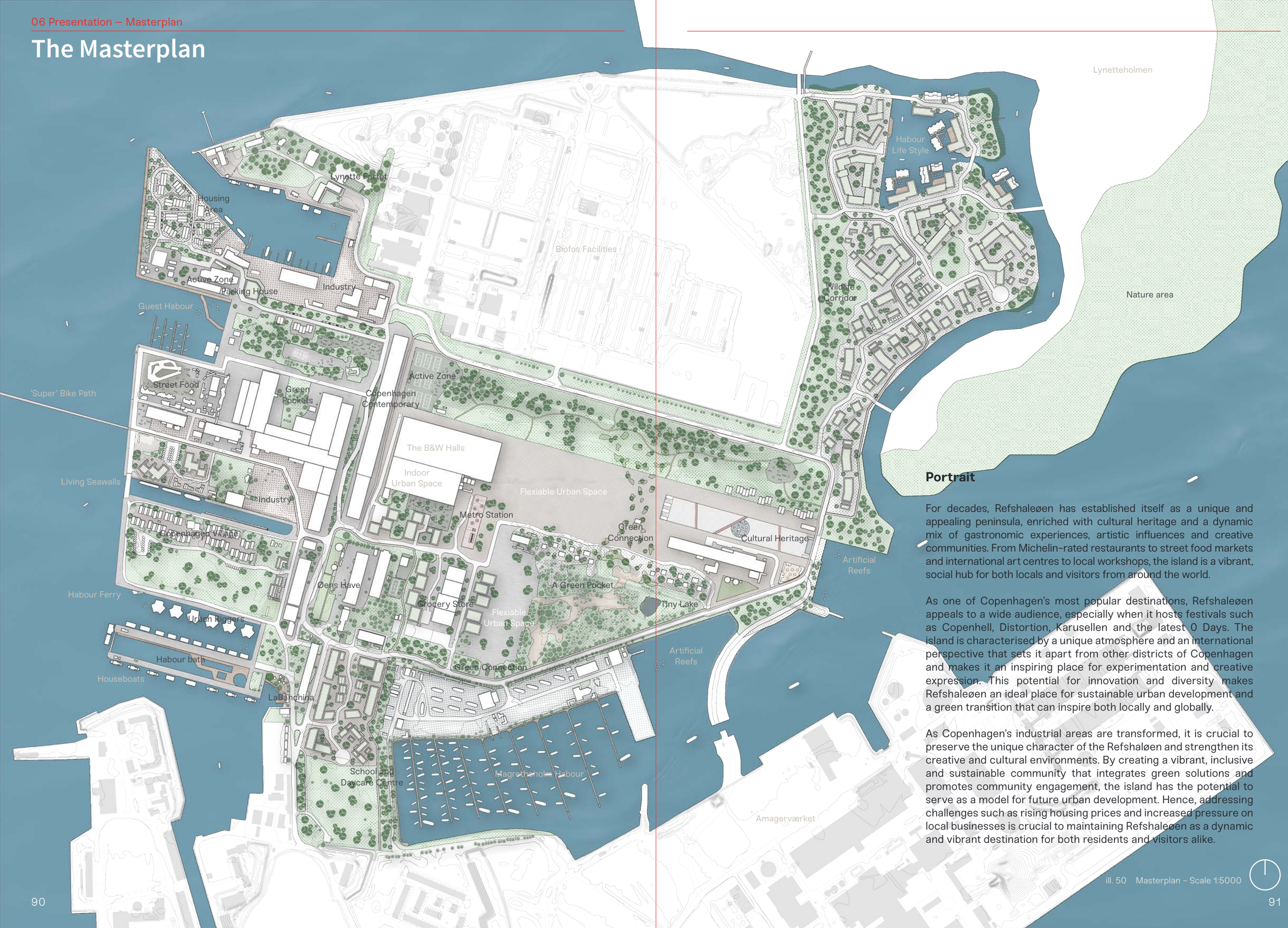
03 – The Expansion Zone

Currently a soil depot, this area is being filled with clean leftover soil from municipal projects. It is the least focused on area of the project site, nearest to the Lynetteholmen project, and will be approached strategically rather than through specific design.

The northernmost area currently consists of reclaimed sea, with little to reflect on in terms of immediate development. Hence, this area is proposed to be developed as one of the last areas within Refshaleøen. This approach allows for more efficient land use and accommodates the practical needs of projects like Lynetteholmen, which may require a temporary construction site. As such, specific details regarding building types, natural areas, and urban spaces in this area are scarce in this thesis. Instead, a conceptual proposal has been made to outline its potential appearance once larger structures are established, with a focus on future connections to Lynetteholmen.

This area serves as a preliminary framework for future planning rather than a concrete design proposal, emphasizing structures and connections over specific building types and urban spaces.

The Masterplan



Portrait

For decades, Refshaleøen has established itself as a unique and appealing peninsula, enriched with cultural heritage and a dynamic mix of gastronomic experiences, artistic influences and creative communities. From Michelin-rated restaurants to street food markets and international art centres to local workshops, the island is a vibrant, social hub for both locals and visitors from around the world.

As one of Copenhagen's most popular destinations, Refshaleøen appeals to a wide audience, especially when it hosts festivals such as Copenhell, Distortion, Karusellen and the latest 0 Days. The island is characterised by a unique atmosphere and an international perspective that sets it apart from other districts of Copenhagen and makes it an inspiring place for experimentation and creative expression. This potential for innovation and diversity makes Refshaleøen an ideal place for sustainable urban development and a green transition that can inspire both locally and globally.

As Copenhagen's industrial areas are transformed, it is crucial to preserve the unique character of the Refshaløen and strengthen its creative and cultural environments. By creating a vibrant, inclusive and sustainable community that integrates green solutions and promotes community engagement, the island has the potential to serve as a model for future urban development. Hence, addressing challenges such as rising housing prices and increased pressure on local businesses is crucial to maintaining Refshaleøen as a dynamic and vibrant destination for both residents and visitors alike.

ill. 50 Masterplan - Scale 1:5000

Strive For Coexistence

Two Concepts

Before presenting the masterplan and the remaining proposed structure, two concepts have been developed to introduce the underlying thinking. The concepts are thus a product of the synthesis, of which the two concepts are rooted in both the important analysis findings and the essential knowledge and presented experience. They work with two dominant factors: human and wildlife. These should not be seen as opposites, despite having very different needs. Instead, they are set up as two directions that are both necessary to achieve the healthy sustainable development that this thesis strives for on Refshaleøen.

ill. 51 Development axes

ill. 52 Green connections

Axis of Development

One way to develop a city is to look at what already exists. This concept is about creating direction for the development of Refshaleøen by working with the historical axis from the island's 'childhood' when the shipyard Burmeister & Wain still existed here. The concept is about developing the island based on the old B&W intersection, where new buildings can emerge, life can develop, businesses can settle, and the city takes shape.

Thus, the development will primarily take place along the axes, with a faster pace and more human-centred surroundings, and to a lesser extent outside of them. This does not mean that development should not take place outside the axes, for example for the north-eastern part of Refshaleøen. Development will still take place, but not with the same speed or intensity. Outside the axes, there is room for a different pace and character.

Within these axes, the area will be characterised by harder surfaces, faster pace, a high degree of historical markers, urban spaces and human-centred design approaches.

Linking the Green

This concept aims to blur the boundary between city and nature by creating green connections throughout the urban landscape. By creating long green corridors through the city's steel and concrete, it fosters a symbiotic relationship between urban and natural environments. Similarly to how Copenhagen's network of railways is laid out like fingers in the landscape, this concept proposes a belt of green spaces extending into the city, providing tranquil havens for people and habitats for animals amidst urban development.

These green corridors prioritize wildlife, with built-in wildlife passages designed for animals rather than humans. Human interaction is limited to specific areas, allowing for the coexistence of urban activity and natural habitats. Permeable surfaces, slower pace, and nature-centric design elements characterize these corridors, creating opportunities for exploration and connection with the natural world within the city.

A Flexible Plan

Two Scenarios

In addition to introducing the two concepts before the masterplan, it is also necessary to clarify one particular detail, the planned metro line M5. Originally, the plan was for the new M5 line to run as a high line with a ramp from Prags Boulevard East to Refshaleøen, on to Lynetteholmen and possibly connect to the Nordhavn stations. This was the idea back the idea consultation phase in 2022, (Københavns Kommune, 2022) but since then changes have been made.

Instead of connecting to Nordhavn, the metro should instead be connected to Østerport through a tunnel, and it is also being investigated whether it is possible for the high line from Prags Boulevard East to be built as a tunnel instead, so that a high line is first established in connection with Lynetteholmen. Regarding the location of the metro station, it should be placed close to the B&W halls, centrally on Refshaleøen. However, of the metro line going out there is to be above ground, placing it on the east side of the island might be better to better preserve nature and identity. Now section will continue to present what the two options mean for the masterplan in the context of this thesis.

ill. 53 Underground metro location

ill. 54 Highline metro location

An Underground Metro

The foundation of this thesis is an underground metro with a station centrally located on the island, at the south-east corner of the B&W halls. Of this, the masterplan is characterised by preserving the distinctive features of the large halls, the embankment and the surrounding landscape. An underground metro will be undeniably expensive, but on the other hand, it will provide almost invaluable flexibility above ground. Renting a tunnel drill, digging to avoid various civil engineering works underground and breaking through Refshaleøen's artificial foundation is certainly not cheap. But compared to the construction of the metro in the rest of Copenhagen, where ancient artefacts and fragile cultural history had to be taken into account, the construction of a tunnel between Prags Boulevard East station and Refshaleøen station is far from impossible.

The metro station itself can then be combined with entrances and exits both inside and outside the B&W halls, to which an almost pulsating effect can be created with the metro. A hub of green infrastructures, all starting from the B&W halls, and spreading out to the rest of the island's facilities with support from the underground metro.

A Highline Metro

Conversely, if it is decided that an underground metro is too expensive, a high line will have to be built instead. The challenge with this, is the effects it would have on the surrounding landscape if such a large construction were to cut through the island.

This thesis proposes, if the metro line will be above ground, to move the location of the metro to the eastern edge of the island. The station could be placed around the connection from the currently temporary road and integrated with the green corridor. In this way, the large concrete construction would not interfere negatively with the distinctive scales and volumes that characterise the central part of Refshaleøen. There will be consequences of not having the metro station located in the centre of the island but placing it to the east is not negative, although, it may help to create a more east-west orientated connection when people arrive on the island. As some might arrive with the metro in the east and others by bus or the harbour ferry in the west, this would strengthen the cross-island mobility. A proposal for a simple masterplan where this solution is a reality can be seen in appendix 06 - Alternative masterplan on pp. 138.

Urban Evolution

Redefining Refshaleøen's Landscape

The upcoming pages will focus on the 'Axis of Development' concept within the proposed structure, with a particular emphasis on human-centred solutions. This approach prioritizes designs that support social and economic sustainability, focusing on human activities, materials, and potentials.

The flow chart to the right shows expected human-orientated movements on the island. The rich red line is the primary flow consisting of buses, cars, motorbikes and other heavier traffic. The slenderer red lines are also made up of heavier traffic, but here at a much more moderate pace and volume. Given that the city is for people, not cars, the speed limit will also be lower, making it more attractive to ride a bike rather than drive. The dashed lines indicate the soft movement patterns of pedestrians, people on scooters and slower cyclists. The blue line is a proposal for the location of a new super bike path to support the green transition. The super bike path utilises a non-existent bridge to the west, the City of Copenhagen plans to establish a new bicycle and pedestrian bridge, or possibly a new direct harbour connection using electric shuttle ferries (Copenhagen Municipality, 2019). Nothing has been decided, but it points in the direction of a bridge, which is why that scenario is also incorporated in this thesis.

ill. 55 The human-centred flow

From Shipyard to Vibrant City Centre - *B&W Hallerne*

Copenhagen's Dynamic Urban Heartbeat

The B&W Halls are a remarkable architectural marvel in Copenhagen, spanning approximately 17.000 square metres and surpassing many of the city's renowned public spaces. For perspective, Rådhuspladsen, which covers about 7.800 square metres, could fit almost two and a half times within the halls. The building features multiple arrival points, including car parks, bicycle facilities, an underground metro station, and tourist bus drop-off points, collectively creating a dynamic flow of visitors and infusing the halls with vibrant energy.

The sturdy steel structure of the B&W Halls has facilitated the integration of new functions, transforming the space into a versatile and dynamic hub. The halls now house a hotel, shops, dining options, workshops, studios, car and bicycle parking, and an underground metro station, catering to diverse needs from accommodation and shopping to creative professions. Original features like the Urban Ranger Camp, Slackline, and Paintball Arena have been preserved to maintain the halls' unique character, while some storage facilities remain for community use.

Through careful programming, the B&W Halls have become a lively centre of activity, creativity, and interaction. The design ensures public accessibility and encourages community engagement, positioning the halls as a central gathering point on Refshaleøen. The balance of various functions and spaces within the halls, combined with their seamless integration into the surrounding urban environment, fosters a vibrant and inclusive atmosphere, making the B&W Halls an essential part of Copenhagen's urban fabric.

In a project of this scale, it is crucial to find a balance between different volumes: which ones are so small that they should be considered closed units, and which ones are so large that their interior space can be considered part of the surrounding urban space. Initially, the B&W Halls was not considered a volume to be programmed in this thesis. However, with increased focus on the historical axis, the question of what should actually take place within this impressive structure arose, as it became difficult to define the surrounding without the interior of the building. Therefore, an overall programming of the building was developed. Section AA' and zoom in 01 on pp. 98 should thus be seen as strategic proposals for utilisation, rather than direct design proposals. On pp. 102 you can find an overview of the location of all the sections.

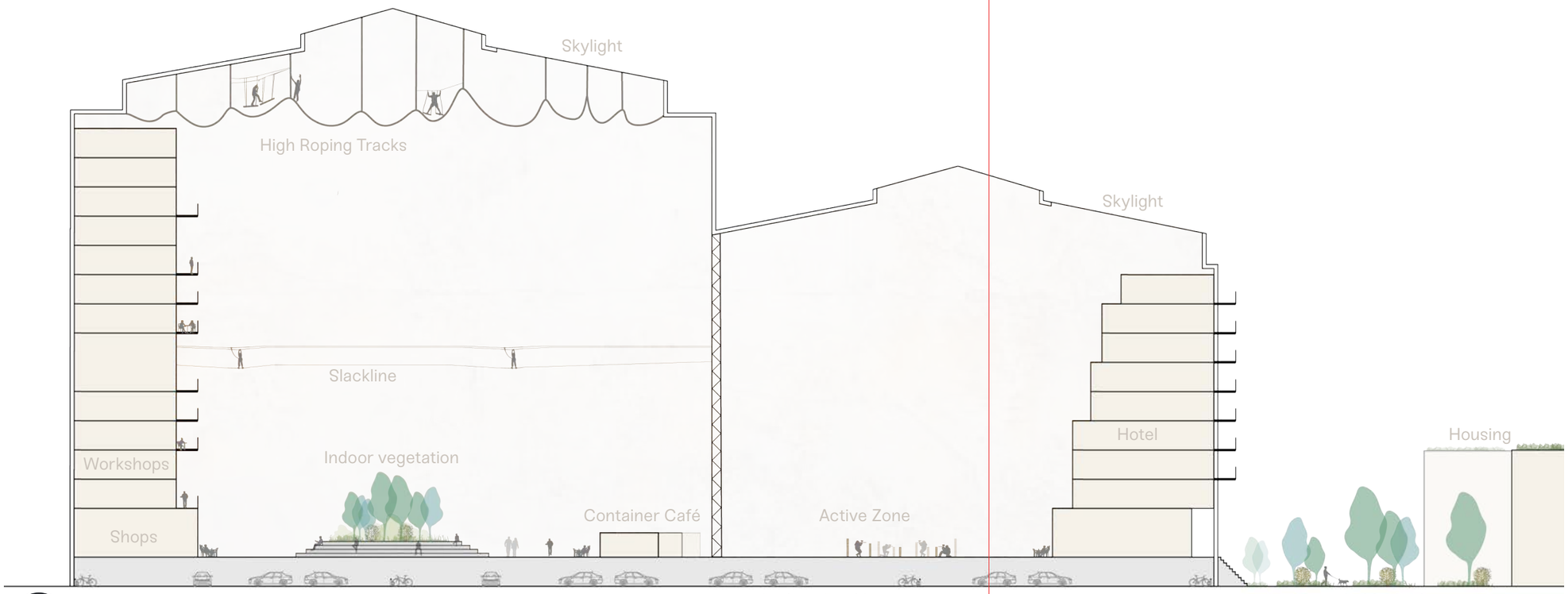
Scenario: A Postcard From a Traveller

A visitor's perspective: Experiencing Hotel B&W.
Persona: Marieke, a tourist visiting Copenhagen.
Objective: To demonstrate the unique adaptive reuse of an industrial building and the vibrant atmosphere of the B&W Halls.

Marieke, a tourist visiting Copenhagen, recently checked into Hotel B&W, located in a repurposed industrial building on Refshaleøen. The exterior resembles a monumental industrial cathedral, but inside, the space transforms into a vibrant indoor city filled with lush vegetation and various activities.

Marieke observed participants from the Urban Ranger Camp navigating high obstacle courses, approximately 50 metres above ground, and heard the excitement from the nearby Paintball Arena. The hotel's indoor roof terrace offered her a panoramic view of the entire hall, showcasing the blend of old steel structures, a rustic concrete floor, and an expansive glass ceiling that melds interior and exterior spaces seamlessly.

Reminiscent of the Markthal in Rotterdam, yet even more impressive, the B&W Halls presented a dynamic urban environment rich in activities. Marieke was eager to share her photographs and experiences with her family, which highlighted the successful adaptive reuse of the industrial space into a lively community hub.



ill. 56 Section AA' – A 'conceptual' through the large B&W halls, looking east – Scale 1:500

ill. 57 Zoom in 01 - Conceptual plan of the large B&W halls - Scale 1:500

When Few Becomes Thousands

A Dynamic Shape-Shifting Space

Today, this area is often used for various events and major functions, most notably the music festival Copenhell. The festival itself, which often advertises itself as inviting guests to 'a trip to hell', is an annual event known for its impressive lineup of everything from heavy metal to hard rock bands. The festival attracts thousands of metal enthusiasts from all over the world and spans four days of intense music, food and drink. Copenhell is not only known for its music, but also for its unique atmosphere and sense of community among festival guests. The latter of which has led to the festival being one of the safest to visit today.

Copenhell, A Child of Refshaleøen

In 2023, the festival welcomed 38.000 visitors and 76 different bands participating in the festivities, compared to the 4.000 back in 2010 when the event took place for the first time on Refshaleøen. In addition to the annual metal party, the people behind Copenhell have also initiated a rock academy for girls and non-binary students to be introduced to the music industry with a heavy metal perspective, a heavy metal cruise between Copenhagen and Oslo, and a one-day event in January, '*When Copenhell Freezes Over*' (Jensen & Michelsen, 2024). Hence, Copenhell is not just about metal music but also a movement that manages to unite diverse individuals from various backgrounds that might not run into each other on other occasions.

During Copenhell, the area transforms into a central hub for concerts, markets, and other activities, showcasing its ability to function as a dynamic and adaptable urban space. Looking forward, this space will continue to serve as a permanent venue for a variety of temporary events and structures throughout the year. It will cater to the needs of local residents, visitors, and tourists, while maintaining the flexibility for Refshaleøen to evolve and innovate.

Scenario: A Phonecall From a 'Metal Head'

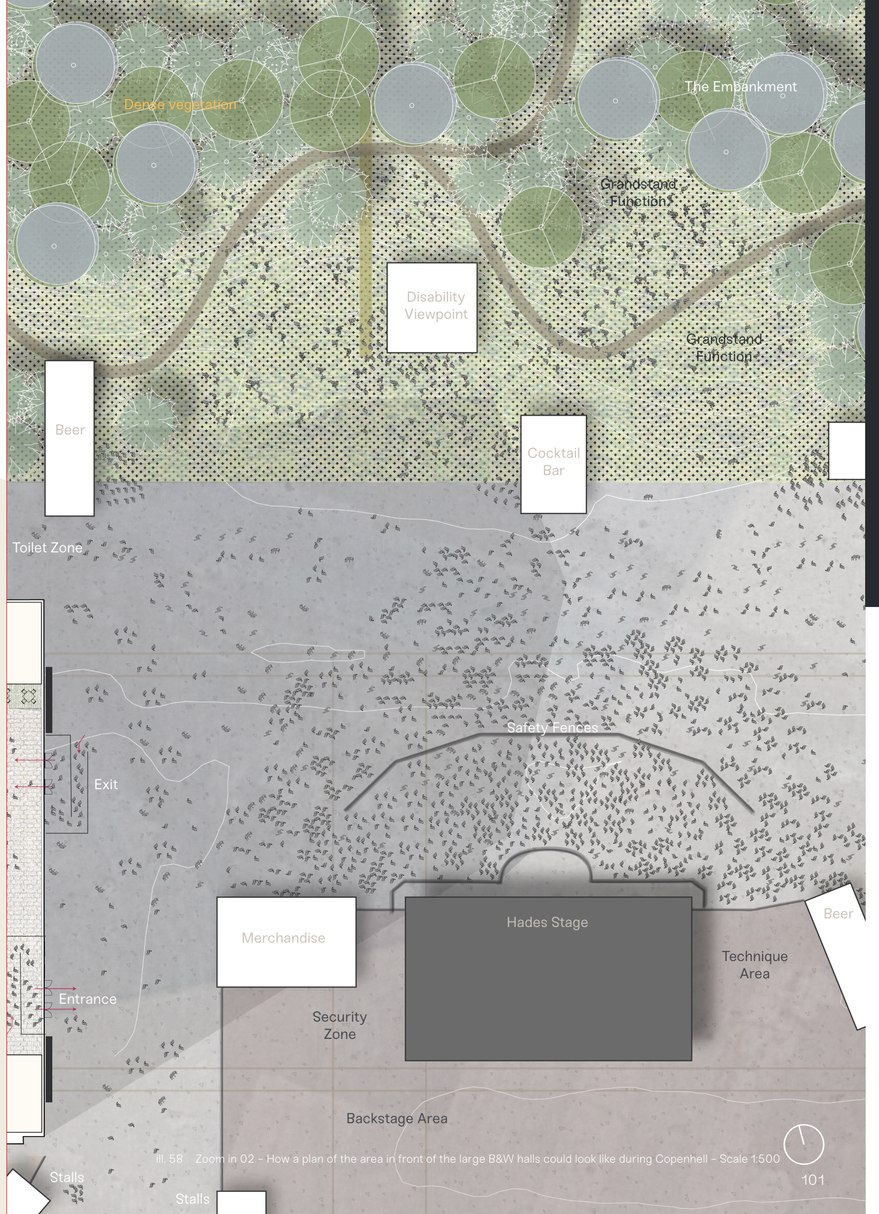
A Day in the New Urban District.
Persona: Claus, a local resident and heavy metal enthusiast.
Objective: To demonstrate the accessibility and atmosphere of the B&W Halls during a major event.

Claus arrives at the B&W Halls for the annual Copenhell, eager to experience the vibrant atmosphere. The expansive halls, now transformed into a dynamic event space, resonate with the energy of excited festival-goers. Claus makes his way to the Hades Stage, where the crowd is already electrified by the performance. The stage, equipped with flamethrowers and dynamic lighting, creates a spectacular visual display that captivates the audience.

Claus decides to enjoy the concert from the embankment, an elevated area offering a panoramic view for the crowd. As he sits, he observes the wave of young people crowd-surfing, a testament to the lively and inclusive atmosphere. The sun sets, casting a warm glow over the scene, and Claus relishes the last rays of daylight with friends.

When the concert concludes, Claus heads towards the newly integrated metro station. The station's entrance, marked by the iconic 'Wolf of Copenhagen' mural on the B&W Halls, is both an artistic landmark and a functional gateway. The seamless connection to the metro ensures a quick and easy departure from the venue, demonstrating the efficiency of the new urban design.

Reflecting on his experience, Claus appreciates how the thoughtful integration of transportation, public art, and event spaces has enhanced the festival. The accessibility and vibrant environment of the B&W Halls during Copenhell exemplify the district's potential as a hub of cultural and social activity.



ill. 58 Zoom in 02 – How a plan of the area in front of the large B&W halls could look like during Copenhell – Scale 1:500

ill. 59 Location and direction of the different sections and zoom ins – No scale.

A Dynamic Urban Space

Preserving Versatility on Refshaleøen

Refshaleøen boasts a sprawling urban space, maintaining its original spaciousness and robust appearance. The area, measuring approximately 270m x 140m, is more than 2,5 times the length and 2 times the width of an 11-man football pitch. From the B&W Halls, a five-minute walk eastward leads to the edge of the construction dock.

The use of such a large space with hard surfacing may seem challenging when it is not used for events like Copenhell. However, this robust surface eliminates the need for frequent maintenance typically required by grassland after large events, proving to be an advantage.

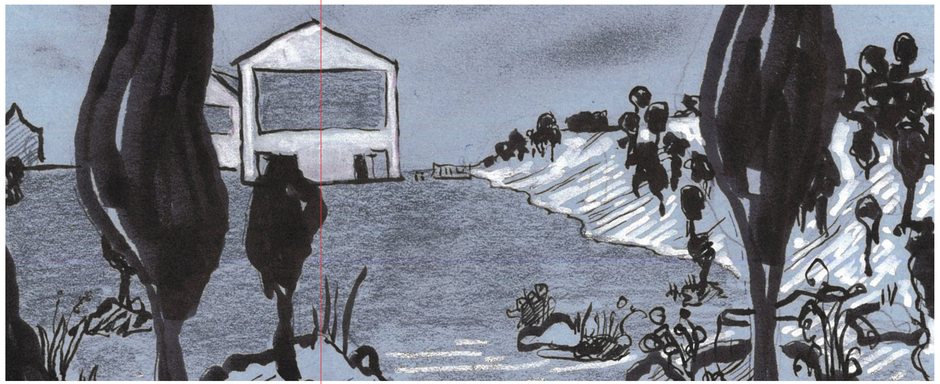
The measures that have therefore been implemented are few and simple, while their effect makes the site more tangible and enhances the experience of the space's impressive scale. These measures, detailed on pp. 103, pp. 104 and pp. 108, allow visitors to spend time and fully comprehend the area's scale. When the temporary structures are not present, the urban space transforms into a versatile area ready for a wide range of activities, from large festivals to quiet moments of reflection.

The urban space interacts actively with surrounding elements, including the embankment to the north, the construction dock to the east, the self-grown forest to the south, and the iconic B&W Halls to the west. Together, they form an environment that encourages exploration and interaction.

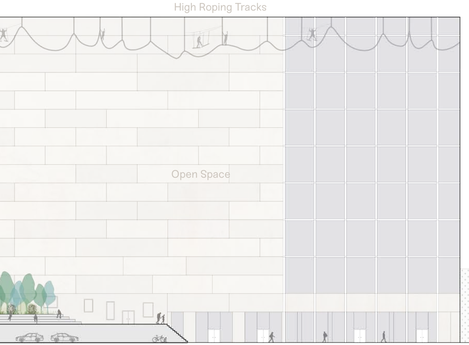
Visitors can easily access shopping, dining, cultural heritage sites, and recreational opportunities nearby. This integration of functions establishes the site as a vibrant urban hub.

It is critical that there is room for the major events that contribute to the identity of Refshaleøen, but at the same time this should not become a stumbling block for the island's future development. Working with this part of the main axis is therefore a delicate matter, which is why this proposal is still open to adjustment and correction, even though it is a concrete proposal.

The most important thing is to preserve space for the functions (in this case 'temporariness') that contribute to creating and strengthening Refshaleøen as we know it today. The urban space can therefore not handle the construction of permanent and delicate structures, which is why space for this should be found elsewhere.



ill. 61 Sketch of the large open space between the construction dock and B&W halls, seen in the background.



ill. 60 Section BB' - The area between the large B&W halls and the Construction dock - Scale 1:500

The Relation to The Embankment

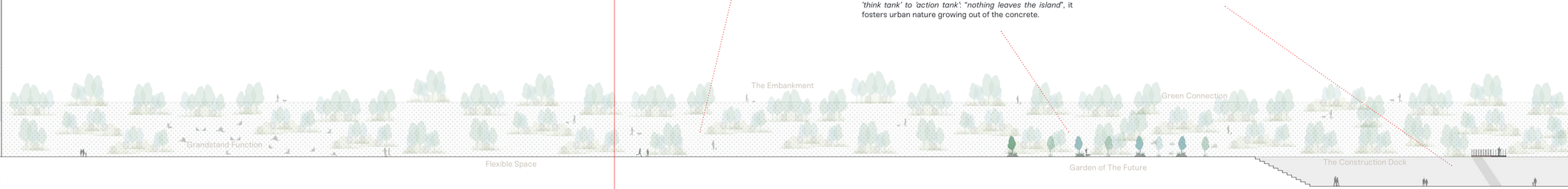
Implemented back in 2000 as an outer boundary, the embankment now functions as a green belt of activity and life. Here it reflects the urban space by imitating the events taking place and thus binds the overall space together, contrary to its original intended function.

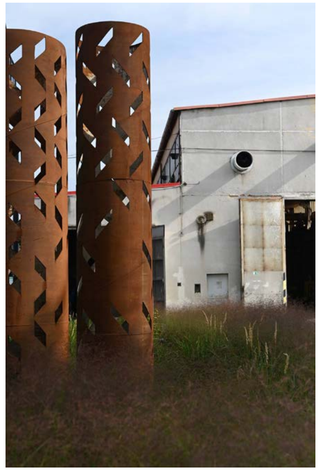
A New Type of Urban Nature

This area serves as a vital laboratory for biodiversity preservation on Refshaleøen. Inspired by the dogma *From 'think tank' to 'action tank'*: "*nothing leaves the island*", it fosters urban nature growing out of the concrete.

A Cultural Heritage Memento

The construction dock, once filled with water, is now empty again and tells a mighty story of its past. Here, the cultural heritage is reinforced by varying installations built from materials from the island itself. Thus, inspired by the reference project *Geoindustri*, the island's former days as a world-famous shipyard are here to be experienced.





ill. 63 Recycled industrial drills for new lighting

Reference Project – Geoindustri

Located in a factory area in Velký Osek, Czech Republic, is the small garden – *Geoindustri*.

The garden is a manifestation of recycling and creative remodelling of materials previously used in industry. The garden consists mainly of grasses and recycled steel drill pipes that were previously part of a production process.

This practice not only reduces the ecological footprint by minimising the need for heavy transport, which is desirable for the development of Refshaleøen, but also creates an artistic expression of industrial elements in a new context, the same principle could help maintain Refshaleøen´s identity. The corroded steel acts as a recurring theme and ties the surroundings of the new office building together.

The installation offers a visual and aesthetic element to the factory environment, and its presence creates an atmosphere of creativity and renewal. (Partero, 2021).

For more details, see appendix 03 – Reference project: Geoindustri on pp. 132.

Restoring the Construction Dock - *Bygge Dokken*

A Cultural Gem on Refshaleøen

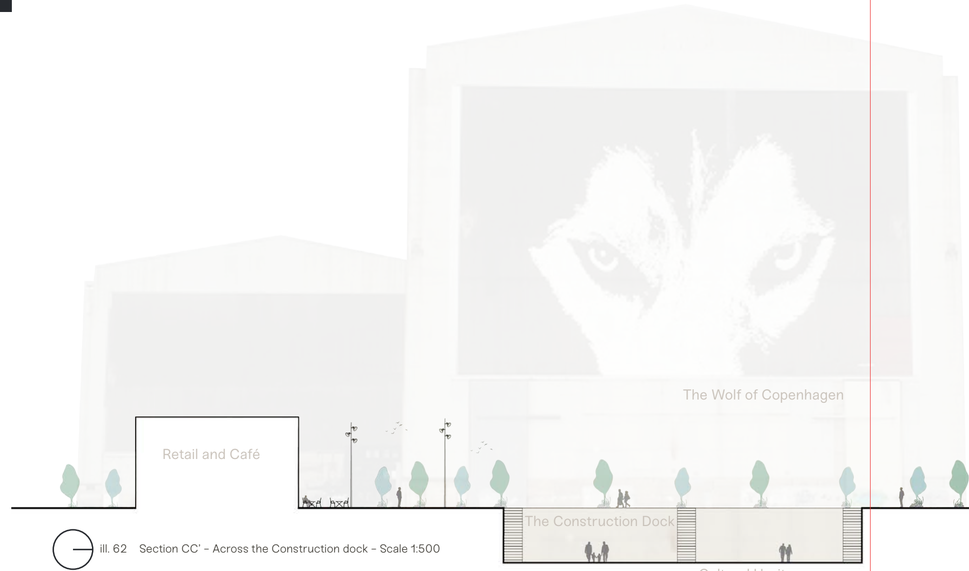
The construction dock on Refshaleøen stands as a testament to the island's industrial heritage. Originally used to build large, impressive metal ships, it is now under water. However, the vision is to empty it of water and transform it into a unique and accessible attraction for all to explore.

Measuring an impressive 40 metres in width and stretching 250 metres in length, the construction dock occupies nearly a quarter of the island's width. Estimated to have a depth between 6 and 9 metres, this vast structure, when emptied of water, will offer visitors an unparalleled architectural and historical experience. Set against the backdrop of the embankment rising 14 metres above ground and the towering B&W Halls reaching heights of 63 metres, the contrast in elevation promises to create a dramatic and unforgettable experience for visitors.

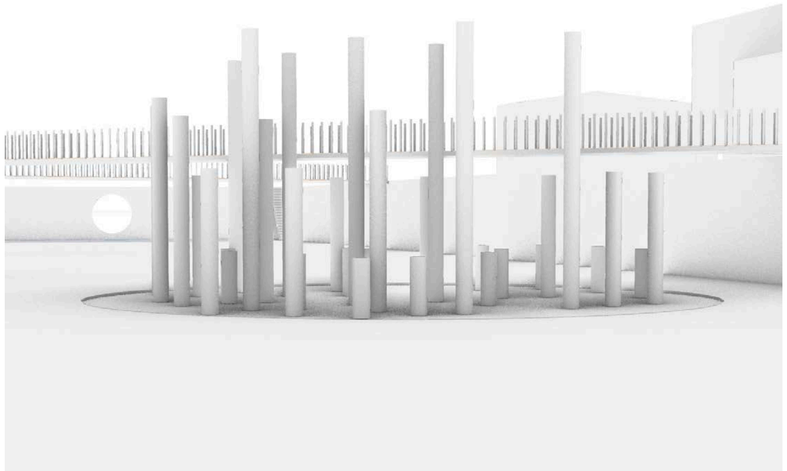
At the heart of the dock, a shallow circular pool will provide space for various temporary art installations crafted from recycled materials sourced from the island. These installations will serve to reflect on the rich history of Refshaleøen, each offering a unique perspective and promoting sustainability and recycling practices. With artworks changing periodically, each visit promises a fresh experience, enticing both locals and tourists alike.

Towards the eastern end of the dock, a circular window will be installed below sea level, offering visitors a captivating glimpse into the underwater world surrounding the island. This underwater view serves as a metaphor for Refshaleøen's maritime heritage and its ongoing ability to adapt and evolve over time.

The emptying of the dock and its transformation into a cultural and historical space will not only revitalise a key element of Refshaleøen, but also strengthen the island's identity as a place of innovation, creativity and respect for its industrial past.



ill. 62 Section CC' – Across the Construction dock – Scale 1:500



ill. 64 Rendering of potential art installation in the Construction Dock, looking towards the east

"The Wolf of Copenhagen"

It is part of Refshaleøen's rich creative scene and contributes to the raw and industrial aesthetic that characterises the place. Derived from the Norse mythology, the Fenris wolf symbolises strength and wildness and is a reminder of both the island's cultural heritage and its modern transformation.

70 Metres Apart

From the depths of the construction dock to the top of the B&W halls, the urban space here can be experienced from the ridge of the embankment. Here, scales can be compared in terms of the impressive shipbuilding that once took place here.

Shifting Focus

Towards Nature-Centric Design

For now, most of this chapter has dealt with a human-orientated perspective in terms of design, the upcoming pages will change into the more nature-oriented design part of the thesis. Recognizing that cities are not solely for human inhabitants, the focus will now shift towards design principles that prioritize environmental sustainability.

To the left, a flow chart illustrates expected movement patterns of the diverse fauna inhabiting the island. The thick red line symbolises the primary flow, which in the future will act as a kind of main road for the fauna across the island. This main flow connects to the surrounding green spaces, fostering the continuation of the existing flora and fauna corridor. In contrast, the thinner lines are the secondary flow patterns, indicating alternative routes taken by fauna when not directly navigating the island.

Where the fauna moves to when not travelling across is what these lines are trying to illustrate. These lines underscore the potential for wildlife to engage more deeply with the urban environment, without entirely forsaking the green spaces, thereby promoting a more integrated and cohesive urban ecosystem for both humans and animals.

The primary flow ■ The secondary flow ▪

ill. 65 Animal-centred flow

Connecting to The Green Ridge - *Volden*

Creating a New Type of Urban Nature

Upon first glance, the area south of the embankment may appear desolate and unable to sustain life. Yet, nestled to the west of the construction dock lies a remarkable space – a laboratory dedicated to combating Denmark's biodiversity crisis, while at the same time creating shadows on the impermeable pavement, mitigating some of the UHI effect. Inspired by the principle of 'nothing leaves the island' and drawing from the innovative PLATO garden project, Refshaleøen boasts a unique urban nature sanctuary.

Here, amidst neatly arranged piles of mixed rubble, consisting of old foundations, pavements, and various mixed steel structures – a multitude of local native species are growing. A mixture of small and medium-sized trees, herbs and hardy grasses, grow between the crevices and cracks. This diverse landscape mirrors a fusion of meadow and stone and the large boulders and rubble create cover for animals to hide in, while smaller cracks create moist voids offering varied habitats for a multitude of creatures.

While not resembling a lush forest, this resilient ecosystem withstands heavy human activity while providing a haven for flora and fauna alike. The reinterpreted urban nature proposal based on the idea of recycling, and 1-to-1 copying from the PLATO garden project, encapsulates the island's character and identity. Much like the rapid growth of PLATO over just two days, similar experiments on Refshaleøen hold promise in bolstering biodiversity (more information, see appendix 04 on pp. 134).

Scenario: Encountering Urban Wildlife

An Evening Walk through Refshaleøen
Persona: Alex, a local resident, and Buddy, his dog
Objective: To demonstrate the integration of green spaces and wildlife corridors within the urban design of Refshaleøen

One evening, Alex took his usual walk with his dog, Buddy, along Refshalevej, a route that passes CopenHot and loops around the construction dock. This particular evening, Buddy appeared more restless than usual, showing heightened interest in the surroundings. As they walked, Buddy suddenly pulled towards a dense area of scrub. Despite Alex's attempts to hold him back, Buddy was determined to investigate.

Intrigued by Buddy's behavior and the rustling sounds followed by a snapping branch, Alex decided to follow him into the thicket. They navigated through the underbrush, and in the light of a nearby lamppost, Alex spotted a fox swiftly crossing the road leading to Amagerværket. The sight of the fox, in such a hurry, brought a smile to Alex's face, realizing that the commotion was caused by this unexpected encounter with urban wildlife.

Buddy remained excited, but the situation brought a sense of amusement and wonder to Alex. This encounter highlighted how the carefully designed urban space of Refshaleøen accommodates not only its human residents but also the local wildlife, creating a harmonious coexistence. The integration of green spaces and wildlife corridors within the urban fabric allows for such interactions, enriching the everyday experiences of the community.

Reflecting on the evening, Alex appreciated the thoughtful urban design that facilitated this memorable encounter. It was a testament to the district's commitment to preserving natural habitats within the urban environment, ensuring that both people and wildlife can thrive.

ill. 66 Conceptual section diagram of a new type of urban nature – No scale

ill. 67 Designed by Atelier Partero and artist Matyáš Chochola, the PLATO Garden project reflected the decay of civilisation alongside the regenerative power of nature. The concept aimed to accelerate nature's reclamation of space and transform it into a living stage (Partero, 2018).

Vegetation in A Concrete Jungle

Expanding the Self-Grown Nature

The green corridor (on pp. 45) that stretches from the Copenhagen savannah (Amager Fælled) through Christianshavn's old fortifications to Refshaleøen and onwards to Lynetteholmen has several vital functions in the urban environment. Its primary purpose is to act as a natural conduit for flora and fauna, but it also fulfils several other essential roles.

Winding through a varied urban landscape, the corridor connects various green spaces, creating a coherent network of pathways and habitats for local flora and fauna. The corridor consists of native trees, shrubs and plants that create a dense and natural vegetation that supports a rich biodiversity and helps to counteract the UHI effect of the city.

Within the corridor, small hidden paths invite people to explore and enjoy nature in designated areas. These paths are surrounded by vegetation that creates a shady and cool environment, perfect for a relaxing walk or a run. The natural, permeable surfaces absorb large quantities of water, ensuring plants can access stored moisture during dry periods.

Wildlife thrives along the corridor, various species of birds, small mammals, amphibians and insects living and moving through the green landscape. For these creatures, the corridor is more than just a place to pass through, it is a home that provides food and shelter. Here they can move freely and effortlessly through the city without being disturbed by human activity, essential for maintaining a healthy and sustainable ecosystem.

Thus, the corridor serves as a green lung for the urban area, providing it with clean air, habitat for wildlife and recreational opportunities for people. It plays a crucial role in the preservation biodiversity and the overall ecosystem, offering a source of joy and inspiration for all who experience it.

ill. 68 Conceptual section diagram of a sprawling green corridor for terrestrial wildlife – No scale

ill. 69 Zoom in 03 – Plan of the eastern end of the construction dock with the green corridor along the waterfront – Scale 1:500

From Limitation to Exploration

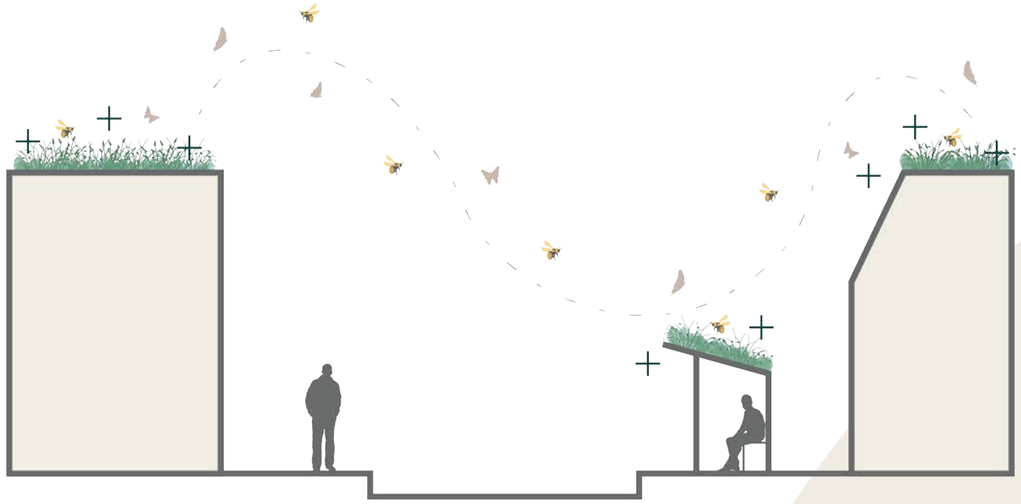
In addition to a green corridor to support the movement of fauna across land, it is important to ensure that life can also take place among the urban structures. This vision involves two primary strategies to support environmental sustainability: creating green footsteps and restoring blue transition zones.

Creating Green Footsteps

As the island develops, it is crucial to create habitats for insects, flower pollinators, birds, small rodents and other wildlife amidst the urban landscape. Hence, this thesis recommends including implementation of various types of green roofs on new buildings, smaller structures, sheds, bus stops, and similar constructions.

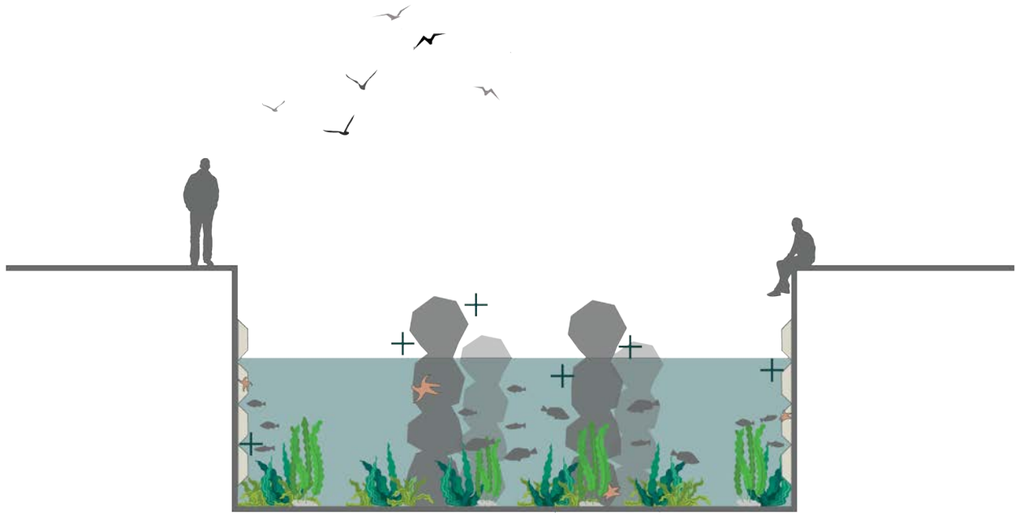
This aesthetic and eco-friendly approach is not merely a trend but an essential part of the island's green transition. Imagine a landscape where structures harmonize with nature, their roofs become part of the surrounding ecosystem, literally buzzing with life. While these roofs won't be entire forests, they will feature smaller plantings, ranging from sedums to lush grasses and flowering meadows. These roofs will help reduce building energy consumption and manage rainwater runoff, preventing it from overwhelming the sewer system.

Green roofs serve as proof of our commitment to a sustainable future where nature does not just exist but is integrated into our urban environments. The roofs are more than aesthetic enhancements; they promote biodiversity and strengthen ecosystem health by providing habitats for insects, birds, and other animals. They additionally, they help lower the city's carbon footprint by absorbing rainwater and reducing energy use. With green roofs, Refshaleøen joins cities like Paris and Toronto in embracing sustainability, creating a healthier environment for humans and wildlife.



ill. 70 Conceptional section diagram of green roofs - No scale

ill. 71 Concept section diagram the artificial reefs - No scale



Restoring Blue Transition Zones

Alongside green roofs, habitats for marine life will are also important to Refshaleøen's development. Through projects like Living Seawalls and Super Reefs, this project will enhance blue sustainability along Denmark's industrialized coasts.

These initiatives aim to create and restore marine habitats. Living Seawalls and Super Reefs are two projects that work to counteract the negative impacts of man-made structures like vertical seawalls, pillars, pontoons and marinas, which often degrade the surrounding marine environment. By mimicking natural habitats, these projects can increase biodiversity and ecosystem health.

Implementing these solutions along the coast of Refshaleøen is expected to have a significant benefit on the marine life. They will provide refuge and breeding grounds for various species, including fish, invertebrates, and plants. Moreover, these structures will help improve water quality and bolster biodiversity in the area.

By supporting marine life, these initiatives will mitigate some negative effects of the upcoming Lynetteholmen development, preserving and protecting the marine environment. Just as green roofs symbolize a step towards a more sustainable future for cities, living seawalls and artificial reefs reflect a commitment to conserving marine environments for future generations.

These initiatives are integral to Refshaleøen's visionary development, contributing to creating a more harmonious relationship between people and the sea.

07

Epilogue

Chapter Introduction

In this final chapter, we reflect on our journey through the Refshaleøen Urban Design Project. We explore challenges faced, solutions proposed, and personal growth experienced, emphasizing community engagement, environmental stewardship, and innovative urban planning for the future.

Discussion

Revisiting the Problem Statement

"*How can Refshaleøen maintain its cultural identity while becoming a sustainable, vibrant district that attracts a diverse population*". To answer this, a critical discussion has been conducted after listing the main measures of how to achieve the desired outcome.

By preserving Historical and Cultural Elements

Refshaleøen's unique architecture and historical heritage, including its industrial structures, Reffen Street food Market, and and cultural events like the festival Copenhell, are integral to its charm. Preserving these elements and including them in future development will maintain the island's unique cultural identity.

By strengthening Ecological Integrity

Improving water access and restoring ecosystems are crucial for enhancing biodiversity and creating more attractive destinations. Establishing more water access points and creating new green spaces will strengthen the island's natural environment.

By supporting Cultural and Social Activities

Existing events and activities contribute to the island's dynamic atmosphere. Supporting and preserving these activities will ensure that Refshaleøen remains a vibrant and lively environment that is attractive to both locals and tourists.

Innovative Urban Planning

Utilizing insights from the idea competition and stakeholders' engagement provides diverse and innovative ideas for the development of Refshaleøen. A flexible structure plan that can adapt to new knowledge and changing conditions should lay the groundwork for future development

Sustainable Transportation

Improving transport infrastructure with sustainable transport links, such as bike paths and public transit, will reduce traffic congestion and pollution, promoting a healthier lifestyle for residents.

Slow and Sustainable Development

Adopting a slow development process allows for learning from experience and ensures that the development is flexible and responsive to the needs of the community and the environment. This is why the structure plan should be flexible allowing it to change as new knowledge emerges and by that support an innovative urban planning approach.

Community Engagement

Fostering strong community engagement will ensure that the development reflects the needs and desires of the local population, contributing to a thriving and resilient neighbourhood.

Economic Sustainability

Selecting areas for development while preserving others for experimental laboratories and temporary test trials will promote economic sustainability and allow for innovation and creativity.

The theories presented in this thesis have been instrumental in guiding the design process, particularly in determining the extent and nature of improvements and addressing sustainability concerns. While the utilization of these theories could have been further emphasized or explored in greater depth, they did provide invaluable frameworks that shaped the direction of the thesis. They served as guiding principles that informed decisions on how best to enhance Refshaleøen while preserving its cultural identity. Ultimately, these theories have played a pivotal role in shaping the outcome of this project, guiding it towards its completion.

This thesis has prioritized the preservation of Refshaleøen's unique cultural identity while at the same time introducing new elements to enhance its vibrancy and sustainability. We have carefully balanced the need for development with the importance of maintaining the island's existing character, recognizing the delicate equilibrium between preserving heritage and fostering innovation. While there may be room for further exploration in maximizing the use of available space on Refshaleøen compared to what has been done in this thesis, it is crucial to proceed with caution to avoid diluting the island's identity.

The improvements made in mobility and green infrastructure signify positive steps towards creating a more liveable and environmentally friendly district. Moving forward, continued community engagement and adaptive urban planning will be essential to ensure that Refshaleøen thrives as a dynamic and inclusive neighbourhood for years to come.

Conclusion

Towards a Sustainable Refshaleøen

This thesis has embarked on an explorative journey through the complex urban landscape of Refshaleøen, dealing with the challenge of preserving its cultural identity while steering it towards a sustainable and vibrant future. Through the IDP, we have delved into the problem, analysis, sketching, synthesis, and presentation phases, each contributing to a deeper understanding of the area's potential, and the balance required to maintain its unique character.

The synthesis of our findings, from the theory and analysis, led to a design proposal that respects the identity of Refshaleøen while aligning with municipal plans and the outcomes of the latest idea competition. We have proposed strategies for environmental sustainability, such as creating green footsteps with green roofs and restoring blue transition zones to support marine life, which not only address the ecological aspects but also enhance the urban experience.

Our field studies, case analyses, and theoretical research have informed a vision where Refshaleøen evolves into a dynamic urban district that harmonizes with its industrial past. The scenarios presented, from experiencing the adaptive reuse of the B&W halls to the transformation during temporary events such as Copenhell, illustrate the multifaceted nature of the space and its capacity to cater to diverse needs.

In conclusion, this thesis contributes to the discourse on urban design by offering a nuanced perspective on the development of Refshaleøen. It underscores the importance of cultural preservation, community engagement, and environmental stewardship in the creation of urban spaces, that are not only functional but also resonate with the people who inhabit them. As we look to the future, the insights and recommendations provided herein aim to serve as a foundation for the continued evolution of Refshaleøen and similar urban environments.

As researchers and designers, we have grown through this process, gaining valuable lessons that will inform our future professional endeavours. We leave this project with a sense of accomplishment and hopeful outlook for the sustainable transformation of urban spaces, where culture, community, and ecology intertwine to create vibrant, inclusive and resilient environments.

Reflection

Reflecting on Personal and Academic Growth

Throughout this thesis, we have experienced significant personal and academic growth. Engaging with the complexities of urban design, particularly in integrating sustainability with urban development, has broadened our understanding of the multifaceted nature of designing for the future. One challenge that stood out was grappling with the scale of the project, which became increasingly apparent as we delved into our work. We have learned to appreciate the delicate balance between preserving natural habitats and accommodating urban expansion in a bigger scale project, a challenge that has improved our problem-solving skills and deepened our commitment to environmentally conscious design.

The project presented several challenges, including reconciling the need for dense urban development with the preservation of open spaces on Refshaleøen. Addressing this required innovative thinking, such as the proposal for green roofs and blue transition zones, which not only enhance biodiversity but also contribute to the island's green transition. Overcoming these challenges involved the IDP and continuous reflection, which were crucial in refining the project's direction. It could still be possible to utilize more of the open spaces on Refshaleøen, however, we have deemed that the amount of new construction is enough, even if what we propose might be on the lower side when it comes to new housing (see appendix 04 on pp. 134).

Reflecting on the research process, we believe the design was effective in capturing the essence of Refshaleøen's identity while proposing forward-thinking solutions. The iterative approach, with its emphasis on the bond between analysis and synthesis, allowed for a dynamic and responsive design process. However, there is always room for improvement, and future projects about Refshaleøen could benefit from even greater engagement from stakeholders and community input.

This project has influenced our perspective on our chosen path of education and our future within the field as professionals. Specifically, it has strengthened our interest for sustainable urban design and desire to further explore and work towards cities that meet the needs of both people and the planet. The importance of cultural heritage and the green shift has been central to the thesis, as a result of our former interests that only have been enhanced through working with this project over the last four months.

Illustrations

Below is an illustration list of all the graphic materials that have been lent to this thesis by various actors, artists, professionals and others. Graphic material that produced in-house will therefore not appear in the list below. Instead, see pp. 122.

If you believe that you hold the copyright to any material that has been inappropriately used or simply used without your permission in this thesis, please contact one of the two authors. The contact information can be found on pp. 4.

External Graphic Material

In-House Produced Graphic Material

Bibliography

Below is a list of all the literature that has been used for this thesis. Of this list, the Harvard referencing system has been used for citation.

The material is not sorted by type of material, but instead by alphabetical order. If the material is found online, it will appear as [online] with an associated link. If this is not the case, the material is either physical materials such as books and documents, or digital documents without a link.

List of Literature

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08

Appendix

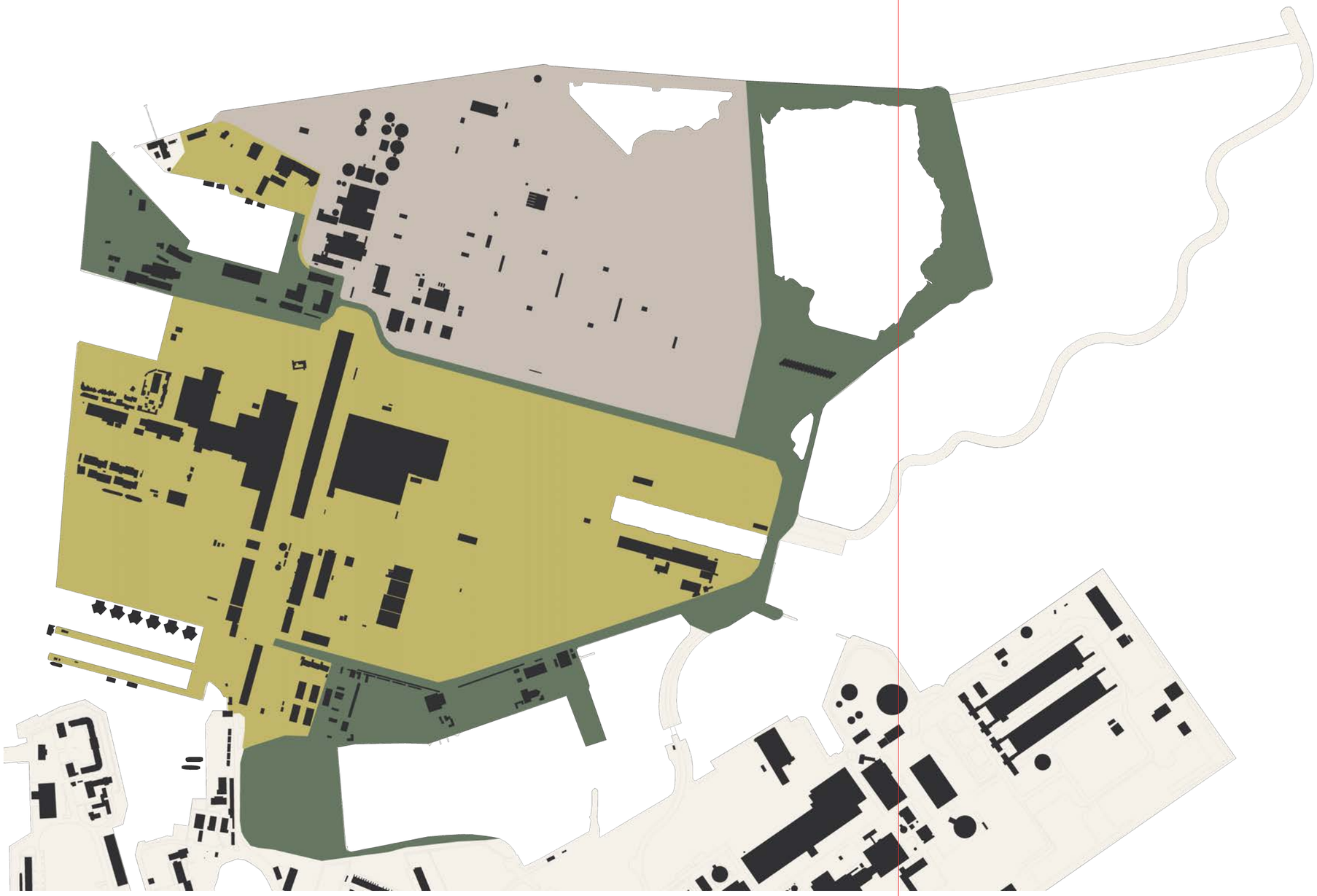
Chapter Introduction

In this section, all supplementary material will be presented. These are more or less relevant material, all of which support the thesis with specific information.

01 - Map of Ownership

Development Co-Operation at Refshaleøen
Refshaleøen is at the moment (in 2024) primarily owned by three large companies, two of which are collaborating on the overall development of Refshaleøen. These two are By & Havn and Refshaleøens Ejendomsselskab A/S.

Refshaleøens Ejendomsselskab A/S
By & Havn
Biofos



03 - Reference Project: Geoindustri

Recycling of Industrial Drills
year: 2021
place: Velký Osek, Czech Republic
artist: Atelier Partero

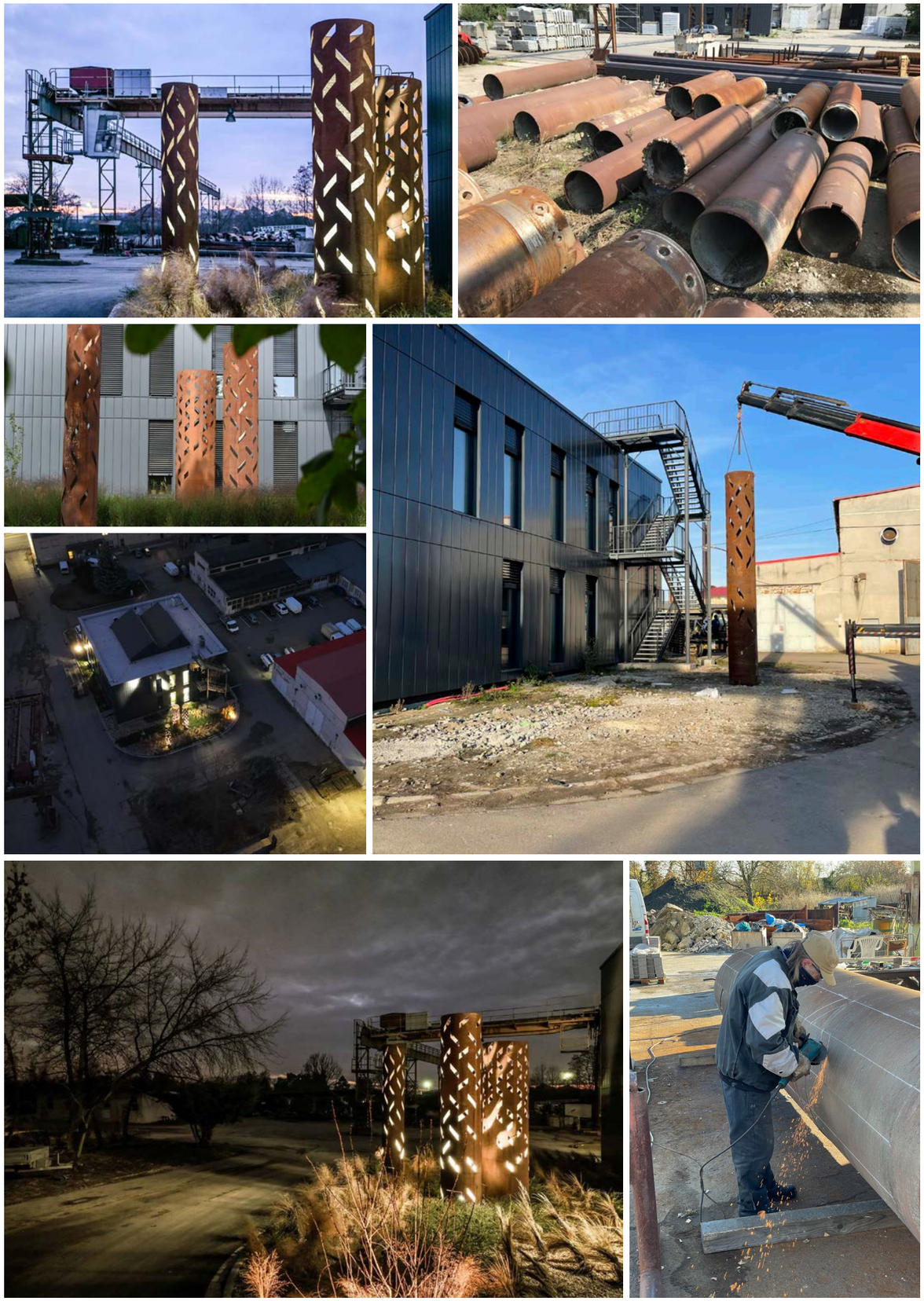
Located in Velký Osek, Czech Republic, the garden on the factory premises represents a unique fusion of industrial functionality and artistic expression, mirroring the company's core operations in deep foundation work using piles. Repurposing recycled steel drill pipes found onsite, the design embodies a commitment to sustainability while minimizing carbon emissions associated with material transportation.

Blending industrial aesthetics with natural elements, the garden juxtaposes the rugged texture of corroded steel with the delicate beauty of plant life, creating a visually captivating landscape. Serving as a serene retreat for employees amidst their daily routines, the garden offers moments of reprieve and reflection during the workday.

As daylight wanes, the garden undergoes a stunning metamorphosis, illuminated by strategically placed lighting fixtures that accentuate its architectural features. This transformation, appreciated by all who traverse the factory grounds, underscores the garden's role as a dynamic and integral part of the industrial landscape.

While recent projects may still be in their nascent stages, the enduring appeal of established landscapes serves as a testament to their ongoing evolution and the harmonious synergy between human design and natural processes. (Partero, 2021).

ill. 72 PLATO Garden Project under construction and performance



04 - Map of Existing and New Buildings

New Building Stock

The diagram shows all new buildings marked in red. These are further divided into smaller clusters where the buildings are intended to be more similar to each other. If these are used exclusively for new housing and with the specified minimum floors, there will be room for around 7,170 residential units. However, it is expected that a large part of these buildings will also be used for commercial and retail purposes. These figures should therefore only be seen as an indicative minimum estimate. In addition to this, it is also expected that new housing will be established in some of the existing buildings.

Building footprint (m^2): 3.313

Average number of floors: 2,5
Building square metres: 8.282

Number of living units (30 m^2 per unit): 270

Building footprint (m^2): 669

Average number of floors: 3
Building square metres: 2.007

Number of parking lots: 133

Building footprint (m^2): 1.884

Average number of floors: 2,5
Building square metres: 4.170

Number of living units (30 m^2 per unit): 150

Building footprint (m^2): 1.930

Average number of floors: 2,25
Building square metres: 4.342

Number of living units (30 m^2 per unit): 144

Building footprint (m^2): 784

Average number of floors: 2
Building square metres: 1.568

Number of living units (30 m^2 per unit): 50

Building footprint (m^2): 30.538

Average number of floors: 5
Building square metres: 152.690

Number of living units (30 m^2 per unit): 5089

Building footprint (m^2): 1.942

Average number of floors: 2
Building square metres: 3.884

Number of living units (30 m^2 per unit): 120

Building footprint (m^2): 6.089

Average number of floors: 4
Building square metres: 24.356

Number of living units (30 m^2 per unit): 800

Building footprint (m^2): 1.006

Average number of floors: 2
Building square metres: 2.012

Combined preschool and daycare centre

Building footprint (m^2): 4.762

Average number of floors: 3,5
Building square metres: 16.667

Number of living units (30 m^2 per unit): 550

ill. 73 Total building stock on Refshaleøen, divided into existing and new structures.

05 - Functions and Stakeholders

Stakeholders on Refshaleøen

Refshaleøen is home to many mixed activities that give the island its character and creative industries. A closer look at the stakeholders here reveals a range of both large and small businesses. Everything from large international events that take place on the island, to small one-man businesses and various creative industries.

ill. 74 Mixed functions, activities, private business and small studios on Refshaleøen

06 - Alternative Masterplan

If an above-ground metro, high line, becomes a reality, a new location for the metro station is proposed from the centre of the Refshaleøen to the eastern dock edge instead. A corrected masterplan could look like the following: