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Leveraging Green-Blue Infrastructure in Kalundborg's Urban Transformation

Master's Thesis

Author:
Eliza Anna Berzina

Supervisor:
Søren Kerndrup

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Department of Sustainability and Planning
Rendsburggade 14
Aalborg, Denmark

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Eliza Anna Berzina

Supervisor:
Søren Kerndrup

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Abstract:

Kalundborg is expanding as educational and industrial hub, yet it faces challenges related to urban cohesion, social wellbeing, and student retention. This thesis aims understand the causes of these issues and investigate how Green-Blue Infrastructure (GBI) can be strategically implemented to improve spatial connections and social vibrancy, supporting the city's evolving development opportunities. The study employs a mixed-methods approach that combines GIS analysis with citizen participation and placemaking principles to identify gaps and opportunites for GBI interventions. Findings show that small-scale GBI interventions can be strategically integrated in central Kalundborg's existing infrastructure to improve spatial and social connections for its students, and achieving higher multifunctionality potential if developed with the surrounding urban context in mind.

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Introduction 1

Urbanization is accelerating, with more than half of the global population now living in cities and expected to reach two-thirds by 2050 [United Nations, ndb]. It is a complex socio-economic process that leads to the expansion of urban areas, reshaping the spatial distribution of populations and influencing occupations, lifestyles, and social structures. As economic activity and innovation concentrate in cities, urban areas develop into hubs for transport, trade, and information flow [United Nations, 2018]. Due to education and employment opportunities, particularly in the industry and service sectors [United Nations, 2018], they begin to attract talent and investment, which plays a key role in economic growth and competitiveness [OECD, nd]. The ability to attract residents is crucial for a city's future, especially given the demographic challenges of population decline and ageing that many European countries are experiencing. It is therefore essential for local governments and urban planners to understand what factors make urban areas appealing [Buch et al., 2014].

Spatial fragmentation is cities physically divides communities, restricts movement and social interaction. This separaton leads to isolated urban identities, shaping distinct cultural, social, and economic characteristics across these divided areas [Tzortzi and Saxena, 2024]. Efficient and effective transportation that ensures smooth movement of people plays a vital role in a city's development and overall functionality [Bibri, 2024]. The 2030 Agenda for Sustainable Development envisions that sustainable development must balance economic growth, social well-being, and environmental protection. One of the SDGs, number 11, emphasizes the need for adequate infrastructure, green spaces, and improved mobility by strengthening linkages [United Nations, nda]. However, efficient infrastructure can become a threat in urban planning as urban transformation intensifies the strain on natural resources, increasing material consumption and land use, which in turn threatens ecosystems and biodiversity [McCormick et al., 2024].

In response, cities are increasingly turning to green and blue infrastructure (GBI) [McCormick et al., 2024], such as tree-lined streets, urban parks and gardens, that support biodiversity, reduce air pollution, mitigate climate change effects, and improve water retention. However, these GBI elements extend beyond their ecological benefits. Such nature-based solutions also contribute to public health, social well-being, and economic prosperity, making them essential for sustainable urban development [Salvo and Vitale, 2024]. Integrating GBI into urban areas is essential for developing liveable cities that support human well-being by strengthening connections with nature, enhancing physical and mental health, encouraging community participation, strengthening social bonds, and creating a sense of pride among residents. However, a challenge lies in the implementation of GBI as it requires innovative design and development strategies that seamlessly incorporate nature into the urban landscape while also considering the unique characteristics and needs of each city [Pinto et al., 2023].

The Case of Kalundborg

Kalundborg exemplifies these challenges as it undergoes expansion of its reputable industrial and educational sectors, which together attract a specialized workforce and students [Kalundborg Kommune, 2023]. This growth not only increases the city's population but also alters spatial land use, as new industrial and educational facilities are developed alongside residential housing projects to accommodate the influx of residents. While this urban transformation offers significant economic opportunities for Kalundborg, it can also bring critical challenges that threaten Kalundborg's urban structure (see Figure 1.1) by putting an increasing pressure on the city's existing infrastructure, housing, services, and natural environment. Moreover, such urban transformation affects the overall livability and attractiveness of the city, especially when certain aspects, such as industry and housing development, are too isolated or prioritized in the planning process.

Figure 1.1. Kalundborg's urban landscape (Own image)

One of the issues the city already recognises is its spatial fragmentation, particularly in the city center, with large and undefined distances between key areas, limited visual connections, isolated large parking lots, and a wide traffic belt (see Figure 5.18) that divides the northern and southern parts of the city centre. Such circumstances negatively affect not only the overall mobility experience, whether for commute or leisure movement, but also creates a socially less-welcoming environment, which is crucial for urban life and community engagement. Another issue having an effect on this is the gradual loss of green spaces in the city center, despite Kalundborg being closely surrounded by nature [Kalundborg Kommune and NIRAS, 2019]. As green spaces are important for numerous environmental reasons, a decline in them contributes to a "colder" urban environment, with less spaces for people to relax and interact with each other, affecting mental and physical well-being. Such fragmented or underdeveloped urban environment ultimately affects overall quality of urban life, which can make it difficult to attract and retain new residents that Kalundborg needs to sustain its particular growth. Therefore, these challenges must be addressed through strategic urban interventions.

Figure 1.2. Bredgade - central traffic belt (Own image)

Green-Blue Infrastructure (GBI) presents a valuable opportunity to not only provide ecological benefits in Kalundborg but also potentially enhance its public spaces in ways that improve social well-being through better movement and interactions. While GBI encompasses a wide range of elements, not all of them contribute to more than their core environmental functions. While some elements serve purely technical purposes, some elements become a crucial part of daily life and human experiences when seamlessly integrated into the urban fabric. Landscape features like green corridors, urban parks, tree-lined streets, water streams, ponds and such not only provide spaces for outdoor activities, but also can uplift and complement their surrounding urban environment and city functions. Consequently, this project explores how GBI - particularly green-blue features that people can see, touch and interact with - can be strategically integrated into Kalundborg's transforming urban landscape to address the aforementioned spatial and social challenges.

Literature Review 2

This chapter examines the state of the art in urban development that is driven by sector-specific growth and its transformational impact on shaping the physical, natural, and social environment within cities. Urban areas consist of multiple institutional levels, each influencing various planning strategies, with different stakeholders having diverse perspectives on the urban structures they have interest in. Therefore, by exploring key concepts like urban transformations, stakeholder roles, and GBI, this chapter highlights the commonalities and dependencies between the three, providing a clear foundation for further analysis of GBI in the context of Kalundborg's specific urban dynamics.

2.1 Key Characteristics and Drivers of Urban Transformations

Urban development often consists of immediate and visible/physical projects, focusing on improving particular existing urban systems to meet specific targets of a place. While development is important to address the needs and challenges of cities, considering also the urban transformation as a broader, systemic change helps understand the changing and evolving context, as well as long-term vision of cities. This is particularly important when considering sustainable planning strategies like GBI, as it requires strategic planning and implementation to be able to mitigate ongoing challenges and also adapt to future uncertainties.

2.1.1 Defining Urban Transformation

While there is no single agreed-upon definition of urban transformation (UT) due to its interdisciplinary research interpretations, several core characteristics can be found across the literature. UT can be referred to as a fundamental and ongoing change in urban systems - such as infrastructure, institutions, governance, ecosystems, lifestyles, and others - that aims to contribute or align with the goals of sustainable development [Grainger-Brown et al., 2022]. Across literature, UT is viewed as context-dependent (e.g., an industrial, mercantile, sanitary, or consumer type of city) and non-uniform [Pickett et al., 2013], influenced by agency, place, and context [Wolfram, 2016], and addresses failures of economic development [Mikelsone et al., 2021]. The word "urban" can be interpreted differently, depending on the context. City, for example, can be viewed as a physical area, network, agent, commons or even a living organism. However, in this research it is considered as an urban setting where people live and work and where transformation can occur, so that a broader range of contexts and perspectives can be included [Wolfram, 2016].

2.1.2 Drivers of Urban Changes and Development

The various drivers of urbanisation identify contrasting city "modes", which are not solely based on the spatial form of the urban fabric but on the question of what cities serve. Answers to this can vary, and in fact, different purposes may coexist in a single city. It can depend on factors such as the specific area of focus within the city, social groups, or institutions of interest. Therefore, these city modes are not absolute and can change over time [Pickett et al., 2013], but creation of sustainably balanced cities involves numerous actors, citizen engagement, and utilizes technologies and data [Mikelsone et al., 2021].

The role of production and service industries

Over time, as industries were established and expanded, the cities' population grew to staff the factories, and the economy shifted, contributing to the accumulation of wealth [Pickett et al., 2013]. Urban factories can support cities by driving not only overall economic growth, but also social welfare. The production of goods and manufacturing play a vital role in the development of most economic systems through productivity, job creation, and generating income. The Arcadis Sustainable Cities Index [2022] emphasizes that for a city to be truly sustainable, it must promote the quality of life and health of the natural environment, and not only prioritize economic development. Industrial facilities function as subsystems within the broader urban ecosystem which also includes other subsystems like people, infrastructure and mobility, and each are shaped by internal and external influences, as well as continuous flows of material and non-material resources [Rudolf et al., 2023].

institutionally and socially (https://www.mdpi.com/2071-1050/12/17/6766)

The role of society and local communities

Policymakers, the European Commission, and other international organisations acknowledge the significance of involving local communities in the development and delivery of public services, infrastructure, and other facilities [Mikelsone et al., 2021], by considering the wider community's wishes and visions in the entire transformation process they are affected by [Grainger-Brown et al., 2022]. This approach is key to creating functional, comfortable, accessible, safe, modern, and enjoyable urban environments for both residents and visitors [Mikelsone et al., 2021]. The community can help support and sustain the transformations over time by promoting participation, supporting maintenance, or better handling any potential negative outcomes. Additionally, grassroots involvement can shift the power dynamics among stakeholders, reducing imbalances, and creating alternative perspectives and more innovative methods [Grainger-Brown et al., 2022].

2.1.3 The Impact of Growth and Stakeholders in Urban Transformation and Development

Cities can grow in two complimentary ways: through urban expansion or by densifying the existing urban areas. The more population is accommodated through densification, the less expansion is needed, and vice versa. Where feasible, densification is thought to be more environmentally friendly than expansion as it is linked to lower transport energy use, shortening travel distances, making public transit, and walking and cycling more feasible, which contributes to lower GHG emissions [Angel, 2023]. However, the growing concentration of people in cities has also significant consequences, ranging from increased resource demand to greater infrastructure needs and strain on local ecosystems [Keita and Kourouma, 2024]. Recent studies on urban expansion reveal that as economic development progresses and people's living standards improve, they begin to consume more - demanding more housing, more workspaces, more facilities, leading to increased land use [Angel, 2023]. Urban land expansion (ULE) is primarily driven by demographic and economic growth. This aligns with theories in urban economics and urban science, which view land demand as a derived demand - one that is shaped by external factors such as shifts in population and income [Mahtta et al., 2022].

Urban ecosystems are influenced by the design of the manufacturing systems, specifically by their product characteristics. For example, the dimension and weight of manufacturing products or systems can determine both the internal and external transport infrastructure with regards to road and facility space. Moreover, the production processes also affect the biodiversity, energy demand and other resource consumption, and humans due to noise, vibrations, odors, and emissions of particles. Moreover, as urban factories serve as employers, they influence the workplace conditions and quality, local area's social and functional mix and networks, encouraging social exchange [Rudolf et al., 2023].

2.2 Green-Blue Infrastructure (GBI) as a Planning Strategy

2.2.1 GBI in Urban Theory

The concept of *urban green structures* dates back to the 1870s with garden allotments and urban agriculture. The term *green infrastructure* then emerged in the mid-1980s, focusing on managing rainwater and reducing runoff. GBI (or BGI) are relatively new terms that first appeared in the 2000s [Shah et al., 2021]. Today, GBI refers to a network of nature-based urban features, such as green spaces and water features, that provide a broad array of urban ecosystem services (UES) [Shah et al., 2021] [Puchol-Salort et al., 2021]. It encompasses a range of elements which can be categorized according to their placement:

- Ground-level elements e.g.,trees, rain gardens, swales, parks, permeable pavements, bioretention and other vegetated areas
- Above-ground structures e.g, green roofs, green walls, and rainwater collection systems
- Below-ground elements e.g., stormwater retention and storage basins

[Chaurasia et al., 2024]

2.2.2 Role of GBI in Urban Areas

GBI produce more than one service. Such infrastructure offers a range of environmental, economic, and social advantages not only to people but also to other living organisms [Shah et al., 2021]. A carefully planned and organized network of urban natural elements enhances the quality of life of the city's residents and promotes equity and biodiversity [Chaurasia et al., 2024]. For example, trees in urban areas provide cooling and shade during summer, while green roofs help reduce energy consumption in buildings and stabilize indoor temperatures [Shah et al., 2021]. Natural spaces also provide significant economic and social advantages. They enhance mental and physical well-being by offering opportunities for outdoor activities, immersion in nature, promote social justice and cohesion, contribute to cultural heritage and diversity, as well as support economic development by playing a role in employment and public revenue through service provision [McCormick et al., 2024,p. 3].

2.2.3 Implementation and Governance of Nature-Besed Solutions in Cities

As cities grow and expand, they replace natural landscapes with built environments, significantly altering land use, microclimates, and having devastating impacts on urban ecosystems [Patel et al., 2024]. The benefits of nature-based solutions do not occur automatically - they must be prioritized from the design stage through implementation and maintenance. Many current projects fail to maximize their broader potential beyond their primary objectives, without considering cross-sectoral benefits or collaboration with private and community stakeholders [McCormick et al., 2024,p. 5]. Nature-based solutions (NBS) are one of the pillars of sustainable development, balancing the social, environmental, and economic goals equally. In Europe, they are seen as a way to drive innovation in an environmental market. However, if NBS are viewed too narrowly through a market or profit-focused lens, it could be problematic. Instead, a broader understanding of NBS and enhanced management of complex socio-ecological systems could create new ways to address interconnected societal challenges [Nesshöver et al., 2017].

The way urban nature is governed depends on the origins and level of power the particular groups of actors hold. These approaches can be grouped into three categories: top-down, bottom-up, and collaborative. The distinctions between these categories are based on how the governance is carried out, what type of actors dominate, as well as their power. For example, top-down efforts involve actions initiated and driven by government actors (e.g., politicians, planners, regulators, and other decision-

making experts. Bottom-up efforts emerge from the ground level, are community-driven, philantropic, NGOs, or even supported by businesses. However, these citizen-centred nature initiatives are difficult to scale and sustain. Lastly, collaborative governance brings together different stakeholders and other actors to work together shared goals but represent different sectors, which is becoming increasingly emphasized when it comes to making sure urban nature solutions are effective.

In Europe, the collaborative governance approach has been identified as an overall trend, transforming existing top-down schemes [McCormick et al., 2024,p. 74]. On a municipal level, the local governments need to evaluate their current urban nature solutions and identify opportunities, align their local initiatives with the broader national and regional strategies, establish cross-sectoral organisations, and engage a diverse range of stakeholders across the city who can advocate for and benefit from NBS in their urban context [McCormick et al., 2024,p. 80–81]. It is also important to highlight that governance approaches are not universal as they depend on the local context and circumstances - what could work in one city or neighbourhood might not necessarily work in another [McCormick et al., 2024,p. 79].

2.2.4 Case Examples of GBI Implementation

The following case studies offer insights into how other cities have integrated nature-based solutions into their existing built environments, outlining the purpose and scale of each project along with the achieved impacts or challenges faced. The highlighted words indicate specific green or blue features that characterize each case, and serve as general reference points for practical GBI application opportunities in other contexts like Kalundborg.

Petuelpark, Munich (established in 2004)

In northern Munich, Germany, a 7.4-hectare green space was developed as part of a complex transportation development project. Its main objectives included reducing above-ground traffic, reconnecting long-separated neighborhoods (Schwabing-Nord and Milbertshofen), expanding Munich's green network and walking and biking networks, creating a meeting point for people of different social and cultural backgrounds, as well as connecting humans with nature, art, and landscape.

A key feature of the project was the Petueltunnel, which redirected traffic underground, aiming to significantly reducing noise pollution and enhancing the area's quality of life. The park itself was designed to offer space for leisure and recreation, featuring several **water playgrounds, a fountain, a café, and artworks**. A "Generation Garden" was also established, providing **free garden beds** for local residents to encourage community engagement through urban gardening. With walking and biking trails crossing through and around, the park serves a spatial mobile connection between the separated and distinct neighbourhoods. This has improved social interactions, as Schwabing is a dense district and holding a high image due to the significant population of academics of the nearby universities, while Milbertshofen is less dense with a great amount of workers and foreigners in the area's production plants.

The park's landscape design also incorporated extensive greenery, including **thematic gardens and various tree species** to enhance biodiversity. Watercourses were introduced with specific plants and 'disruptive stones' to support aquatic life by ensuring a greater oxygen content in the water. As a result, Petuelpark strengthened social cohesion, improved livability and recreation opportunities, fostered a stronger connection to cultural heritage and natural spaces, which was overall appreciated by the citizens, offering a quieter, greener, and more inclusive space for both people and wildlife. [McCormick et al., 2024,p. 58] [Urban Nature Atlas, 2021] [Hartl, nd]

City Forest, Sofia (initiated in 2018)

Bulgaria's capital and the largest city, is a dynamic and continuously growing urban center with significant natural resources, including hot thermal springs, rich biodiversity, fertile land and long sunny days. However, the city has struggled to fully utilize these assets, partially due to limited awareness of the value of ecosystem services. Additionally, Sofia faces sustainability challenges linked to its rapid

industrialization during the Soviet era. Mainstream adoption of NBS has therefore been hindered as the challenge lies in balancing the modern need of economic growth with ecological and social sustainability.

The City Forest initiative emerged as an example of civic engagement aimed at not only delivering ecosystem services like climate regulation and improved air quality, but also fostering a sense of community and belonging. The initiative relied heavily on public involvement, coordinated by an NGO Grupa Grad, with volunteers contributing in tree planting, donations, and crowdfunding. This initiative was aimed at transforming neglected or marginalized urban spaces by **planting trees and restoring a green corridor** that would allow fresh mountain air to circulate through the city. Its goals included not only improving air quality and reducing carbon emissions, but also increasing recreational and leisure opportunities, strengthening Sofia's green infrastructure.

However, since the project's municipal support has diminished over time, it can face difficulties in achieving a large-scale impact, as citizen-led efforts alone often lead to scattered and small-scale interventions. Moreover, a challenge lies in balancing environmental conservation with urban priorities, such as economic growth, tourism, residential land expansion. [McCormick et al., 2024,p. 184–185] [Urban Nature Atlas, 2022]

Jomfru Ane Park, Aalborg (established in 2011)

Located in central Aalborg, Denmark, Jomfru Ane Park has transformed a previously inaccessible industrial port into a **multifunctional urban green space**. The development is a part of Aalborg's larger urban strategy to densify and enhance its waterfront, and was awarded the Nordic Green Space Award in 2013 for its design and multifunctionality in such a compact area. The project also aligns with the city's vision for improving biodiversity and access to nature.

The park offers diverse recreational activities such as **swimming, equipped sports areas, and open green spaces** for socialising and other uses of free will, making it a popular destination for both locals and visitors. It features four distinct **urban gardens**, each offering different activities, such as a **sunken green space** for relaxation [Boverket, nd]. Due to the park's open location by the Limfjord, it is highly sensitive to wind and weather, which significantly influences the park's attendance compared to other parks in the city. For example, on sunny days, more people visit the area for recreational activities, while in adverse weather the park is primarily visited for walking in the fresh air. Park users have highlighted the importance and appeal of green spaces, especially grass areas, which provide a place for relaxation and peaceful social gatherings. Moreover, the park is positioned close to Aalborg's shopping centers, cafes, bars and a university campus, which further increases its accessibility and appeal [Harder et al., 2011] .

Theoretical Framework 3

This chapter presents theories and frameworks that have a shared commitment to sustainable urban development, especially one that is human-centric. While the economic theories build on the urban transformation drivers discussed in the literature review with regards of economic growth and impacts, the biophilic urbanism emphasizes the integration of nature in cities, the core of GBI, to improve address environmental and social problems. And last but not least, placemaking theory frames a clear process that transforms physical spaces by and for human experiences. By covering all three sustainability aspects, this chapter aims to offer a holistic view of how GBI solutions can transform a city.

3.1 Sustainable Economic Paradigms: Regenerative Economics and Development, Post-Growth

Regenerative economics presents an approach for reshaping economies amid urgent social and environmental challenges. Rather than only focusing on minimizing harm, it explores how social, cultural, and environmental systems can be restructured to support the well-being of all life on Earth. Regenerative economics approach integrates regenerative practices that promote the renewal and regeneration of natural and social systems, with the economic approach based on wise resource management and community living [Shannon et al., 2022].

A regenerative economic model involves thinking and planning across dynamic systems at the right scale and pace. Localisation approaches aim to build an economy that values the community and its surroundings while revitalising local resources. Examples include micro-enterprises, re-localisation policy, sustainable investment models, locally sourced food, and purpose-driven businesses [Shannon et al., 2022].

Among the most pressing global challenges today are climate change, urbanization, and inequality, and their interconnected nature makes it difficult to address one without considering the others. Sustainability practices traditionally have been used to manage the intertwined relationships between people, prosperity, and the planet. As the global challenges intensify, more innovative and holistic solutions, such as regenerative development, are becoming increasingly essential [Knott et al., 2019]. At its core, regenerative development is founded on a worldview that sees humans as deeply embedded in nature, emphasizing the dynamic, complex, and interconnected relationships among all living organisms and recognising that change is constant and inevitable [Knott et al., 2019].

In parallel, to create sustainable societies, it may be necessary to move past from growth based economies, since economic growth has historically been linked to environmental harm [Mair et al., 2020]. Building on this idea, post-growth futures share a common vision of an economy and society focus shifts

from pursuing economic growth to prioritizing environmental and social wellbeing [Paulson and Büchs, 2022].

3.2 Biophilic Urbanism and Design

One of the biggest challenges in today's world is environmental degradation, particularly global climate change driven by fossil fuels and land clearing. While global efforts focus on addressing these issues along with other SDGs, the local natural environment in cities has also become a growing concern. In response, biophilic urbanism has emerged as an approach to integrate natural systems within cities [Allam and Newman, 2023]. Biophilia refers to the inherent and fundamental bond that humans have with the natural world. This bond comes from the innate tendency of humans being drawn to, understanding, and emotionally responding to nature, which affects their psychological well-being. This well-being manifests in enhanced sensory experiences and favouring certain landscapes as spatial attributes of accessible biophilic elements in the built environment can influence cognitive abilities, feelings of security, and physical well-being [Hung, 2025].

Biophilic urbanism is cost-effective and benefits community-building [Allam and Newman, 2023]. Landscape designers incorporate natural elements and topography to enhance the livability and appeal of urban areas, balancing nature with the built environment [Hung and Chang, 2022]. Biophilic elements in urban settings includes features like greenways, parks, gardens, water bodies, street trees, and vertical greenery. These elements serve as points of contact with nature, contributing to the sense of connectedness and unity [Hung, 2025]. Evolutionary theories suggest that biophilia is based on evolution [Barbiero and Berto, 2021], which explains the psychological benefits of connecting with nature.

Attention Restoration Theory (ART) is a related theory on environmental psychology, perception, and reactions. ART states that exposure to natural environments with restorative qualities - such as being away, extent, compatibility, and fascination - can help restore attention from fatigue. Fascination in particular involves involuntary aspects and aesthetic experiences that encourages exploration and discovery of a place [Barbiero and Berto, 2021] [Kaplan and Kaplan, 1989].

3.3 Placemaking

Placemaking is an interdisciplinary concept that has become widely used to discuss how urban areas are planned, designed, and also experienced. It is a process that mobilizes a given place's physical, cultural, and social identities to increase their shared value. The perspective of placemaking has shifted in recent times, as its focus on people-place relationships and the social impacts of urban development now also includes the physical transformation of environments, as well as the importance of decision-making, especially community involvement in the design process [Dubois et al., 2023]. Therefore, placemaking

involves reimagining and transforming public spaces to create a stronger connection between the people and places [Knight, 2016].

City infrastructure creates spatial clustering economic activities through divisions of services, goods, labour, and innovation, which is what often is promoted in investments. However, when planning and delivery of infrastructure focuses on financial considerations, it overlooks the effect on lives and experiences with places [Dubois et al., 2023].

Placemaking efforts focus on making more effective use of existing physical assets and underutilized spaces, for example, targeting underutilized "greenfields" or revitalizing "brownfields". These interventions can be initiated both by governments or communities, and are aimed at stimulating economic development and benefit the community with improved livability, inclusion, employments, and income. The functional and experiental value of a place can be elevated through interior layout, green areas, multifunctional spaces, or even by just the use of color. Moreover, imaginative architecture, materiality, and landscaping play a key role in creating visual continuity and unity, thereby establishing a more welcoming and inviting environment. Even simple interventions like signage and wayfinding contributes to a place's identity and quality, as well as art and installations can display community values like culture and history [Dubois et al., 2023].

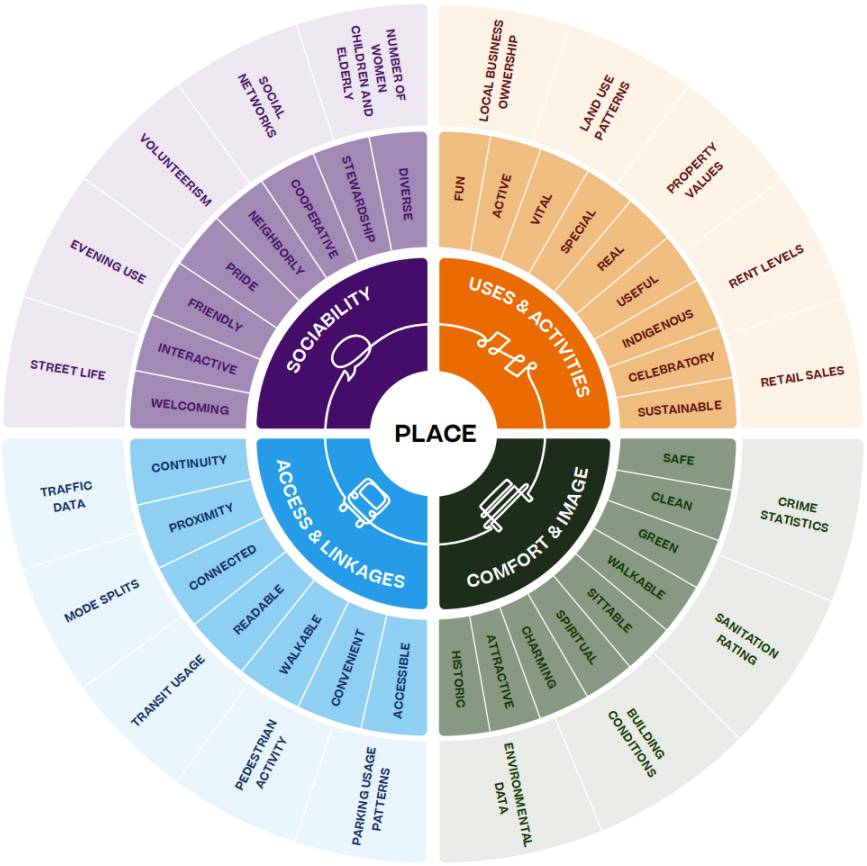


Figure 3.1. The Place Diagram (source: Project for Public Spaces)

Project for Public Spaces [2022] has developed The Place Diagram (see figure 3.1) as a tool to assist communities in evaluating places. The inner ring highlights the key attributes of a place, the middle ring lists its intangible qualities, and the outer ring displays measurable data. It frames how a great place typically shares four essential attributes: first, accessibility and good connections to other vital locations in the area; second, they offer comfort and present a good image; third, they draw people in to encourage participation in various activities; four, they create a social and enjoyable atmosphere where people want to return repeatedly.

The placemaking process focuses on engaging with people who live, work, and play in a space. It involves observing, listening, and asking insightful questions to understand the needs and desires for the place and community itself. The process starts with defining the place in question and identifying stakeholders, followed by an evaluation of the space and its issues. Next step is placing a vision for the space, followed by short-term experiments and management, and finally - continuous reevaluation and long-term improvements [Project for Public Spaces, 2022].

Research Design 4

4.1 Problem formulation

As the city of Kalundborg is undergoing growth driven by the expansion of its key industries and education hubs, its need to attract and retain residents, including students, becomes increasingly important. This puts pressure on the built environment where the challenge lies in balancing this growth with sustainable urban development, particularly infrastructure that not only supports the logistics and ecological environment, but also urban liveability, attractiveness and social well-being .

4.2 Research Questions

Green-blue infrastructure (GBI) presents an opportunity to address the needs of Kalundborg and its key residents by integrating not only ecological and aesthetic qualities, but also strengthening spatial connections and social functions within the urban environment where the opportunity exists. Therefore, this research project aims to answer the following main research question:

How can Green-Blue Infrastructure help leverage Kalundborg's opportunities as an education and business hub, while addressing its challenges of urban fragmentation, improving social well-being and student retention?

The research follows a structured approach that breaks into three interconnected sub-questions, each building up on the insights gained from the previous one, ensuring a logical progression:

1. *What characterizes and drives Kalundborg's development today, and what challenges affect the potential of the growing education and business sectors?*

This first sub-question is essential to understanding the fundamental forces driving Kalundborg's urban development. By examining historical consequences and the role of key stakeholders influencing urban structure, this sub-question identifies the resulting changes in city's overall land use, demographics, and the specific pressures that are put on Kalundborg's spatial infrastructure, public spaces, and social structure. Moreover, it identifies the urban demands of key institutions, emphasizing on the matter of attracting and retaining students that contribute to the success of local businesses. Therefore, this exploration sets the base for subsequent evaluation of:

2. *What opportunities in spatial connections and GBI integration exist to address the fragmentation in Kalundborg's urban landscape?*

Having established the key drivers of urban change, the second sub-question shifts focus to evaluating how Kalundborg's infrastructure supports the evolving needs of its residents and city functions. By understanding and mapping human movement opportunities, their purpose, and analyzing available infrastructure networks, it aims to identify both spatial hotspots and disconnects, highlighting routes and areas essential to local residents. This question also aims to assess the extent of existing GBI assets within Kalundborg's urban fabric, therefore identifying the gaps and potential opportunities that could contribute to spatial and social urban cohesion. The findings provide a basis for discussing GBI's potential role in improving Kalundborg's central area, which is explored further in the next question:

3. In what ways can GBI in Kalundborg create cohesive urban spaces that make the city attractive to its students?

Building on the previous analysis, this question focuses on two main aspects. Firstly, the GBI's potential to enhance urban cohesion and vibrancy by transforming underutilized spaces in a chosen focus area with nature-based elements that align with placemaking principles - considering residents' needs and preferences, as well as valuing local identity and plans, behaviours, and ensuring effective use. Secondly, this sub-question explores how such GBI interventions can be strategically integrated into Kalundborg's urban landscape to indirectly benefit also the surrounding urban functions, such as businesses.

The following diagram 4.1 illustrates the research design, presenting the structured approach by outlining the aims and methodologies associated with each step of the project:

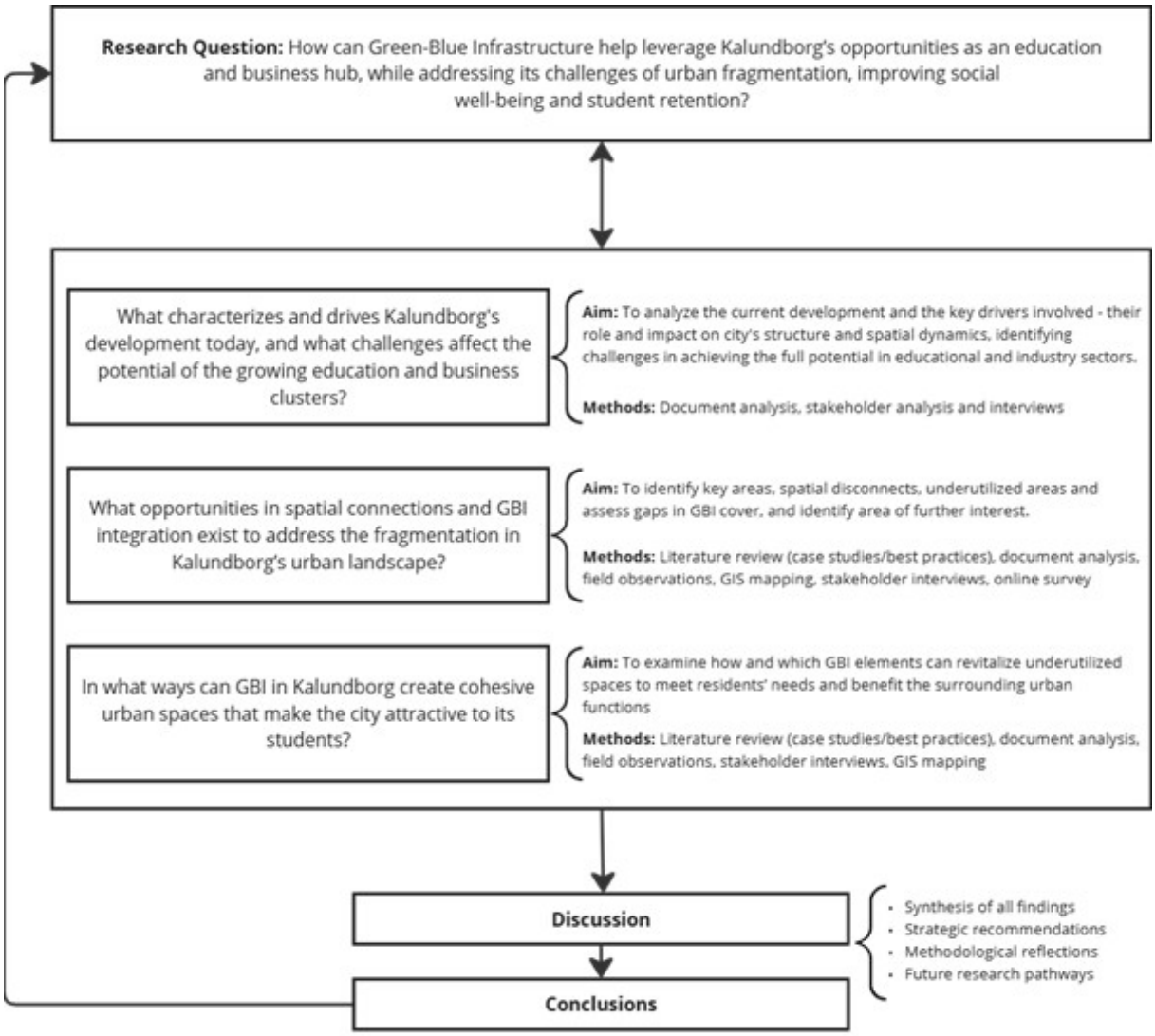


Figure 4.1. Research design diagram (own prouction)

4.3 Methods

This study employed a mixed-method approach that enabled a thorough examination of the research questions, providing both theoretical context and empirical insights to support and interpret the research findings.

4.3.1 Literature review

This method refers to a review of published materials that discuss existing or recent literature on a given topic. These reviews can vary in scope and depth, and may include findings from other relevant researches [Grant and Booth, 2009]. By gathering insights from other empirical studies, a literature review can explore and justify research questions more effectively by synthesizing findings that show evidence on a topic and highlight gaps in knowledge. This method is also a key component for developing theoretical frameworks and concepts [Snyder, 2019].

The application of this method in this study primarily involved a process of searching relevant keywords and terms emphasized in the research questions and design in various online databases (e.g., sustainable urban development, urban transformation, nature-based solutions, urban nature, green-blue infrastructure, urban growth, industrialization, urban communities, etc.). The information has been obtained from databases like *Aalborg University Library (Primo), Google Scholar, Scopus, Research Gate,* and *Science Direct*. For the assessment of most relevant information, a filter of publication date within the last 5 years was often applied, however, expanded if the search resulted in insufficient amount of relevant sources. Moreover, prior to analyzing and synthesizing the literature material, an exclusion criteria related to the geographical context was applied - for example, excluding sources that focus only on urban settings significantly different from Kalundborg, thus far from obtaining relevant insights.

4.3.2 Document analysis

Document analysis is a research method that is applicable to qualitative case studies which explore a singe phenomenon or setting in depth. The contents of the documents analysed contain text or visual imagery that can reveal meaning, develop understanding, and offer insights into the research problem [Bowen, 2009]. This method has been carried applied from the beginning stages of this study until the very end by examining municipal documents, as well as documents produced by relevant companies or institutions in Kalundborg, and extracting relevant information that offer background and specific context. It serves as a knowledge base for further analysis and interpretation, provides supplementary data that help generate new questions, as well an helps track changes and development over time. Although document analysis offer efficiency, accessibility, and precision, several limitations exist with this method. Documents may lack the detail and depth needed to answer some research questions or can be difficult to retrieve (e.g., digital walls), which may lead to gaps in knowledge and limit additional

ideas for research. Additionally, some documents might reflect selective organizational agendas that align with internal principles [Bowen, 2009].

The most important and valuable documents examined in this research and interpreted throughout the report were:

- *Kalundborg kommunes udviklingsstrategi frem mod 2035: Fremgang får flere med i fællesskabet* - This municipal development strategy has been presented in public consultation in 2023, and consists of explanations and descriptions of cross-cutting themes dealing with settlement, welfare, business, education, nature and infrastructure. It sets the overall direction for the desired development.
- *Hvidbog (Juni 2023 - Behandling af høringssvar: Kalundborg kommunes udviklingsstrategi frem mod 2035: Fremgang får flere med i fællesskabet)* - This document is a collection of public consultation responses to the above-listed development strategy and includes the municipality's comments. It serves as an important follow-up with specific suggestions and changes requested by the public.
- *Strategisk helhedsplan for Kalundborg bymidte* - a strategic masterplan for the the city center which was developed in collaboration of the municipality and NIRAS (a Danish consulting engineering company) and Realdania (a philantropic association that financilly supported the project). The project was adopted in 2019 and describes and illustrates urban challenges, much of which are still relevant, thus forming a basis for this study.
- *Kalundborg Kommuneplan 2021-2032* - municipal plan specifies and summarizes the general political goals for development in the municipality and serves as a link between overall plans and provisions in the local plans. Additionally, parts of *Kalundborg planområde: K01 Kalundborg midt* were analysed to determine the use and construction options in the individual parts of the city, offering a well-informed basis for GBI potential

These documents have been provided from Kalundborg Municipality itself as other stakeholders involved in the analysis were have not published documents that are relevant to the core understanding of Kalundborg's urban planning. Information retrieved from other actors involved different methods which are presented in the following sections.

4.3.3 Mapping & Spatial analysis

The method for the spatial analysis within this study has been mapping using *QGIS* software - a free, open source spatial visualization tool. Such Geographic Information Systems (GIS) help organizing, visualizing, editing, and analysing spatial data, revealing hidden connections and insights that guide decision-making un urban planning [Geoinfo, 2025]. The software contains a QuickOSM plugin, that contains data from *OpenStreetMap (OSM)* database. However, to ensure that the data displayed in the illustrations produced is up-to-date, the OSM data has been compared with manual field observations, *Google Earth Street View*. The combination of these tools is important when analysing continuous urban

development, especially in the context of Kalundborg where many new spatial developments take place, thus continuously requiring updates in the GIS databases. Additionally, *Danmarks Arealinformation* also offers map layers from the Danish Environmental Portal's data and this information has been compared with or supplemented with OSM data.

Since ensuring up-to-dateness of all data sources is not feasible in the scope of an entire city, the produced maps in this study may not be 100% accurate. However, more attention to data validation in the spatial analysis of this study has been given to the relevant focus areas to ensure a well-informed analysis.

4.3.4 Stakeholder Analysis

Stakeholders are groups or individuals that are affected by and have and important influence on a project, study, decision, or policy. Understanding them is crucial for gaining insight into the economic, political, and social setting of a project or study area. This is achieved by a stakeholder analysis that helps to identify who is involved in a particular study or project, what is their interest the matter, role in decision-making, as well as how they are connected. It can also help determine who and when should be involved in any further developments [Schneider and Berghöfer, 2017] .

In this study, the stakeholder analysis has been performed to identify who has interest and power in the process of GBI implementation as a means of enhancing Kalundborg's urban landscape that improves mobility and social interactions among residents, especially students. Part of the analysis is stakeholder mapping, which is a visual tool used to categorize stakeholders based on their influence and interest, which also helps to understand their communication needs, for example, if studies like this were implemented practically. The resulting map is a four-quadrant power-interest matrix (see figure 4.2) where the y-axis indicates level of influence (top = highest level), whereas x-axis represents the level of interest (rightmost = highest level) [Tristancho, 2024]. However, a possible drawback of this method is that the position and influence of a stakeholder can change due to changes from internal events or rapid changes in the broader context, thus shifting a stakeholder's position in the matrix.

4.3.5 Semi-Structured Interviews

Semi-structured interviews are a qualitative research method that accommodates many research goals, allowing flexibility in how questions are asked. This interview type incorporates a mix of open-ended and more structured questions based on data guided by existing constructs within the particular research discipline, as well as experience of the interviewee. Formulating questions takes considerable time and requires adjustments to ensure that each question clearly supports the research purpose [Galletta and Cross, 2013].

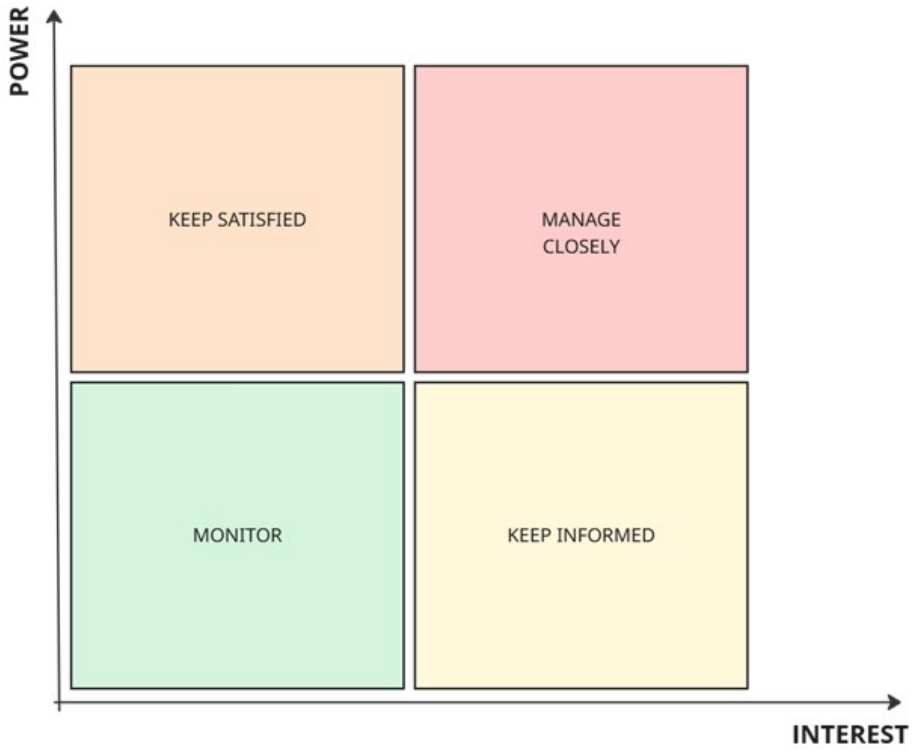


Figure 4.2. Stakeholder mapping template (Own illustration, based on Tristancho [2024])

Formal Interviews

As part of the method, an interview guide has been prepared and shared with interviewees in this study prior to the interview in order for them to have the opportunity to prepare valuable information. The guide can vary in the degree of structure and detail as it depends on the purpose of the interview and interviewee's role and knowledge on the topic. Therefore, the flexible yet strategic structure is the reason this method has been chosen. In this study, two formal, semi-structured interviews have been carried out.

The first interview was conducted with Head of the Department of Sustainable Development in Kalundborg, Søren Stensgaard. The aim of this interview was to gain local expert insights into Kalundborg's urban planning - covering the themes such as of urban development, infrastructure and mobility, the social environment, the city's industrial and educational development, as well as included follow-up questions related to municipal documents and statements. Findings to these themes informed all questions asked in this study, especially the first one which included a stakeholder analysis, therefore questions were formed accordingly.
This interviewee was selected internally by the municipal council internally after a request was sent to the municipality's main email address. By clearly stating the purpose and goal of the interview, it helped ensure that the most appropriate person was allocated to participate in this study; however, this also resulted in a longer waiting time. The interview was conducted online via Microsoft Teams and lasted one hour. The conversation has been transcribed upon verbal approval, and the transcript has been cleaned up and included the appendix of this report.

The second formal interview was conducted with Camilla Møllerup Top, a project leader at Knowledge Hub Zealand (KHZ) who develops and facilitates networks and public-private partnerships in Kalundborg. The first aim of this interview was to understand how KHZ connects to Kalundborg's urban development as a stakeholder and actor within the industry-education sector. Second goal was to gather insights into employee (and possibly student) experience with urban living and movement in the city, as well as their relationship with GBI. The second goal, as expected, was answered rather subjectively, based on the interviewee's general impressions, observations, insights amongst colleagues, and not much based on concrete data. Findings to these themes informed all questions asked in this study, especially the first one which included a stakeholder analysis, as well as the third sub-question that considers the values of Kalundborg's residents.
Also this interviewee was selected internally by KHZ team, after a long line of communication that also started with a request sent to the organisation's main email, and by following-up by a phone call due to no response. The interview was conducted online via Microsoft Teams and lasted 50 minutes. The conversation has been transcribed upon verbal approval, and the transcript has been cleaned up and included the appendix of this report.

Informal Interviews

Several informal interviews were conducted with local residents (or employees) of Kalundborg. The first set of interviews took place during a visit to the city at the start of the research period, during which 5 individuals across diverse demographic groups were approached in public spaces, and asked few simple and exploratory questions. The aim of these questions was to understand how residents experience Kalundborg's urban life, in terms of movement, activities, and general values, thus obtaining primary data that grounded further analysis. The questions and responses have been registered and included in the appendix of this report.

An additional informal interview was conducted during the final phase of analysis, where a student living and studying in Kalundborg was casually interviewed in order to obtain insights into how specifically students and other young people experience urban life in Kalundborg, thus guiding the analysis of GBI interventions that are relevant to this resident group. The interviewee was chosen through a personal network, and the conversation took place on a messaging app, thus providing convenient option of sharing informative media as presented in the appendix.

4.3.6 Online Survey

When communities are empowered to take ownership and be part of decicion-making processes, it shapes the social systems in a way that benefits the communities themselves. Producing community-driven data, solutions, and policies can lead to meaningful transformation and social wellbeing. It involves listening to the voices of local residents, and recognizing that every individual holds valuable expertise [Schiavo, 2021]. In this study, an online survey was prepared and sent to residents of

Kalundborg, with the aim of obtaining valuable insights into how people in Kalundborg experience their daily urban lives - revealing differences, uncovering problems, key values and preferences of the individuals, and examining what role GBI plays in their lives, as well as their thoughts on future developments.

There are several advantages with this method that lead to applying it in this study. Online surveys offer fast data processing and low costs [Zhang et al., 2017], they are quick to distribute and can facilitate large sample sizes, reduce data entry errors (e.g., compared to paper surveys), and provide consistent results [Loomis and Paterson, 2018].

For this study, the survey was structured in 4 sections, containing questions that have been formulated aiming to address the research questions and themes:

1. Respondent overview and key values: providing data on respondent age, main occupation in Kalundborg, individual insights into importance of core urban values
2. Mobility and movement patterns: obtaining data on choice of transportation, revealing key destinations and functions, as well as uncovering problematic places or experiences
3. Green and blue spaces in Kalundborg: obtaining data on what role does GBI play in their daily urban lives, their perspective on its broader potential, as well as providing insights to where GBI is desired
4. Final comments: an open-ended question for any additional insights about the topic that had not been revealed in previous sections

The survey was developed on *Google Forms*, where its responses are reported real-time and summarized in automated graphs. An access link was shared via diverse online community groups of the social media platform Facebook. The groups were sought using the keywords "Kalundborg", "4400", "Vestsjælland", and selected based on their relevance to community matters, acitivity, as well as by ensuring that sharing such surveys is not against the rules of the groups.

Groups engaged with were: *Det Sker i Kalundborg* (13200 members), *4400 Kalundborg* (19900 members), *Kalundborg, Gørlev og Hong - alt er tilladt* (17700 members), *Kalundborg Netværk* (2700 members), *Gørlev, Hong, Kalundborg og resten af Vestsjælland næsten alt tilladt* (17800 members). Additionally, the survey was shared individually with a student through personal connections, and was asked to further share it among peers.

The survey received 21 response over a span of one week, after which the results were summarized and reported for implementation in the analysis of the study. To accommodate both Danes and internationals, the survey included the option of choosing between English or Danish language, from where on it followed a conditional logic that separated the response summaries by language. Coincidentally, the language split resulted in a demographic split, where English respondents were mostly individuals in their 20s, whereas Danish respondents were over the age of 30.

Therefore, the side-by-side split and comparison presented in the appendix accounts for differences in

age (and primary occupation), not simply by language preference!

It is important to note that with just 21 responses, this survey provides limited grounds for detailed analysis and reliable interpretation– especially when comparing across different demographic groups. While these findings offer useful indications, some trends may look significantly different if more respondents participated in the survey.

4.3.7 Field Visit and Observations

Observation is a method where the researcher adapts to a setting and interactions, exerting limited influence on the environment. An observation of the field (city of Kalundborg) is important for gaining a broader understanding of the urban setting and social situations, especially before narrowing down the focus on any specific research and analysis questions. During the process of observing, attention should be paid to the organisation of space - how it is used, divided, as well as how social actors are interacting with the spaces. However, it is impossible to observe everything at once, thus strategic choices of what, who, where and when to observe must be made [Ciesielska et al., 2018].

As part of this thesis, one field visit was conducted where the aim was to observe Kalundborg's urban layout from a human-perspective. It involved making observations and documenting sightings through images and videos of how the city looks and functions i.e., observing social atmosphere, how people move, where they gather, how they interact with the spaces and each other. Moreover, these observations and documentations served as recent evidence, especially when using and analyzing GIS data. Additionally, during the field visit informal conversations with locals were carried out (see subsection 4.3.5).

A second field visit and observations was planned to inform and support final sections of the study's analysis. However, due to unforeseen changes in schedule, it was not possible.

4.3.8 Adaptation of Placemaking Principles to the Kalundborg Context

The Place Diagram (presented earlier in Figure 3.1 captures many aspects that contribute to a great place, presenting a great opportunity to apply this framework to all kinds of urban places, regardless of size, shape, and function. However, some of the inner ring qualities can be rather subjective, while some of the outer ring's data requires complex measurements. Therefore, for the purposes of this thesis, considering all aspects of The Place Diagram is not feasible as it would require an extensive and time-consuming analysis.

The booklet by Project for Public Spaces [2022] outlines questions to consider for each of the diagram's four core attributes, which will help guide this study's analysis of any place or area in Kalundborg, as well

as aid formulating interview and survey questions. Additionally, by eliminating or giving limited attention to complex measurable data aspects such as financial metrics, the following table 4.1 presents the points that will be considered in the current thesis:

Table 4.1. Main considerations for analysis and the desired outcomes

Core Attribute	**Consideration point for analysis**	**Desired outcome**
Access & Linkages	Visibility from a distance	Space should be noticeable from afar, with a view into its "insides", creating a sense of openness and welcome
	Connection to surroundings	Avoiding physical or visual barriers like parking lots, blank walls, or windowless buildings that discourage entering the space
	Engagement from adjacent occupants	Stakeholder considerations – assessing whether occupants of nearby buildings use the space or would like to
	Pedestrian & Bike accessibility	Safe and comfortable access, including clear, intuitive and direct link to surrounding areas, without having to navigate through heavy traffic or bleak streetscapes
	Transportation options	Space can be reached by a variety of transportation options - not limited to one mode
Sociability	Social gathering potential	Place should be appealing as a meeting point for friends and other social groups
	Pride in place	People speaking proudly about the place, pointing out its positive features and suggesting it as "the place to visit" to a tourist
	Community diversity	Presence of varied age groups, ethnic backgrounds, and social statuses – supporting an inclusive environment
Uses & Activities	Usage type and frequency + spatial distribution	Reveals the place's relevance to daily life, appeal, and its functional success; identifies areas for improvement
	Multifunctionality	Can support a variety of activities simultaneously, such as walking, eating, playing, reading, relaxing, etc.

Core Attribute	Consideration point for analysis	Desired outcome
Comfort & Image	Seating	When relevant, the place provides convenient and comfortable choices of where and how one can sit
	Mental and physical comfort	Area is clean and feels safe – no unpleasant noise, smells, and is well-lit

The desired outcomes presented in the table are formulated based on insights from the Project for Public Spaces [2022] booklet, as well as from findings from the literature review and the other two concepts presented earlier in this chapter. This combination forms the foundation of what will be examined in the main analysis chapter, however, their relevance and applicability can be affected by emerging additional Kalundborg's case-specific insights and conditions.

Analysis and Results 5

5.1 Contextual Overview of Kalundborg

meta text Before analysing and addressing any specific themes, it is essential to understand the broader context of Kalundborg - what has influenced and shaped the city into what it is today, the transitions and spatial transformations that hold certain value in current city planning and development. It involves influential urban factors like population changes and its connected social institutional structures, as well as historical events shaped by past climate conditions, civilizations, and politics.

5.1.1 Facts and Figures

Population

Over the last 15 years, the population in Kalundborg city has remained stable, with moderate fluctuations such as a gradual increase from 2012 to 2018, followed by a steady decline until 2022, which could be attributed to a mix of natural demographic trends (ageing, youth outmigration, etc.) as well as the Covid-19 pandemic. However, the city's population quickly rebounded afterwards, marking the highest point in the dataset - 16,558 persons as of 2024 [Danmarks Statistik, 2024] - potentially indicating improved living conditions, such as new housing and employment opportunities.

In terms of age groups, the younger population (0-9 years) has consistently been shrinking, while the older age groups (aged 60 and above) have experienced a gradual growth, suggesting an ageing population within Kalundborg. However, recently there is also a noticeable increase in younger adults and those of working age, especially within the 20-39 year age groups [Danmarks Statistik, 2024], indicating good educational and employment opportunities in Kalundborg, drawing more people in.

Influx of foreign workforce and students

When looking at Kalundborg Municipality as a whole, immigration data shows a steady and accelerating influx of immigrants arriving for employment, education, family reunification, and other purposes. For example, immigration for work purposes has been one of the largest and fastest growing categories, with an increase of 153 people in 2008 to an impressive 1065 people in 2025 (projected) [Danmarks Statistik, 2025]. This increase is largely driven by growing employment opportunities in the local industries, in efforts to attract foreign workers to fill labour shortages and increase productivity (Top, 2025; see Appendix D). Additionally, immigration for educational purposes, including students and interns, has also grown steadily - from 46 students in 2008 to an expected 195 students in 2025 [Danmarks Statistik, 2025]. This consistent rise reflects Kalundborg's increasing appeal to international students, with

local English-taught educational institutions and internship opportunities in industry and biotech sectors [Tækker, 2025] [Kalundborg Kommune, 2025].

5.1.2 Historical Development and Key Transitions

Kalundborg's history dates back to the Stone Age, around 4000 years ago, when the sea level was approximately 2.5 meters higher than today, submerging large parts of the current city area. Early settlements of that time were located near the water - at the foot of Sct. Olai Bakken, Møllebakken, and Højbyen. Later in the Middle Ages, around year 1170, a castle known today as Vestborgen was built on the hill of Kalundborg, which prompted the development of a fortified urban area nearby and gradually also the Kordel district. The city gained further prominence in the 12th century as an important hub for the crusades in the Baltic sea, and continued to grow as Højbyen fortified and expanded eastward.

Later, the castle complex expanded with walls, towers, moats, and a new Kalundborg Castle, gaining the city political and administrative importance as royal meetings were held. In 1443, already being one of Zealand's major cities, Kalundborg was granted market town privileges. However, later during the renaissance, Højbyen's significance reduced as it suffered repeated damages from fires and wars, destroying the castle. In contrast, Nederbyen then became as the actual city as it had better access for traffic, and greater potential for property expansion.

Kalundborg then grew as a trading and ferry hub, prospering through grain exports and industry, including a brandy distillery and windmills. This led to improvements in infrastructure as a new road to Holbæk and Copenhagen was built. Despite losing its status as the region's main ferry port to Korsør, Kalunborg gained back its significance with the opening of its own railway station in 1874. From here, transport and trade connections improved, and industrialization accelerated, with an ale brewery becoming one of the city's major industries. As the harbour continued expanding, with a short-lived shipyard during Word War I, traditional milling declined and Kalundborg established its oil port and refinery. This set the stage for massive industrial growth in the 1960s, including the establishment of large companies like Novo Nordisk. [Lex.dk, nd] [Kalundborg Middelalderby, 2021]

Kalundborg today

Today Kalundborg can be viewed as a "visionary" city (Top, 2025; see Appendix D). Over recent years, Kalundborg has experienced growth and development, becoming a key industrial hub in Denmark [Kalundborg Kommune, 2023]. Kalundborg is home to a diverse range of industries, including biosolutions, biotechnology, high-tech manufacturing, a network of smaller yet strong subcontractors and service providers, making it an attractive destination for industrial investment. *Kalundborg Symbiosis* plays a crucial role in optimizing resource use across these multiple industries. It is a pioneering model of industrial symbiosis and circular economy where collaboration between private and public

actors ensures that waste from one company becomes a resource for another. Moreover, several global companies that operate internationally rely on foreign recruitment [Kalundborg Kommune, 2023].

To meet the needs of the expanding industries, the municipality has also strengthened its role as an educational center that allows young people to study locally and having a strong career possibilities, especially in the local industry sector [Kalundborg Kommune, 2023]. This is achieved though collaborations between the municipality, education, and industry sectors (Top, 2025; see Appendix D), therefore education is also seen as a vital driver or economic growth by meeting labour market demands. Campus Kalundborg, established in 2021, plays a central role in this development, hosting major Danish universities as well as Absalon UC, creating a unique educational and research environment closely connected to region's industries. Moreover, local businesses offer internships, apprenticeships, part-time jobs, and collaborative projects, which strengthens the local workforce [Kalundborg Kommune, 2023] [University College Absalon, 2025].

Even though Kalundborg's urban area is not underwater like it was in far past, the city's urban terrain elevation is still relatively low. This presents a high vulnerability to flooding risks accelerated by current climate change, which influences Kalundborg's urban planning decisions. Moreover, Kalundborg aims for a sustainable urban development, and actively works on various sustainability initiatives, such as green transport options, enhanced pedestrian and bicycle infrastructure, reduced car use (Stensgaard, 2025; see Appendix C).

A more detailed understanding of Kalundborg is presented in chapter 5.2 onward.

5.2 Kalundborg's Urban Development and Its Key Drivers

This chapter presents an analysis of Kalundborg's urban development, particularly exploring what sustainability themes the city is prioritizing in its urban planning decisions. It also reveals key actors involved in sustainable urban development in Kalundborg, particularly regarding green-blue infrastructure that provides services for a more vibrant urban and social life in the city. These findings are essential to carry out all analysis parts presented in this thesis, ultimately allowing context-specific and well-informed discussions and reflections.

5.2.1 Kalundborg's Vision and Goals Towards Sustainable Infrastructure and Social Well-being

Urban densification in Kalundborg city is in progress, and more city center **housing** is being developed to support a vibrant community. There are initiatives in place to make the city more attractive for students by means of improved housing and social spaces. Many citizens in general want alternatives to traditional detached houses, such as smaller homes, shared housing communities, as well as sustainable building solutions. The development of **Havneparken** and other public spaces across the municipality is creating more opportunities for social interaction, cultural events, and tourism, whilst preserving city's history [Kalundborg Kommune, 2023].

Many citizens enjoy walking in the nature, and a great quality is the proximity to open countryside and nature in smaller towns and villages. However, many experience a limited access to nature and safe pathways. To address this, new **walking routes**, preferably circular, will be developed in collaboration with landowners. In city centers, there is a challenge of limited seamless and safe transitions between neighbourhoods, while also making the city more green and pedestrian-friendly. Therefore, the focus is on **improving the flow** between these crucial central areas and **enhance connectivity for cyclists and walkers**, encouraging a healthier, more sustainable lifestyle [Kalundborg Kommune, 2023].

Moreover, Kalundborg municipality runs the 'Få det fikset' project, which distributes money to support **community-driven urban development**. Local citizens are directly influencing their local areas by deciding how the funds are used. Funds are allocated only to public projects, such as new playgrounds, improved pathways and lighting, meeting places, bathing jetties, and shelters. Communities submit proposals, which are reviewed by municipal contacts before approved by the Finance Committee (Økonomiudvalget) and Municipal Council (Kommunalbestyrelsen) [Kalundborg Kommune, nd].

In connection with future climate change and major urban developments, Kalundborg's river stream Kærby Å will face increased water inflow. Due to the river's limited capacity to handle more water, Kalundborg Municipality and Kalundborg Forsyning are working together on a master plan to develop

green-blue infrastructure solutions that address current and future needs. Along with addressing water management issues, this project aims to **create a new recreational infrastructure along the river**, combining nature-based solutions with multifunctional infrastructure, thus strengthening biodiversity and ensuring continued sustainable development in the area [Kalundborg Forsyning, nd] (Stensgaard, 2025; see Appendix C).

5.2.2 Stakeholder Analysis

Sustainable urban development involves many different aspects and thus different players. Since this study focuses on GBI as a means of enhancing Kalundborg's urban landscape by implementing green-blue features in its built infrastructure to visually and functionally connect key urban and nature areas - promoting movement along with social interactions among residents, especially students - it is important to identify who has interest and power in this process. This is done via stakeholder analysis, where the goal is to identify key actors which play either direct on indirect role in this particular sustainable urban development in the context of Kalundborg, driving it and/or being affected by it.

This identification gives critical insights for further analysis of who should be considered and informed when planning GBI (yellow), who are the key actors that are highly engaged and enable or facilitate this type of planning (red). It also shows who is engaged in the process but may consider mainly their own needs and interests (orange), as well as who play the least direct role but should still be taken into account (yellow).

This allows a more tailored analysis of where the gaps in green-blue infrastructure in Kalundborg exist, exploration of opportunities and possible interventions, as well as their feasibility and effectiveness on spatial connectivity and social sustainability. The following key stakeholders have been identified from formal interviews with Kalundborg Municipality and Knowledge Hub Zealand, as shown in Figure 5.1:

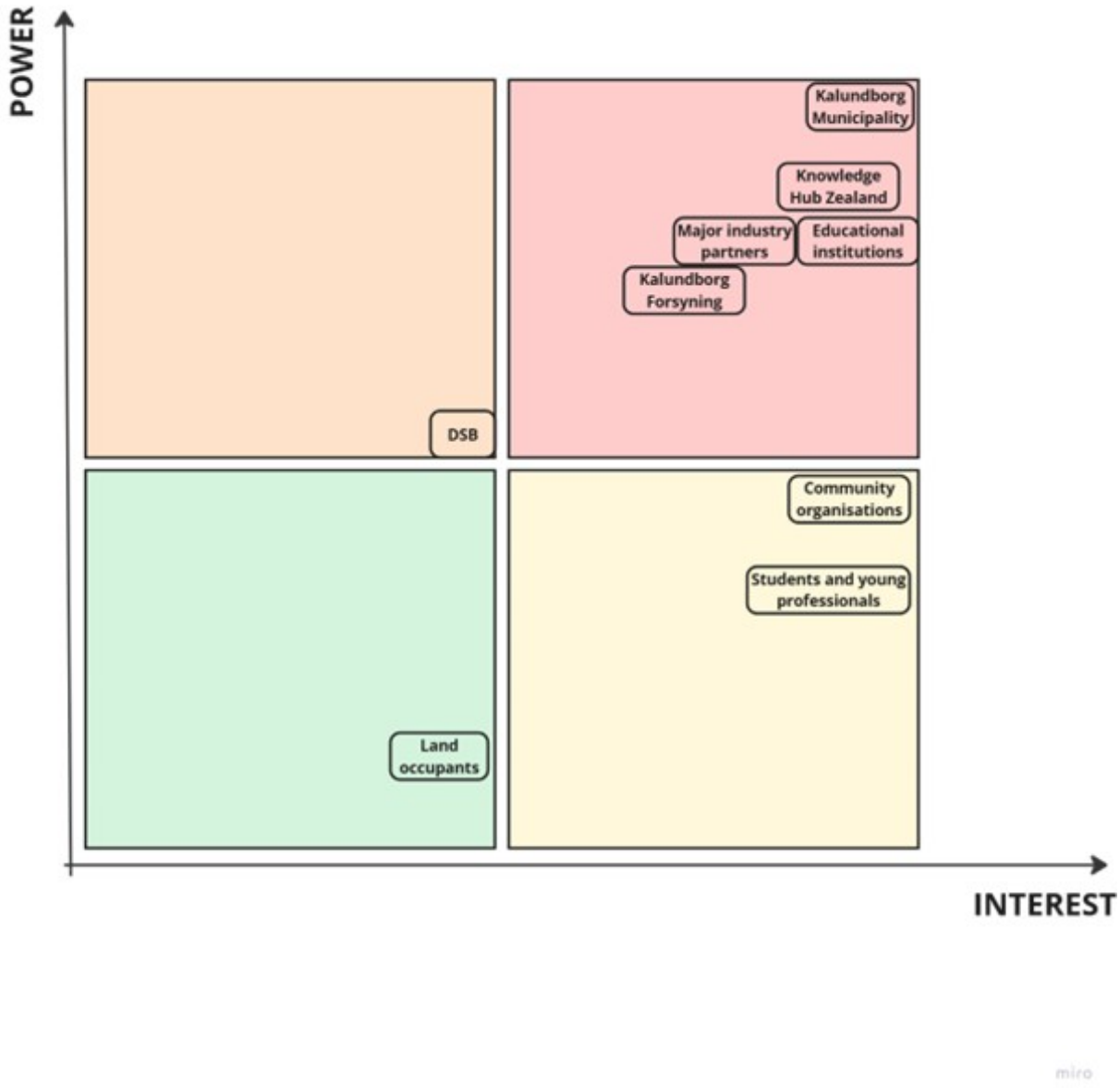


Figure 5.1. Stakeholder power-interest matrix (own prouction)

High Power & High Interest

Kalundborg Municipality (Department of Sustainable Development): A key actor in driving Kalundborg towards a more sustainable and resilient urban environment, attracting more people to live in Kalundborg. Responsible for various sustainability projects, including climate adaptation, infrastructure and green mobility projects, public transport, development of housing and business, student support and assistance.

Power: Holds high formal authority in decision-making processes, including land use regulation, infrastructure investments, and climate adaptation policies. These aspects are particularly relevant to GBI as its integration can be influenced by land zoning laws, funding allocation, climate standards, and general urban priorities.

Interest: High interest in ensuring the city is not only sustainable and functional, but also an attractive place to live, work, and study in, ensuring a high quality of life. The municipality aims to attract a larger proportion of students by expanding educational opportunities. Leveraging GBI to enhance the quality and accessibility of key public spaces can help achieve this social development. GBI is particularly relevant to the municipality's primary interest of integrating nature-based solutions that adapt to or mitigate climate change (especially flooding) risks in Kalundborg's urban areas, affecting the physical built infrastructure and humans.

Knowledge Hub Zealand (KHZ): As a secretariat to Biotekbyen, KHZ collaborates closely with large companies within the local biotech industry such as Novo Nordisk, as well as with Campus Kalundborg and its affiliated educational institutions such as Absalon University College, thus bridging the connection between industry, education, and research. KHZ also has strong partnerships with Kalundborg Forsyning, other smaller companies, as well as the municipality.

Power: While KHZ does not hold formal authority in spatial urban development, its central role as a cross-sectoral initiator and facilitator holds significant informal power in urban planning decisions by initiating agendas to support urban conditions regarding education and workforce.

Interest: High interest in attracting students and workforce, and ensuring they have a high quality of life through socializing and networking opportunities. This aligns with GBI's potential to create a well-connected and accessible urban environment that brings people closer to nature and to each other.

Major industrial partners: Large industrial actors, for example Novo Nordisk, are major employers in Kalundborg. They drive the economy through production, export, and also innovation. Their presence influences Kalundborg's spatial structure through land use, as well as social structure through diverse workforce needs. Their expansion and success strengthens Kalundborg's identity as global biotech hub and thus its regional and even global reputation. Therefore, it is important to consider their role and demands as critical part of Kalundborg's urban environment.

Power: Moderate to high, as they have no direct control over Kalundborg's planning decisions, they still hold power through their economic dominance and partnerships with local institutions such as educational. Their expansion creates spatial pressures through increased land use for new facilities, demand for adequate infrastructure to support the logistics.

Interest: Apart from high interest in technical skills of their workforce, the industries also have high interest in retaining their employees long-term, as well as attracting students, i.e., future employees. This means that they can be interested in GBI's ability to foster social wellbeing for their employees and accessibility to their work facilities, but due to the lack of direct power in urban planning, they may not see it as a priority in their internal planning.

Higher-education institutions: Educational institutions such as Campus Kalundborg (and even to some extent Kalundborg Gymnasium) teach advanced science programs within biotechnology sectors.

These educational programs are closely linked to Kalundborg's industries, therefore they have a close collaboration and partnerships with the companies, the municipality, and KHZ, paving direct career pathways. They function not only as educational facilities but also shape Kalundborg's communities, especially young people in the city. Therefore, any other educational institutions (universities with programs based in Kalundborg) are highly relevant to the city's urban environment through their role in shaping the social landscape.

Power: Moderate to high, as educational institutions have the ability to attract and retain students as their primary goal, thus influencing municipal priorities such as student-oriented public spaces, infrastructure, housing, and overall wellbeing. They can advocate for GBI integration in the form of vibrant outdoor spaces, improved pedestrian or cycling infrastructure to improve accessibility and safety around and in-between campuses and student housing.

Interest: High interest in ensuring that students are supported not only academically but also in terms of social wellbeing. This is particularly important for international students and newcomers to Kalundborg who have to immerse themselves in social life to create important networks. GBI here plays a strategic role by providing opportunities to students to explore the city, its nature and recreational spaces, meet others. Additionally, since new projects in Kalundborg require integration of nature-based solutions for rainwater management, campuses are highly interested in GBI ecological services.

Kalundborg Forsyning (utility company): Owned by the municipality, Kalundborg Forsyning is responsible for supplying services to city's urban areas, such as drinking water, district heating. It also treats wastewater for the entire municipality, and provides surface water to some of the city's large companies. Moreover, it maintains close collaboration in projects that involve urban renewal and climate adaptation, health, environment, and nature [Kalundborg Forsyning, 2025].

Power: Moderate to high, as it has high technical expertise which is applied in "blue" infrastructure projects such as surface water solutions ad stormwater management, thus they hold critical role in how climate-resilient NBS are implemented in urban areas, affecting the success and multifunctionality of GBI interventions.

Interest: Moderate. Due to water being a core part of GBI, Kalundborg Forsyning has high interest and involvement in sustainable water management practices that affect urban infrastructure and public spaces. However, they likely do not have much direct interest in GBI as a tool for connecting spatial and social features.

High Power & Low Interest

DSB (Denmark's national railway company): As Denmark's primary railway operator, it provides regional and national train services, connecting Kalundborg to the rest of the country. It is responsible also for the timetables and service quality - factors highly relevant for people commuting to and from

Kalundborg regularly.

Power: More moderate than high. Although it does not directly influence Kalundborg's urban planning, its rail infrastructure influences the city's overall accessibility, especially in terms of frequency and speed. Therefore, their service holds power over commuter behaviour.

Interest: Their interest primarily lies in service delivery and ridership - factors that DSB and municipality are working on together to increase. While this benefits Kalundborg regarding increased use of sustainable public transport to - among other things - reduce private car use, for DSB the interest may primarily lie in financial profit. Moreover, their combined interest in accessibility and use of the train service presents an opportunity to integrate GBI solutions around stations in Kalundborg, or strategically connecting to commuter destinations within the city, and enhancing whole commute experience.

Low Power & High Interest

Students and young professionals (future residents of Kalundborg): This group involves current and future students studying in Kalundborg, as well as young professionals employed in the city, for example, after completing their studies. They represent an important demographic in Kalundborg's goals and vision of a more socially vibrant and attractive city. Therefore, as end-users of urban spaces, their opportunities and experiences in Kalundborg can highly depend on the quality of the urban environment. Moreover, attracting and retaining this demographic is essential to educational, social, and economic development in Kalundborg.

Power: Low to moderate. They lack direct formal authority, and may influence urban planning decisions when included in civic engagement processes, such as surveys or community meetings. Their power can also be increased when certain institutions or organizations with higher power can advocate on their behalf.

Interest: High, as green-blue spaces and the related infrastructure significantly influence their daily life - from social and physical wellbeing to movement opportunities and experiences. GBI can be strategically planned and designed to meet their specific interests, thus creating an inclusive and community-like urban environment.

Community organisations (e.g., volunteer, culture, sports): Representing diverse groups that involves civic engagement, social wellbeing, and overall participation in city life. They create important social value by encouraging interactions across diverse groups and communities. For example, SYMB is an association-driven enterprise in Kalundborg that connects people and co-creates activities, events, and facilitates networks between residents, students, workers, businesses, and municipal actors, thus allowing interdisciplinary discussions and actions [SYMB Kalundborg, 2025].

Power: Moderate power in urban planning, as they hold only informal influence through social networks, trust, knowledge of everyday life in Kalundborg. When they are actively engaged, they can ensure

that GBI interventions reflect on the values of all people, thus increasing the multifunctionality and effectiveness of GBI and other urban planning strategies.

Interest: Can have high interest in GBI as urban spaces that provide space for their organisational activities, such as outdoor events and informal gatherings which are essential to community functions.

Low Power & Low Interest

Space-intensive land occupants (e.g., car dealerships): Land occupants, especially those that take up relatively large land plots such as car dealerships, logistics grounds, or storage facilities, can occupy essential urban land in Kalundborg. For example, in areas that are targeted for urban redevelopment, these occupants can create conflicts in the planning processes.

Power: Typically low power, especially when the redevelopment plans are supported by municipal strategies. Their operations can often be relocated to other areas, thus holding very limited say in planning decisions.

Interest: Low to moderate interest in GBI integration as their primary concern may be economic and ensuring operational continuity, however they could benefit from increased customer traffic and through improved accessibility and urban image in the surroundings.

5.2.3 Impacts of Industrial and Educational Expansion

Today, it is difficult to discuss Kalundborg without mentioning its industrial expansion, which has accelerated new local developments in the city. Novo Nordisk, a pharmaceutical manufacturing giant, has always been one of the biggest employers, and its 2021 investment of 60 billion DKK in production facilities creates an important impact on Kalundborg. Figure 5.2 shows urban areas in Kalundborg that involve this industrial use (red), as well residential (yellow) and other urban land uses and covers (for details, see Appendix F).

Moreover, due to the ongoing expansion of educational opportunities in Kalundborg, the number of students will increase to 10% of the population, transforming the culture and energy of the city (Stensgaard, 2025; see Appendix C). The higher education study environment in Kalundborg is highly technical and international [Kalundborg Kommune, 2025].

In connection with the industry aiming to double its production capacity with its expansion, the city prioritizes and plans new housing areas to accommodate the increasing number of people wanting to work and study in Kalundborg. In fact, approximately 1,000 new dwellings planned on the outskirts of the city will bring noticeable changes in the current land use (Stensgaard, 2025; see Appendix C). Additionally, large construction projects, especially by Novo Nordisk, have led to a significant inlux of construction workers that currently rent out most of available housing, contributing to the high housing

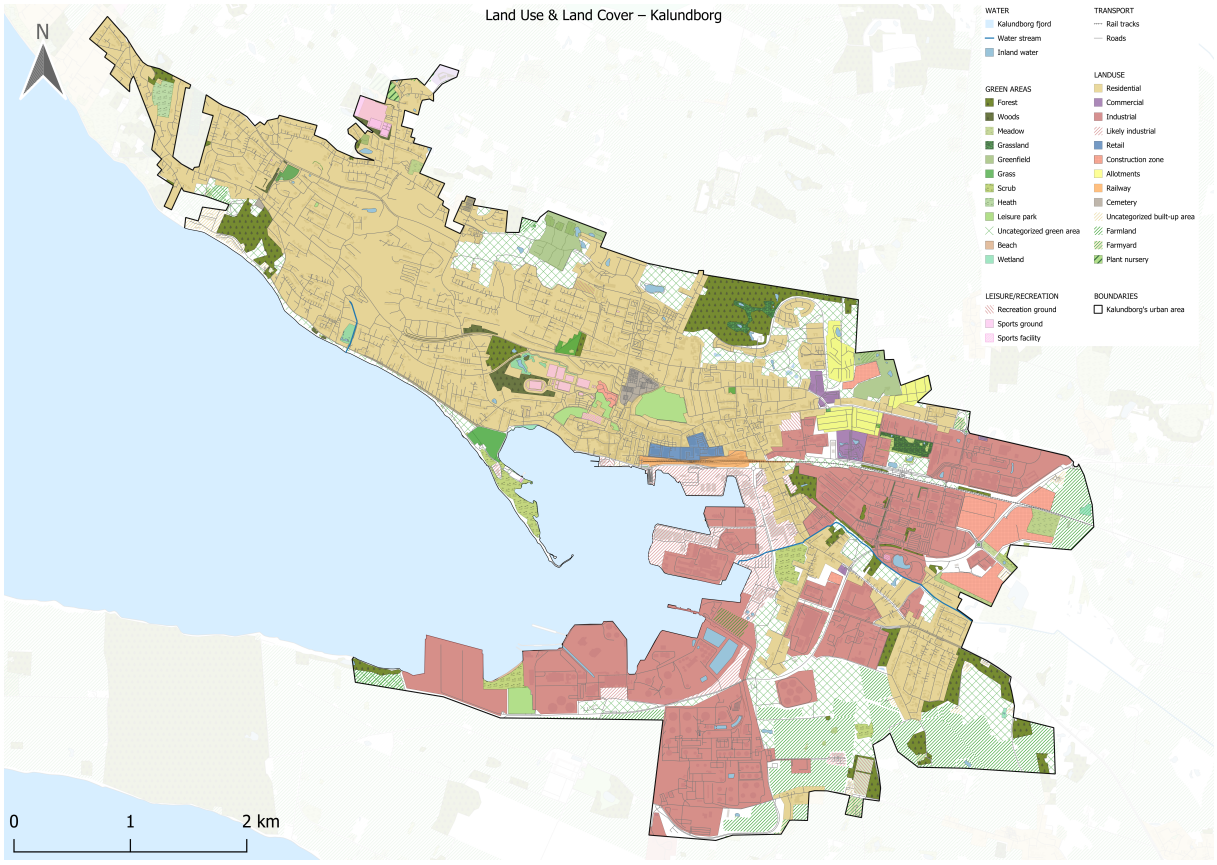


Figure 5.2. Land use and cover in Kalundborg (own prouction)

demand and limiting housing opportunities for any newcomers like students. This creates a challenge in balancing the planning priorities for new housing projects - when new facilities will be built, this temporary housing demand by construction workers will decline, thus ricking overcapacity of empty accommodation units (Top, 2025; see Appendix D).

Moreover, as flooding issues persist, the city is running out of space to handle the excess rainwater due to the expansion of these residential and industrial areas. Therefore, a revision in the municipal plan now requires local rainwater management with nature-based solutions for new developments to store or slow water drainage, decreasing the dependency on pipes.

While the city center itself does not experience serious road congestion, the main access roads into the city do - especially around Novo Nordisk facilities where the road capacity is limited, leading to traffic breakdowns and congestion during peak hours (Stensgaard, 2025; see Appendix C).

5.3 Kalundborg's Urban Layout and Connections

This chapter addresses research sub-question 2 by exploring Kalundborg's spatial structure, particularly what areas in the city are essential to its residents and what opportunities exist for them to reach these areas or spaces. It also aims to analyze what movement challenges exist to have a well-informed base knowledge for further exploring possible nature-based solutions that can lift some of the barriers or add multifunctionality to existing places - combining green-blue with infrastructure - which is investigated in a chosen case area later in chapter 5.4.

5.3.1 Key Urban Areas: Functions, Green-Blue Extent, Interconnection

Several areas in Kalundborg can be identified as key destinations due to their frequent usage as revealed by local residents, their historical and tourism importance, being the main place of one's occupation, or serving other critical functions for urban life. These areas are highlighted in figure 5.3.

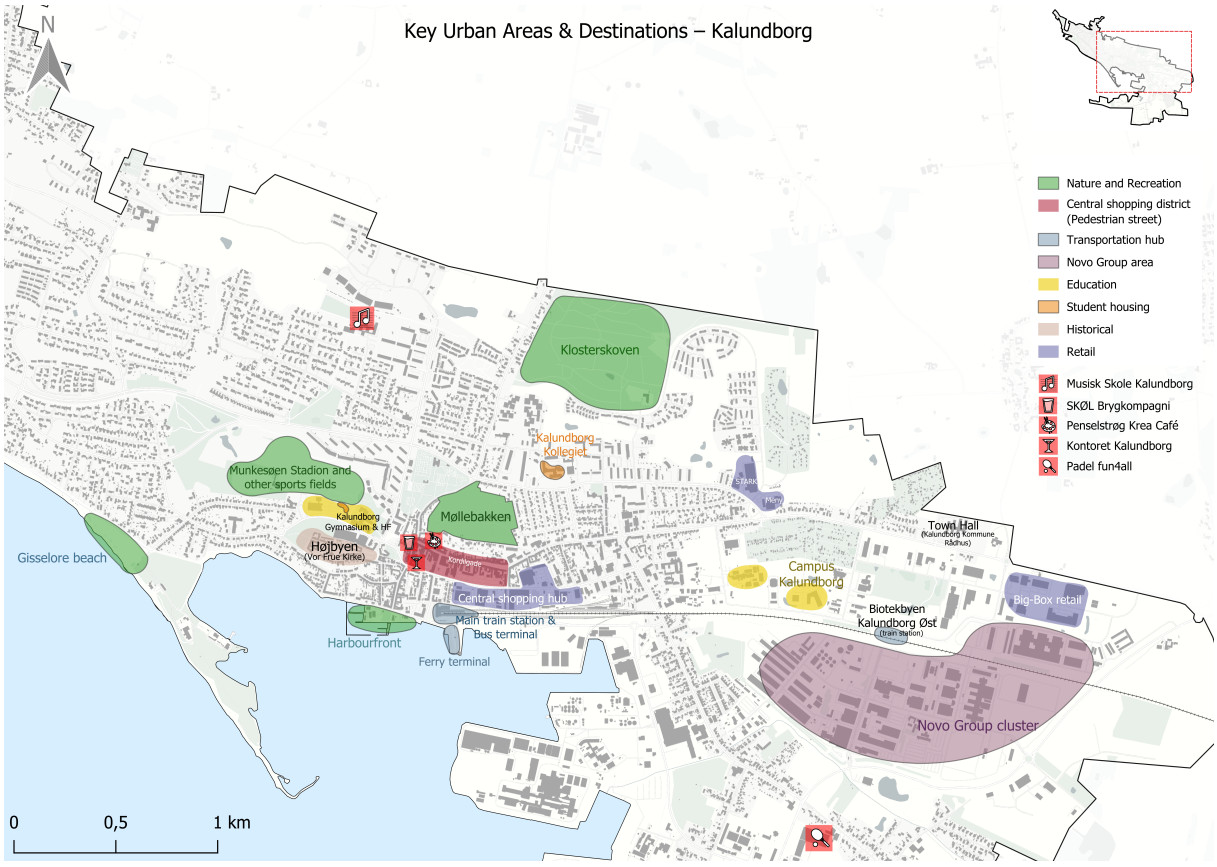


Figure 5.3. Key urban areas and destinations in Kalundborg (own prouction)

Kalundborg's **habourfront** is popular among all people in the city, serving as a mixed-use scenic area that combines blue infrastructure with recreational and commercial offerings. Users frequently use

this area as an area for relaxation, walking along the waterfront, gathering with friends, and even using the cafes for work or studies. Facing south, it offers a wide, sunlit view of the other side of the Kalundborg fjord, including the diverse industrial structures that always have been prominent in Kalundborg's landscape. Additionally, the presence of docked boats adds to the area's maritime value.

Moreover, several large green areas are integrated in Kalundborg's infrastructure, adding an important nature value. Also facing south, **Gisseløre beach** is an appreciated nature space, featuring a grass area with benches and a pathway along the shore, serving as a great route for running by. **Munkesøen stadium** and its multiple large sports fields around offers active recreation, and due to its close proximity to city center and Kalundborg Gymnasium, it invites a broad range of people. **Møllebakken** is the most central nature area in Kalundborg, situated on a higher elevated terrain, offering a quiet atmosphere and an above view of the entire city center at its bottom, including the iconic **Vor Frue Kirke** in the old medieval part of Kalundborg. Due to this park's central location and paved roadways, this area can connect many of the other key urban destinations around it, particularly for soft road users as through car traffic is allowed only in exceptional cases as indicated with physical barriers. At the northern edge of the city's urban zone lies **Klosterskoven** - a forest park, featuring pedestrian paths and a dog park.

Key areas for young adults include educational institutions such as **Campus Kalundborg** and **Kalundborg Gymnasium & HF.** While Campus Kalundborg is primarily home to Absalon University, it offers also programmes from University of Copenhagen (UK) and Technical University of Denmark (DTU), all offering higher education in bioproducts and biosolutions both in Danish and English [Novo Nordisk Fonden, 2025]. A new and larger campus building is planned to be completed in 2028, bringing together six educational institutions under one roof, developing and running programs collaboratively across all levels of education - from vocational training to PhDs. This project also invests towards advanced lab equipment and strengthening partnerships between the educational institutions and the local industries, putting an even greater importance to the entire eastern part of the city (Top, 2025; see Appendix D). All other adult educational institutions as well as industrial partners in Kalundborg are shown in figure 5.4.

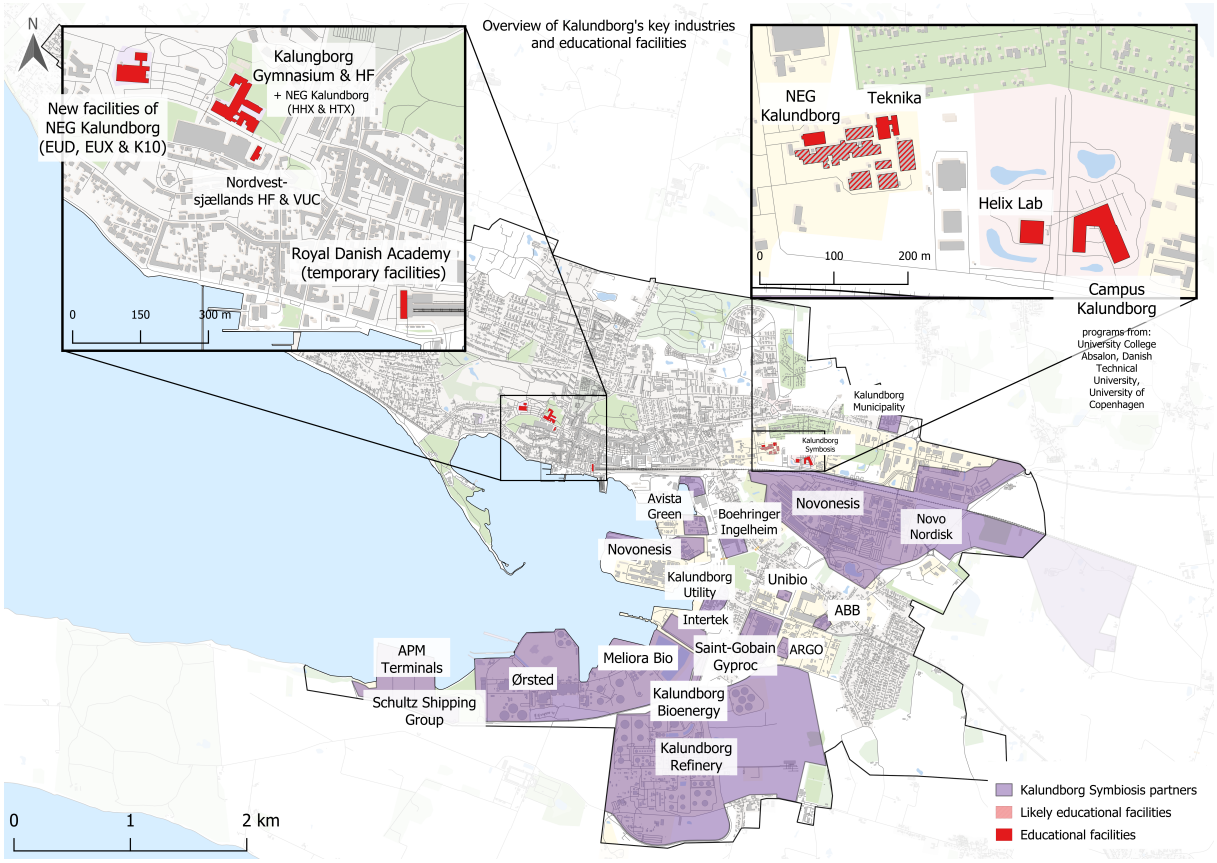


Figure 5.4. Kalundborg's key educational institutions and industrial symbiosis partners (own prouction)

5.3.2 Transportation Infrastructure: Types, Roles, and Challenges

Infrastructure is a key factor to how people experience their daily lives, whether it is a work-home commute, running errands, or leisure time. It is essentially meant to be a facilitator, but it can be a barrier in urban life, depending on one's habits, lifestyle, age, or solely due to urban restrictions such as private zones, for example. Findings from formal and informal interviews (Appendix A, B, C, D), as well as from an online survey (Appendix E) reveal that multi-modal access, walkability, and nature integration in built infrastructure are important aspects for Kalundborg's residents as they offer social life and wellbeing across the city and support daily commutes. These aspects are particularly relevant to students and employees of major institutions in Kalundborg, such as Campus Kalundborg and Novo Nordisk, as their daily responsibilities and schedule depends on transit options. However, challenges exist.

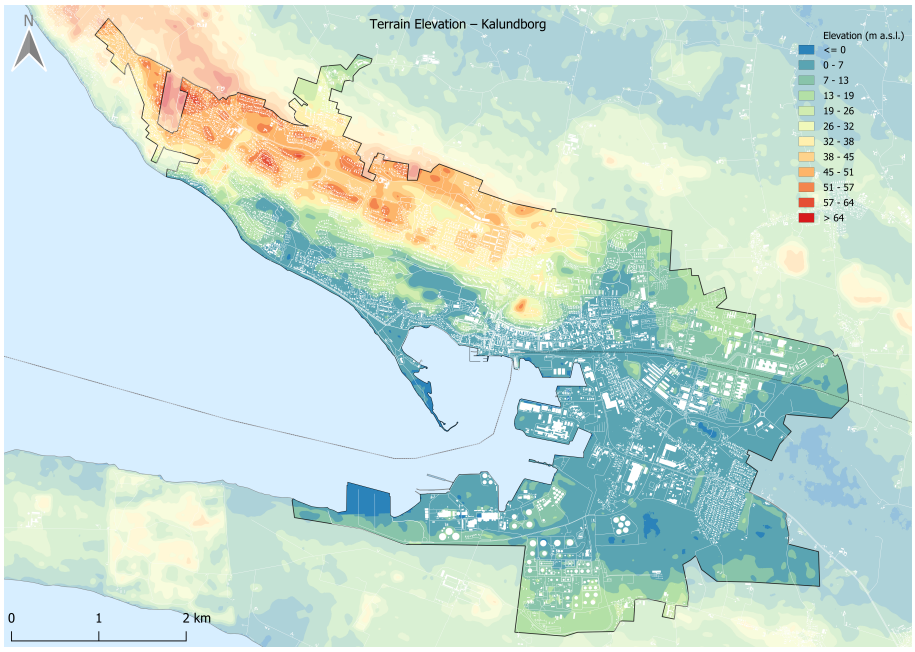


Figure 5.5. Terrain elevation in Kalundborg's urban zone (own prouction)

Mainly due to the terrain, Kalundborg is a stretched-out town laying in-between the fjord and hills (see Figure 5.5). This means that people often need to bike and walk relatively long distances, for example to get from the educational and industrial areas to the city center. This presents a challenge in overall mobility and can discourage bike use, therefore the city is focusing on establishing stronger bicycle and pedestrian connections to promote active and sustainable transport (Stensgaard, 2025; see Appendix C) [Kalundborg Kommune, 2023]. Currently, most major roads in Kalundborg have some type of bicycle infrastructure that safely links key areas (see Figure 5.6). However, many disconnects exist where cyclists must choose to either continue movement unprotected from cars or try to find a safer and more comfortable but longer alternative route. Moreover, based on field observations, some of the bicycle "lanes" that run at street level are very narrow, and can be mistaken for road edge marking, creating confusion and less safe cycling conditions.

Moreover, many students and workers rely on public transportation, either because of discomfort with cycling over hilly terrain or due to living in another cities and commuting daily. There are multiple bus lines going through Kalundborg, linking residential, industrial, nature, as well as other smaller towns in the wider region. All of these bus lines start or end at Kalundborg's central train and bus station, which strengthens the importance of safe walking and cycling conditions along these bus routes, as well as informs which spaces in Kalundborg are most accessible, or may experience relatively more noise due to bus activity.

The municipality aims to reduce personal car use and improve railway connections by increasing the train service frequency and speed, thus shifting more people from cars to trains which has high potential of happening as studied by DSB (the largest train operating company in Denmark) (Stensgaard, 2025;

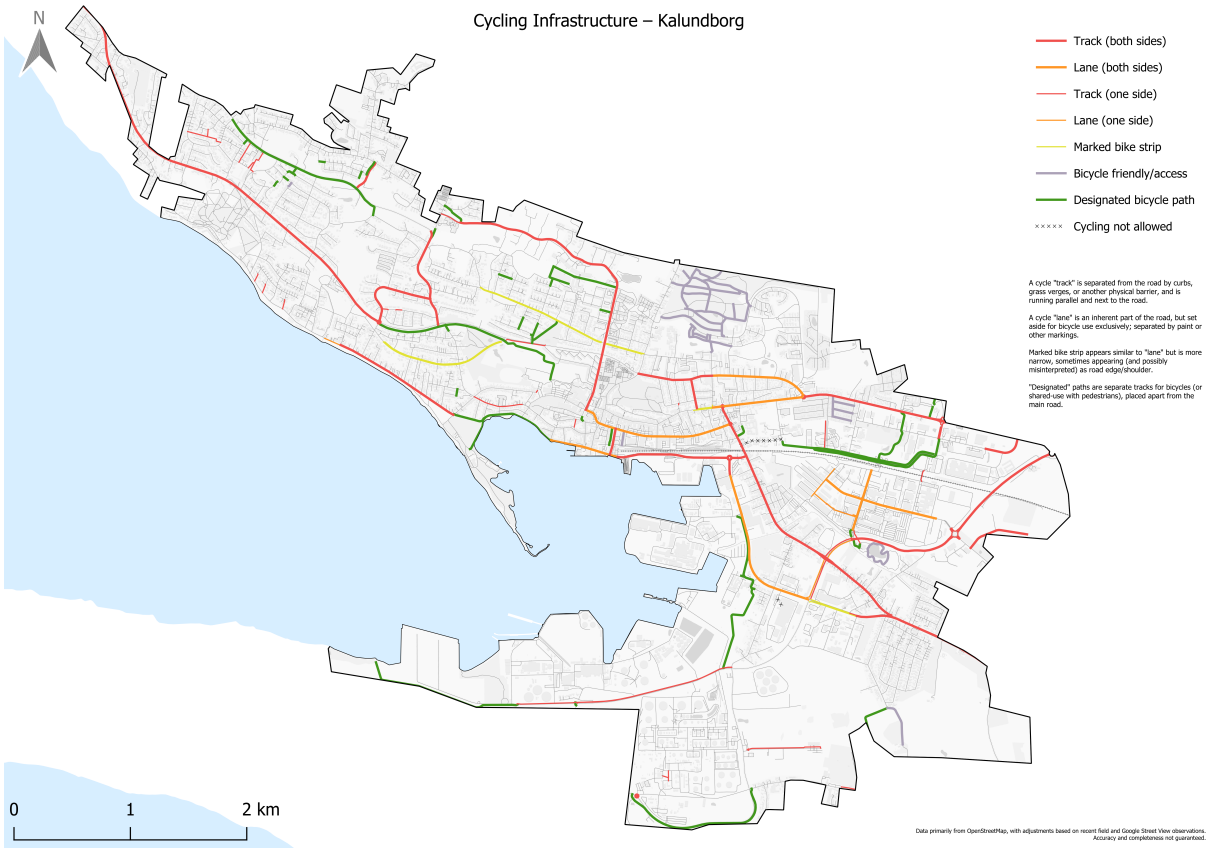


Figure 5.6. Cycling infrastructure type and coverage in Kalundborg's urban area (own prouction)

see Appendix C). Train users admit that often it is quite frustrating to commute from Copenhagen to Kalundborg by train, as it only runs once or twice per hour, thus creating overcrowding (Top, 2025; see Appendix D). In collaboration with DSB, Kalundborg is working to address these issues (Stensgaard, 2025; see Appendix C). Additionally, a new highway is underway with its last section toward Kalundborg expected to be finished by 2028, which will help addressing the issue of congestion on primary access roads into the city, especially during peak hours (Top, 2025; see Appendix D).

Infrastructure also plays an important role in supporting Kalundborg's industry and logistics sectors. The municipality recently has launched a project that aims to make freight transport more sustainable and efficient by reducing the amount of empty truck trips, exploring possibilities for shared transport facilities, and improving electric vehicle infrastructure. While large companies often manage their own green transport logistics, smaller businesses need more support in this transition (Stensgaard, 2025; see Appendix C).

Green-Blue Infrastructure in Kalundborg's Urban Planning

While historically the approach to green-blue infrastructure has not been a priority in Kalundborg's local planning, it has recently gained more attention in relation to increasing flooding risks and the expansion of residential and industrial zones. One of the major changes in the revised municipal plan is for how stormwater is managed in new developments. Instead of relying solely on pipes, new developments now are required to manage rainwater on-site by integrating nature-based solutions to slow down the runoff or retain it, thus preventing floods. In parallel, municipality is working toward the expansion of biodiversity corridors, thus combining nature restoration with water management.

Moreover, as discovered in the survey for this research (Appendix E), people are drawn to urban environments with green and blue assets, and most would choose a route to walk or bike through a green-blue space rather than infrastructure of bland views - dominated by asphalt and concrete. Residents have also pointed out that existing green spaces are poorly integrated in Kalundborg's everyday urban setting, requiring intentional effort to visit rather than being a natural part of movement paths. However, implementing these solutions is challenging. The main barriers are space and money - there is very little extra room to retrofit the existing infrastructure with these green alternatives, and financial constraints further complicate this issue, especially large-scale interventions (Stensgaard, 2025; see Appendix C).

5.3.3 Identifying Gaps and Opportunities for GBI Interventions

By overlaying common movement networks with the key urban areas, as well as by analyzing stakeholder input, several gaps arise. Although most survey respondents reported being able to move around Kalundborg with relative ease, some specific concerns, challenges, and desires were revealed (see Figure 5.7):

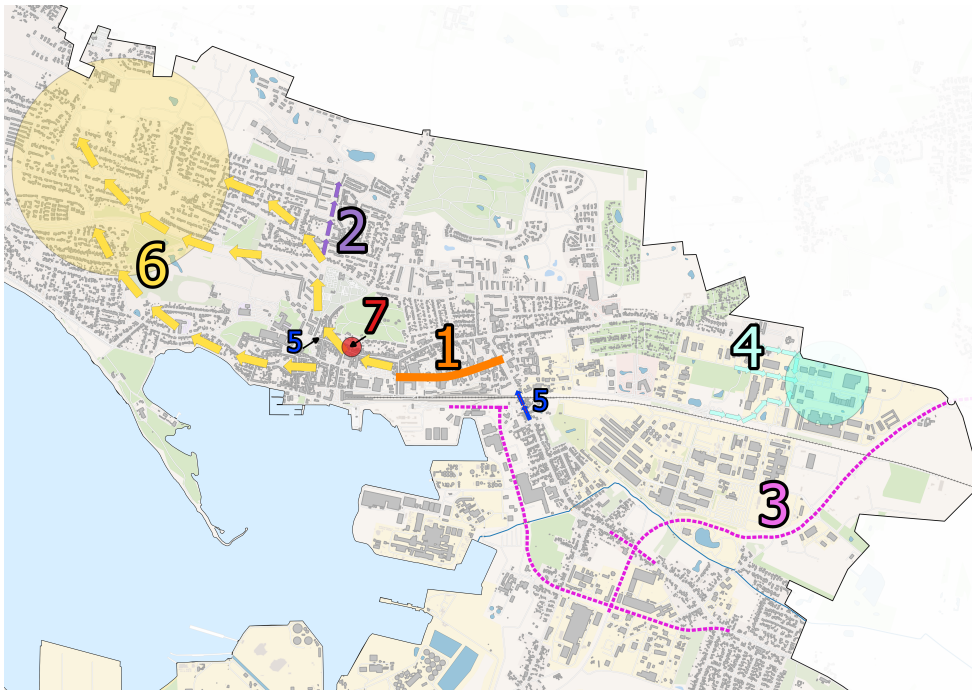


Figure 5.7. Unpleasant movement areas, as identified by residents (own prouction)

1. Elmegade: very central, but lifeless street where more housing and greenery are desired
2. Klosterparkvej: unsafe walking conditions during dark hours
3. Main road by industries: a lot of traffic
4. Area near *Biltema*, *Jysk*, *Harald Nyborg*: unsafe and unsettling pedestrian conditions due to aggressive car drivers
5. Western part of walking street (Kordilgade), and the signal-controlled intersection by the train crossing and *OK Gas Station* (likely Slagelsevej 40): unclear bicycle signage causing confusion about permission to cycle
6. Moving north-west from city centre (towards Raklev): decreased walkability due to car prioritization and disconnected sidewalks
7. Møllebakketrappen: insufficient lighting creating unsettling environment at night

General issues include unpleasant smells across the city due to Novo Nordisk, frequent prioritization of cars over cyclists and pedestrians, which creates a loud and unsafe environment for more vulnerable people like children, as well as overall reflections on the city feeling isolated and empty, which creates an unsettling movement experience – especially after it gets dark.

Due to the limited amount of survey responses, it challenging to identify which of these areas in Kalundborg are particularly concerning for most residents of the city. However, most of the issues pointed out are in the central area, thus exploring opportunities for improved GBI integration is highly relevant in the city center as most activity takes place there. Therefore, the next chapter (5.4) is focused on a part of this central area, where more relevant and detailed analysis can be presented.

5.4 Central Kalundborg as a Case Study of GBI Potential

Based on findings in the preceding analysis sections, this chapter addresses the third and last sub-question asked in the research design. It involves a focused analysis of an area relevant to students and thus worth exploring GBI potential by applying ideas from the placemaking concept to guide analysis and suggestions of practical solutions. It also examines current local plans within the area to ground any further discussion of GBI.

5.4.1 Selection of the Case Area

The chosen area of focus has been selected due to its importance in connecting everyday resident life with Kalundborg's cultural, recreational, and commercial core area (see Figure 5.8). Since students are key players in the city's industrial and overall urban development, the chosen area encompasses the currently main student housing (Kalundborg Kollegiet) and the central key destinations appreciated by students (and other residents, as noted in survey and street interviews (Appendix E1), namely the scenic Møllebakken leisure park, the central district featuring favourite food and drink amenities, as well as the harbourfront.

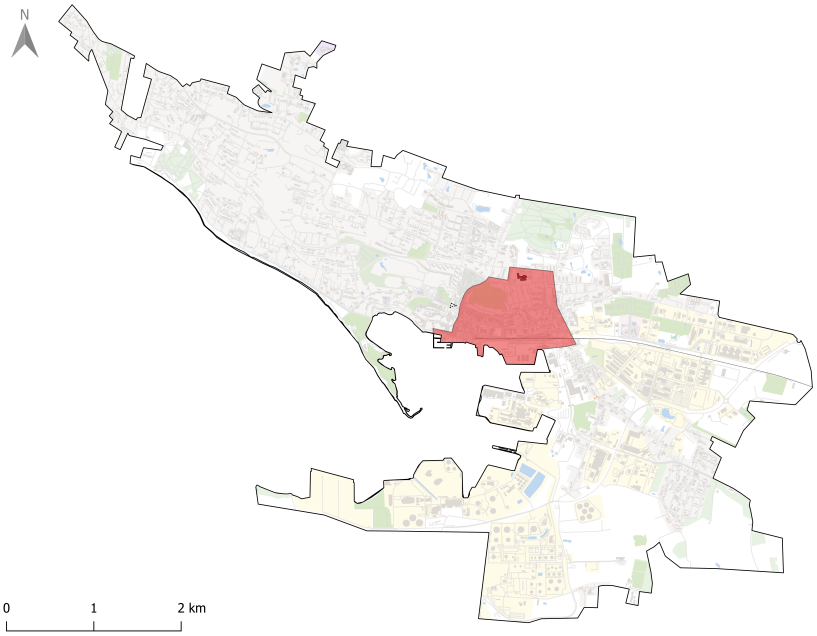


Figure 5.8. Chosen case area location within Kalundborg's urban zone (own prouction)

As discovered in previous chapters, the nature areas found around the city lack seamless connection, which, coupled with the fragmentation of Kalundborg's city center, does not support the city's vision of a lively and vibrant urban life. From a methodological standpoint, this area provides a relevant opportunity for applying the few placemaking framework ideas chosen for this study - assessing accessibility,

functions and activity potential, comfort and sociability by leveraging green-blue infrastructure. Exploring in further detail the physical and visual barriers, the findings in this focus area can give valuable insights into strategies that might contribute to improving other areas within the city, especially as urban development continues and Kalundborg expands spatially and demographically.

5.4.2 Spatial and Functional Assessment of the Area

To better understand how the selected focus area functions spatially and socially, the assessment follows an example route that students from Kalundborg Kollegiet may take to reach Kalundborg's central amenities and down to the harborfront. It involves an assessment of what the route segments feature, their structure and functionality, as well as examines the surrounding urban context to develop well-informed interventions that leverage the site's potential of multifunctionality. The route sections (or corridors) and their surroundings described in this section are shown in Figure 5.9.

Figure 5.9. Route scenario sections (own prouction)

The movement in this example begins along Rubjerg Alle (1) (figure 5.10), which runs downhill with bicycle tracks on each side of the road separated by tree-lined buffer zone, and green hedges on outer sides. This street is a great example of green infrastructure where urban nature and human mobility form one cohesive system that supports many desired outcomes within the Placemaking concept, particularly regarding the core attributes of Access & Linkages and Comfort & Image.

Figure 5.10. Rubjerg Alle (1) (source: Google Street View)

Then moving toward the central area and Møllebakken, one would have to travel Sct. Jørgensbjerg street (2) (figure 5.11) which is a key access route from the east where it connects to the broader bike lane network, however, its western section has a clear disconnection of this network. Instead, this section consists of a two-direction carriageway with informal curbside parking along one or both sidewalk sides, with partial green hedges along the housing as the only urban nature elements. Here, an intersection with Bryggervænget (3) (figure 5.12) features clear direction and name signage towards the Møllebakken park, with a small open garden-like plot, a high terrain-made green hedge along the road, with a bench overlooking this intersection. Good greenery coverage, however, this road is steep and narrow, which may result in decreased comfort and accessibility for some individuals.

Figure 5.11. Sct. Jørgensbjerg (2) (source: Google Street View)

Figure 5.12. Bryggervænget (3) (source: Google Street View)

The western end of Sct. Jørgensbjerg is a transition point, where one can either move up to Møllebakken park again (4) (figure 5.13), continue down the main walking street (5) (figure 5.14), or travel down toward the harbour (6). From this transition point, the road up to the Møllebakken (4) prohibits through traffic, with the exception of errand purposes, resident, and bicycle use. The way up is narrow, in-between houses at first, but soon allows a scenic overview of the area due to elevation gain.

Figure 5.13. Møllebakken road (4) (source: Google Street View)

Figure 5.14. Kordilgade (5) (source: Google Street View)

The way down towards the harbourfront and central station can continue via Nygade (6) (figure 5.15). It is a straight north-to-south two-way street, enclosed by three storey buildings and lined only with sidewalks on both sides. Moreover, Nygade descends in slightly in elevation, offering a visual corridor toward the harbourfront in the distance. However, the view is currently obstructed by stacked industrial containers in the port area, creating a visual barrier towards one of Kalundborg's currently only blue infrastructure assets. In the middle, Nygade intersects with the central traffic belt, and ends by the shopping mall (figure 5.16).

Figure 5.15. Nygade north (6) (source: Google Street View)

Figure 5.16. Nygade south (6) (source: Google Street View)

This traffic belt consists of Elmegade (7), a key connector between Kalundborg's eastern and western urban areas. It features two-directional car lanes, bicycle lanes integrated at pavement level, and sidewalks on both sides. The streetscape lacks urban nature elements, offering only sparse grass buffer zones by commercial plots, and very few trees. As noted by one of the survey respondents (see Figure 5.17), the numerous car dealerships and vast open frontage areas and parking lots creates an environment, that is car and asphalt dominated, lacking much of the core attributes desired by the Placemaking concept. Notably, here a demolished bowling alley has left an approx. 2500 sqm. empty and unused plot in this central part of the city.

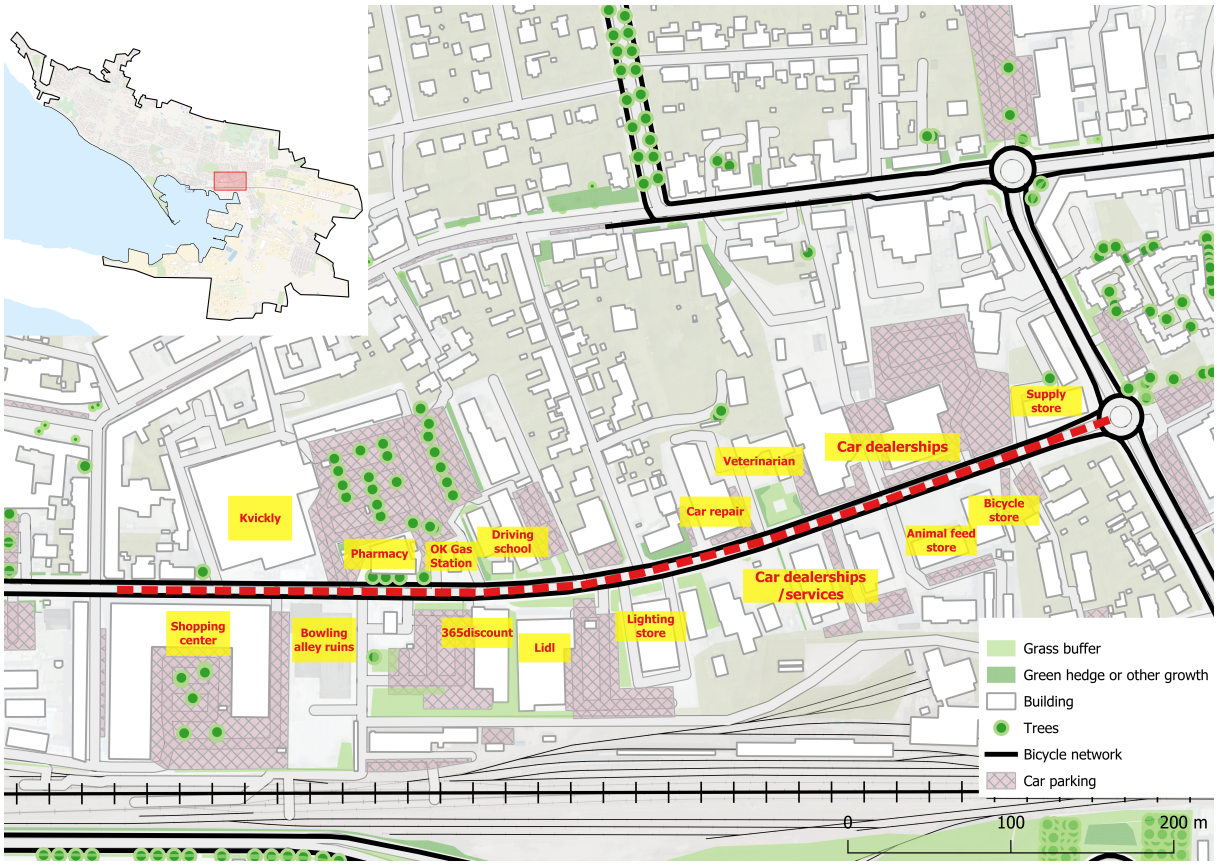


Figure 5.17. Urban setting and functions on Elmegade

Continuing the central traffic belt from Elmegade, Bredgade (8) (figure 5.18) shares the same road layout but includes more visible greenery, such as hedges and trees. Most of these green elements are featured within a large central parking area of approx. 6500 sqm. that one can move through to access Kordilgade (the walking street) through multiple transverse passageways through buildings. Overall, Bredgade appears as a fragmented urban space with high traffic volume.

Figure 5.18. Bredgade (8) (source: Google Street View)

Figure 5.19. Vænget + Banegårdspladsen (9) (source: Google Street View)

Turning south, Vænget and Banegårdspladsen (9) (figure 5.19) provides a clear visual and physical connection toward the harbour and the central, train, bus, and ferry station. It features curb-elevated

bicycle lanes and sidewalks on both sides, with a row of trees on one side. Moreover, it serves as a major muti-modal corridor that also accommodates many bus routes (see appendix). Adjacent to the station, a parking area is framed around by row of trees, adding an important level of greenery integrated in such busy urban environment.

Along the railway and harbour, Østre Havnevej (10) (figure 5.20) begins/ends as Denmark's National Road 22, serving as one of the key access roads into the city with bicycle network, linking Kalundborg's industrial areas and National Road 23 towards Copenhagen. A strip of grass and hedges separates the road from the train tracks, while the view on the harbour-facing side is dominated by industrial elements, often obstructing the landscape view entirely, as also seen from Nygade (6) earlier.

Figure 5.20. Østre Havnevej (10) (source: Google Street View)

Figure 5.21. Vestre Havneplads (11) (source: Google Street View)

Moving westward, Vestre Havneplads (11) (figure 5.21) provides access to one of Kalundborg's most valued recreational destinations - the harbourfront. The streetscape in this section includes grass buffers, green hedges, and some parking areas adjacent to the local amenities. The harbourfront itself offers a mix of activities, including a streetfood, a cafe, and fast-food hut - all with both indoor and outdoor seating offering a view of the harbour landscape. It also features open grass areas, a beach volleyball court, a children's playground, and an unpaved free space for flexible use, such as events. Havnebad, an open public swimming facility established in 2024 (figure 5.22), offers space not only for bathing, but also features a kayak polo court, space for informal gatherings, recreation, and enjoyment of the maritime atmosphere [Frøslev, nd].

Figure 5.22. Harbourfront (Own image)

5.4.3 Spatial and Functional Guidelines from Kalundborg's Local plan 2021 (current)

The area along Sct. Jørgensbjerg is aiming for a housing-oriented development, however due to the length of this street and the lokalplan's involvement of Slagelsevej on eastern end, it is unclear how much these plans apply or are directed towards the western end of this street - within the selected case area. However, home renovations are required to promote the green features in this area, such as planting along and on road areas. Moreover, the street has an environmental priority of including trees, speed bumps, and other elements to reduce traffic between Rudbjerg Allé (1) and Kordilgade (5) [Kalundborg Kommune, 2021d].

The area between Kordilgade (5) and Bredgade (8) is historically old, consists of cafes, banks, housing, and light commercial properties, and the localplan states the the ground floors along the boundary of this sub-area (including parking lots along Bredgade) should be used for customer-oriented business. Interestingly, new developments such as youth housing may be developed on the large parking areas at Bredgade. These developments must be placed in a way that support the area's original structure, contributing to safe and multifaceted green urban spaces. Additionally, Nygade (6) should be transformed into a quiet street ("Stillevej", a low speed road featuring bumps or narrowings) [Kalundborg Kommune, 2021a].

The area around Elmegade (7), particularly the south-west section is designated for larger grocery stores, specialty shops, and center-related activities and possibly housing. Any future development here must ensure coherence with Kalundborg's broader retail layout, including the possible Nytorv mall's expansion or separate renovations, thus forming visually cohesive blocks. Moreover, Elmegade is planned to be transformed into an approx. 17 meter wide street that is environmentally prioritized with a narrowed carriageway and cycle paths, as well as a side branch link to the railway are can be closed and replaced with another road that continues along the railway. These possible developments indicate

that the area's traffic flow can be redirected strategically creating a more comfortable environment for cyclists and pedestrians, and creating space for nature elements, enhancing the green character of the roads and parking lots [Kalundborg Kommune, 2021e].

The central train station area (9) is mixed use, including residential, offices, grocery stores, services. The localplan emphasizes that this area should be developed to offer customer-oriented activities, as well as more housing, including student housing, thus upgrading the area's role a central urban link that connects Kordilgade (5) with the harbour. The plan also stresses that the open spaces - roads and parking lots - must achieve a green character and microclimatic comfort via planting as much as possible. This may also support the plan of tightening the street and building structure, however, also respecting it [Kalundborg Kommune, 2021b].

Moreover, the area between the train station and Bredgade (8) is for retail, featuring large grocery and specialty stores, with the possibility of other urban center activities, including housing. Additionally, the store areas can be transformed into mixed-use developments that incorporate culture functions like a library, cinema, or multi-purpose rooms, thus reinforcing the synergy with the Kordilgade (5) shopping district [Kalundborg Kommune, 2021c].

5.4.4 Strengthening Urban Connections Through GBI and Placemaking Principles

Having developed a well-informed understanding of the selected focus area -particularly the spatial and urban functions of some of the possible routes that Kalundborg's students and others might take to reach the harbourfront via the city center - this final analysis section explores potential GBI interventions that could enhance the area's urban appeal. This section concentrates on small-scale site-specific solutions that are informed by field observations, current planning frameworks, as well as stakeholder input. Additionally, the proposed GBI interventions are shaped by placemaking principles introduced earlier in chapter 4.3.8, highlighting how such interventions could support accessibility and connectivity, enhance comfort and safety, encourage diverse uses and activities, and enable social interaction - themes that contribute to an attractive urban life.

As identified in the preceding analysis sections, the starting and ending segments of this example movement corridor scenario (Rubjerg Alle (1) and Vænget/Banegardsplandsen (9)) contain valuable and desired nature elements that are a coherent part of the streetscape, namely, tree lined streets with safe cycling infrastructure. These streets connect other key infrastructure links, offering good visibility throughout. However, multifunctionality and direct social engagement potential via ground-level greenery are limited, especially on Vænget (9) which functions as one of the primary traffic arteries, thus requiring hard surfaces for vehicle (incl. bus) and pedestrian movement.

In contrast, Sct Jørgensbjerg presents more opportunities for GBI interventions due to its relatively

generous width and the presence for roadside car parking, but it currently lacks bicycle lanes and features limited greenery. Therefore, this western section would benefit from an integrated bicycle lane network as a continuation from the existing infrastructure to the east. Some green hedges are present along some building frontages, however, the street could accommodate additional green pockets (e.g.,planted shrubs and swales, with or without trees) between parking spaces, if they were to be kept. Such interventions would align with the Local Plan's aim of reducing and calming the traffic on this road stretch as they would visually and physically narrow and tighten the open space, improving pedestrian and cyclist safety and comfort.

Nygade (6), which is planned to be converted into a "quiet street", also holds high potential for similar GBI elements. Due to the downhill orientation, proposed build-outs for GBI could take the form of sustainable drainage solutions such as bioswales to collect rainwater runoff and create a green corridor visual. Although Nygade's narrowness and enclosed environment limits its potential for larger, more multifunctional functions, more space for greenery and cycling infrastructure exists at Nygade's southern end - by Nytorv mall. Here the removal or reduction of a few roadside parking spaces or conversion to one-way traffic could offer integration of multifunctional GBI elements. These could include seating or small pocket parks that enhance sociability, particularly if supported by the shopping mall's ground-floor retail that through their products and services actively engage with customers like students and such, offering a reason to stay and gather. Additionally, such green design assets would provide retail employees a small green space to spend their breaks outdoors.

Continuing from Nytorv along the railway toward the central station (Jernbanevej), an added bicycle infrastructure accompanied with green elements would enhance the accessibility, comfort, and safeto for cyclists and pedestrians. This intervention is particularly feasible given the road's low traffic load as most vehicle access to the retail spaces is via Bredgade (8), as indicated by road signage. Moreover, such infrastructure connection would support any future redevelopment of the area, such as cultural amenities as proposed in the Local Plan. It would therefore facilitate a more attractive access for students and other culture enjoyers, while also creating a visual connection to the train station and further to the harbourfront. Such combined redevelopment would address the current fragmentation of Klaundborg's urban center by offering accessible, multifunctional space between the currently popular harbourfront (11) and the Kordilgade (5) pedestrian street, whilst the GBI could create cohesive pathways through the culture developments, strengthening the green network visually and functionally.

Furthermore, the area between Kordilgade (5) and Bredgade (8) features large open spaces dominated by parking lots and greenery in and along them. Parts of these parking lots could be upgraded with larger green areas that also support customer-oriented businesses nearby. For example, one business that is particularly appreciated by Kalundborg's students is bar Kontoret. While the main bar frontage is in the pedestrian zone on Skibbrogade, some activity could take place in its parking side. If a few parking spaces were repurposed for GBI such as courtyards, this could enhance the opportunities for socialization and leisure. This may particularly be attractive to public amenities offering a frontage

towards west, thus more sunlight during evenings when most people enjoy their free time. However, due to the high traffic volume on Bredgade, such green areas may be affected by traffic noise and safety concerns. Therefore, any socially multifunctional GBI along Bredgade should aim to buffer or reduce the exposure between the two atmospheres - loud and busy versus secluded and human-scale.

5.4.5 Summary of Analysis Findings

The analysis of Kalunborg center reveals both spatial challenges and opportunities for incorporating GBI assets, especially as focused on example corridors connecting student housing with the city center and harbourfront. While some route segments like Rubjerg Allé and Vænget already feature a high level of greenery accompanied with adequate bicycle and pedestrian infrastructure, the central areas are dominated by car infrastructure and lack inviting public spaces. These areas have been found to show potential GBI interventions based on the spatial and social functions identified in the areas, as well by considering local plan data and possible future developments. These interventions a primarily ground-level greenery elements that together form a cohesive network, and improve comfort and identity, multifunctionality of public spaces, as well as improve mobility through enhanced infrastructure proposals.

Discussion 6

This chapter critically discusses the empirical findings presented in the main analysis, focusing on the potential of Green-Blue Infrastructure interventions to address Kalundborg's urban fragmentation by strengthening the connections between key urban and nature areas, thus creating a more cohesive and attractive urban environment for students and residents alike. The discussion integrates insights from the methods applied, as well as linking them with theoretical perspective, and experiences from other cases for a general context. The key themes included in the analysis are the role of citizen involvement and GIS tools that shaped the context-specific understanding of Kalundborg's challenges. This chapter then discusses the significance of green interventions for improving the urban experience among target groups like students, as well as reflections on the methodological strengths and weaknesses. Finally, the chapter explores any future implications for urban development in Kalundborg and cities alike.

Key Research Findings

The analysis reveals that Kalundborg center exhibits a degree of fragmentation that is due to infrastructure dominated by cars and open asphalted surfaces, creating urban environments where focus on pedestrians, cyclists, and nature is limited and disjointed. These conditions hinder seamless connections between urban core areas, thus reducing opportunities for a vibrant and attractive urban life. This a particularly important aspect to ensure when considering students - future workforce - that often are newcomers to Kalundborg and their new social networks can be shaped and supported by an attractive urban living. Therefore, an analysis focused on an area relevant to students revealed key corridors that lack integrated nature elements and cycling paths in the existing built infrastructure.

As found in the current literature and theory, GBI interventions can be flexible, large- or small-scale strategies that leverage nature's assets to offer environmental, social, and spatial benefits for the built environment. These interventions can be placed directly in public spaces in a way that fits the existing urban fabric, especially small interventions. In connection to the placemaking concept, GBI can also activate underused spaces, providing access, comfort, and sociability for humans, thus serving also as social catalysts that bridge disconnections and create a more cohesive urban experience.

Within the context of the selected area, small-scale green interventions like bioswales, green buffers between parking spaces, secluded courtyards, and the creation of "quiet streets" offer promising strategies to link together the fragmented key parts of the city. These GBI elements not only can tighten and calm traffic spaces and increase biodiversity but also offer multifunctionality that improves microclimatic comfort and visual quality. In addition, these improvements have the potential to enrich daily experiences for people by providing more attractive and accessible routes and places that support leisure or socialising directly or indirectly - for example, in connection to nearby customer-oriented businesses.

Combination of Citizen Participatory Input and GIS data

Through a general understanding of GBI as a planning apporach (2.2), a notable strength of this study lies in the combination of citizen participation and GIS-based anlaysis to identify and propose possible GBI interventions. While GIS enabled mapping of hard infrastructure (e.g., road and cycling networks, land use including green coverage, and urban destinations), field observations together with conversations with stakeholders (i.e., local residents, city officials, and organization representatives), as well as an online citizen survey provided insight into the lived experience of individuals.

The involvement of residents, especially through the online survey, added a participatory dimension to the research by incorporating subjective perceptions that helped forming a general understanding of the core values and concerns of Kalundborg's residents when interacting with urban spaces. This dual approach offered a more nuanced understanding of where GBI interventions would be strategically meaningful, both spatially and socially. For example, while GIS identified objective spatial disconnections and functions, the citizen feedback revealed how such areas were experienced, highlighting psychological barriers, reduced comfort and safety. However, as explained in the methodology, the citizen participation in this study was limited, thus resulting in limited amount of insights. If more time and human resources were available, it may be possible to reach more citizens, increasing the engagement and quality of responses, and even enable involvement in further research. Regardless, this approach suggests that digital participation can increase the democracy in urban planning by giving voice to the ones with less direct power, especially when given prepared options or the opportunity to express opinion freely and confidentially. Citizen involvement is also a core part of the concept of Placemaking, where places are designed *with* and *for* the community, therefore the principles of this framework can help informing the urban planning decisions that are more directly aimed at considering human experiences and values of urban spaces like Kalundborg.

Comparative Insights from Literature and Case Studies

The findings from Kalundborg case reflect the broader trends and challenges observed in other urban studies and GBI research. Numerous literature sources and studies emphasize the importance of urban greening and design of public spaces that support social and spatial cohesion. The three case studies presented in chapter 2.2.4 offer insights into approaches for implementing GBI in varying urban contexts, each reflecting on a specific planning approach, spatial conditions, as well as the socio-political dynamics that can inform the feasibility of GBI in Kalundborg.

For example, while in the case of Peutelpark in Munich GBI is integrated in a broader urban development, the project exemplifies the benefits of such large-scale transformations by highlighting the value of combining motor mobility solutions with recreational interventions that free up surface space for human-centered use and reconnects separated urban areas, thus bridging diverse communities. Of course, Kalundborg lacks the scale and density of Munich, however, the principle of using GBI solutions

as connective and multifunctional assets is transferable. The Peutelpark case also highlights how community-led uses can activate common spaces, which is something that Kalundborg could replicate through, for example, courtyards and gardens near student housings and educational institutions. This is a strategic approach that has been also manifested in Jomfru Ane Park in Aalborg, where the proximity of a green recreational space by the harbour to university and commercial areas has increased the multifunctionality of the whole area, thus increasing its appeal. On the other hand, Sofia's City Forest initiative emphasizes the power of civic engagement, but also the importance of long-term municipal support. Kalundborg can learn from this case by ensuring strategic integration of GBI themes in its urban planning frameworks, thus giving power to bottom-up initiatives to enhance the collective identity and urban greening.

Methodological Reflections and Limitations

The methodological strengths in this study lie in the employed mixed-methods approach. It combined analysis and interpretation of official planning documents, offering insights into priorities and strategies. Whereas semi-structured interviews - with an experienced sustainable urban developer and a representative involved in Kalundborg's education-industry sector - formed an understanding on governance processes in the city, implementation barriers, as well as ambitions shared across different sectors.

However, several methodological limitations emerged throughout the study. One of the challenges was the limited diversity and amount of stakeholders consulted. Although the two formal interviews offered valuable insights to carry out the research entirely, a broader amount of perspectives would have added more depth to understanding Kalundborg's core issues and the current processes addressing them, especially within the selected focus area in the last analysis section. This constraint was largely due to the long response time between the researcher and the potential interviewee, and sometimes even resulting in no response. This, coupled with the underrepresentation of students and other residents, may have limited the study's ability to fully ground the proposed interventions. For instance, a consultation with a technical expert within sustainable infrastructure could have broadened the selection of GBI interventions proposed, as well as their effectiveness, multifunctionality, and role in the broader urban context.

Furthermore, the selected focus area for the last analysis section allowed interpretation that is specific only to this specific site, due to its role as a central hub within Kalundborg, thus a separate urban environment when compared to other areas. This means that application of proposed GBI interventions in the wider urban context most likely would not result in providing the same services. For example, incorporation of a secluded green courtyard in western residential zone of Kalundborg would not create the same urban vibrancy effect as if the courtyard was integrated in an active urban center. Therefore, this further stresses the importance of considering the surrounding context of GBI proposals.

Notably, while the study proposes qualitative improvements through possible GBI scenarios, the ability to quantify economic, environmental, and social benefits is challenging and complex. For example, assessing impacts like social well-being, improved mobility, and enhanced urban appeal would require long-term monitoring and tools that are beyond the scope of this research.

Implications for Further Research and Development

The limitations and findings in this study point towards several possible directions for further research and development in Kalundborg, as well as other small to medium sized cities with shared characteristics and goals. At the core of this research lies the question of how GBI can strategically minimize urban transformation, improve social wellbeing, and enhance student retention to leverage a city's role as both an education and business hub. While the study has provided conceptual insights into how small-scale place-based GBI interventions can contribute to these goals, further research is required to ensure the real effectiveness of these interventions.

Future research should explore the long-term effects of GBI interventions. Particularly, examining how the urban nature integration in existing and developing infrastructure translates to resident attraction, stronger social and spatial network, and students' intention to settle after graduation. This would require longitudinal studies with repeated observations, measurements, combination and advancement of tools, as well as detailed data collection and monitoring like student or employee intake and migration, for instance.

Moreover, future research should involve citizen participation to a greater extent, and consider the needs and experiences of residents whose urban goals are targeted towards. Although it usually means all people and groups, in the context of urban growth driven by education-industrial sector expansion it is essential to engage with both local and international students, newcomers, and other youth communities because their perception of urban appeal can differ from already established residents or decision makers. It could involve the use of the Placemaking principles to the extent where target resident groups may co-create interventions, thus really responding to their lived experiences.

Conclusion 7

This thesis has been set out to investigate how green-blue infrastructure (GBI) can support Kalundborg's transformation into a spatially cohesive, livable, and attractive city - particularly in the light of the city's evolving role as educational and industrial hub. The goal was to understand how GBI elements can be strategically planned and placed to offer benefits that align with the needs and values of the city's students, and residents alike.

Following a structured research design, the study has addresses three core questions. First, it revealed that Kalundborg"s urban development is shaped and driven by the continuous growth of its industries and their globally recognised sustainability practises like Kalundborg Symbiosis, This industrial expansion has resulted in increased workforce, housing, and transportation demand which the city is addressing through establishment of more educational opportunities and housing. The prioritization of these new developments in Kalundborg's urban planning has resulted in limited attention given to redevelopments of existing areas that lack cohesion and vibrancy.

Second, the research revealed in order to effectively connect and integrate key areas and destinations in Kalundborg, the existing infrastructure networks should be enhanced through improvements in comfort and accessibility for pedestrians and cyclists, reducing car dominance, and by integrating more nature-based solutions to form a cohesive green network. Based on resident input and GIS analysis, challenges such as disconnects in bike lanes, unsafe pedestrian zones, as well as car and parking dominated areas reduce the physical and mental wellbeing of residents.

Lastly, by examining student-focused movement corridors between two central key destinations and considering placemaking principles, the analysis shows that there are opportunities to integrate small-scale GBI interventions - such as planted buffer zones, sunlit or shaded seating, secluded recreational spaces, and greened traffic-calming elements - that can enhance the appeal of Kalundborg's central spaces through cohesive connections and increased distribution of green assets. Moreover, the routes, integrated with GBI, have an increased sociability potential when developed considering existing and future urban amenities like culture or customer-oriented spaces.

In conclusion, GBI can be a valuable and multifunctional urban planning tool that supports Kalundborg's long-term goals, including student retention and urban vibrancy. It can be achieved by focusing on strategic interventions that consider the needs and values of the local residents, therefore highlighting, that GBI does more than provides ecological values - it has the potential to actively shape attractive urban experiences that contribute to goals of social wellbeing and spatial cohesion.

A Street interviews with locals in Kalundborg

Note: Responses are based on field notes and memory, and have been reconstructed for clarity.

Interviewee	Response
Do you live in Kalundborg? Do you work and/or study here?	
Two students	Yes, we moved to study here.
Young man #1	Yes, I work as a scaffolder here.
Young man #2	Yes, I neither work nor study.
Working woman	No, I grew up here but now I live in Odense and commute to work at Novo here. Out of all my colleagues only one lives in Kalundborg. The rest come from Odense or Holbæk.
Senior woman	Yes, I moved from a more rural area nearby over a year ago.
What do you like (or dislike) about living in Kalundborg?	
Two students	I like that there is more nature than in bigger cities like Roskilde, where I can get overwhelmed.
Young man #1	The people are nice.
Young man #2	I don't know.
Working woman	Back when I was living here, I liked to hang out with my friends and take walks, go to the harbour to get coffee. It's very nice being a kid here, but later as a young person, it's quite boring. Not enough happening for young people, so the city is a bit dead. We usually joke that it only consists of hairdressers and pizza places. My parents still live here, and they don't like what the city itself has to offer, so they only appreciate the nature surrounding the city, the water and forests.
Senior woman	The nature, water and fresh air.
How do you spend your free time in Kalundborg?	
Two students	Go around with friends, sometimes up to Rosnæs where there is beautiful nature. There used to be a great building for all the young people where we used to go, socialize, and meet people, but then it closed and reopened somewhere else and it's not the same anymore.
Young man #1	Hanging out with friends at Havnepark and going to a pub.
Young man #2	Spend time with friends.

Interviewee	Response
Working woman	Sometimes together with my work team we have Friday beer down at Skøl, which is a microbrewery that's actually doing quite well. They are expanding quite a lot and that's also where young people go because it has those city vibes that we are all used to. We also do social gatherings here because it's easy to do right after work. In April we're going to paint. They have a ceramics painting place, which is quite the only thing that we're using the city for as a team.
Senior woman	Go on walks, sit by the harbour, play badminton.
How do you usually get around the city? (e.g., walk, bike, bus, train etc.)	
Two students	We don't own bikes, so we take the car or the bus – there are a lot of convenient routes for me and they run regularly.
Young man #1	By bus.
Young man #2	Walk.
Working woman	By car.
Senior woman	Walk or take the bus.
If you could change or improve anything in Kalundborg, what would it be?	
Two students	More social life, more places for young people to go, especially having cafes that could be open later in the evening. I understand that it is hard to get customers and sustain business for more hours, but otherwise the city is "dead".
Young man #1	Better opportunities for nightlife. There used to be a club but now it's only pubs where not a lot of people go.
Young man #2	I don't know.
Working woman	I need more cafes, right now there's only the one on the harbour. Also, some more events and culture stuff, like concerts and talks and stuff like that for me to be able to live here. I think that if there was more of this, more young people would be drawn in. Because as young people we just leave. I think it's going to help now that they have gotten a bit more education places here, also in the industrial area - you can get a diploma in biotechnology and so on. And there's also an architect school. So I think it's going to help that they get more possibilities for education, that will help and draw more young people here because they also promised a job in the industry afterwards.
Senior woman	I could talk for hours but right now nothing specific comes to mind.

B Follow-Up Informal Interview With a Student

Interviewee: a 23 year old student at Absalon University in Kalundborg who lives in the student housing unit Kalundborg Kollegiet. The aim of this interview was to understand typical student behaviour and interaction with urban spaces and their connections in Kalundborg.

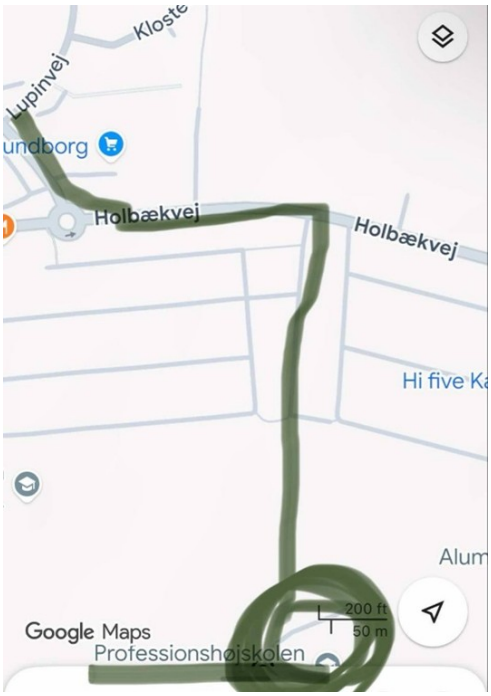
Note: this interview was carried out via casual text messaging, and much of the original conversational tone is preserved.

Question 1: **Where do students generally live? I know there's the kollegiet at Frederik Andersensvej 14B and another (mobilhouse) by the gymnasium, but are there any more? Maybe a lot of you also rent apartments/houses (and maybe there are particular neighbourhoods where this is common/preferred?)?**

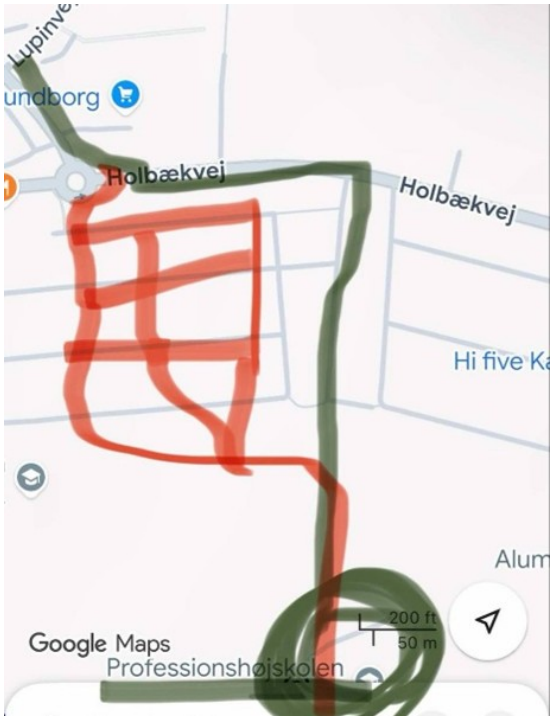
Answer: Frederik Andersensvej 14B or also 14C. Mobile houses, and people sign up with dab and fob to get housing as students but it takes a while. Like a year and 6 months if you're extremely lucky. Other than that i hear there are some "apartment houses" out in the center where students/novo nordisk workers rent out a room n they share a kitchen and bathroom. Kollegiet is also expensive and the rent increases every year, so people are trying to move out but there aren't available places that have reasonable rent. I don't know anywhere else aside from that. I also know someone who stayed with a family and rented out a room.

Question 2: **How do you and other students usually get to university and back? If it's by bike (or walking) then is the route convenient and comfortable or do you need to bike extra because or missing or inadequate infrastructure? I know you can't speak for everyone, but could you describe the route you take to/from university? (either walking, biking, bus etc)**

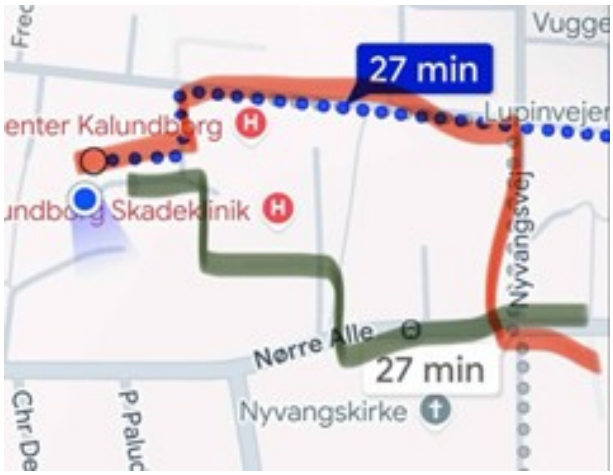
Answer: So from the left to the right. We use this shortcut by the sundheds og akut hospital instead of what google maps shows you on the blue dotted line. The road takes you down to the street where there is a bus stop as you can see. It's a maximum 5 mins walk, if you walk slow, from the kollegiet. Then we walk all the way down nørre alle where you'll find another straightforward road straight to Absalon.



Or when the weather starts getting nice and the flowers are blooming or there are apples on the trees , we can walk through this garden like maze (i think it's what the danes refer to as their summer houses) all lead to Absalon:



If you're biking, you use the red highlighted path, and meet again in nørre alle then use the same path to school like you would if you're walking:



A lot use this too it's like 50/50, it's more flat so some prefer it, and some think it's shorter. So I think it's a preference on which is easier to bike:

I walk most of the time except during winter when it's extremely cold and there's snow then I just get rides from friends or take the bus. A lot of students bike to work. While others have cars, or of course most walk as well just like me. Some have scooters - I also do actually, I used it a lot last 2 semesters, but I just forgot about it because I haven't used it in so long. But a lot more students are buying scooters now to use. When I just started, I was biking too but the hills were challenging... not really hills but kind of. But that's not something you can change. It's just me being lazy.

Question 3: **What are the top places you go to hang out with others (or alone) and what do you do there?**

Answer: "Skøl" mostly but that's because of work (hanging with people from work outside working hours). It's quite expensive to have more than 1 beer as a student so we don't typically go there otherwise. We sometimes go to "kontoret" and we the student council from Absalon sometimes collaborate with them to throw parties there like halloween parties. We throw most of our own parties at campus though and host Friday bars because our drinks are cheap. There is a club k52 but I think it

had been shut down now. Typically, people throw parties at the kollegiet. If they want to party they go out in Copenhagen!

We do (some of us who are active... which is not a lot) go to play padel together (if you search padel Kalundborg it will show up, there's only one), I hear some of my classmates joined the music band at the Kalundborg kommune music school, I think that's the name. There is also a ceramic painting place at the center people go to a lot (Penselstrøg Krea Café)

Question 4: **Do you or your friends ever wish there were more outdoor hangout spots around the city? I often hear about only the harbourfront and Rosnæs.**

Answer: Yes, harbour or Rosnæs. But more and more people are getting into running, and it's really beautiful out there. Lakes, forest, nice houses with a lot of green. We also have Gisseløre beach which is nice, I sometimes run by it and a lot more others do.

Question 5: **How is the general feeling or experience with the main city centre (Elmegade, Bredgade)? Is that an enjoyable area to be in or people generally just go through quickly in and out?**

Answer: The area where there are car dealerships people just go through when they want to grocery shop. But no one says they'll go there for a walk or anything else.

C Interview Transcript: Søren Stensgaard (Kalundborg Municipality)

Note: This transcript has been edited to remove small talk and filler words for clarity and improved readability.

Eliza Anna Berzina: (...) To start, what is your current role, how long have you been working in this field, and what do you find most motivating about your work?

Søren Stensgaard: My current role is Head of the Department of Sustainable Development in Kalundborg. It's a small department directly associated with the director of the area. My role is to supervise, inspire, and work with various topics within sustainable development, covering climate adaptation, climate change, public transportation, and attracting people to live in Kalundborg. I also assist students, provide feedback on housing developments, coordinate infrastructure projects, and work on business development and EU projects. It's not an exhaustive list, but those are some of the key areas.

Eliza Anna Berzina: And what's particularly motivating for you?

Søren Stensgaard: I've always been motivated by working with sustainable development. Right now, Kalundborg is an exciting place to work because of the many large projects happening. There are quite a few opportunities arising, but also many challenges. Agendas like good living, biodiversity, and water management are all key issues here.

Eliza Anna Berzina: It sounds like a lot of responsibilities.

Søren Stensgaard: It is, but it's fun.

Eliza Anna Berzina: Do you have any past professional experience that offers additional insight?

Søren Stensgaard: I started my career in the Municipality of Copenhagen. I'm an environmental planner by education from Roskilde. I've worked and lived for 15 years on a small island. For two years, I was the daily manager of the Samsø Energy Academy, it's an NGO working on energy democracy and public participation. I also worked as head of department on Samsø and was a director for technical planning and infrastructure. I have been in Kalundborg 4 years now.

Eliza Anna Berzina: I'd like to understand Kalundborg's urban development. How would you describe the city's structure and key functions?

Søren Stensgaard: Kalundborg is not a big city in the Danish context, it's a rather small city with around 15,000–16,000 residents. It's situated near the harbor and at the end of the railway, and has traditionally been and is a town living off industry. The city is stretched, squeezed between the fjord and hills, which defines its development. In recent years, a lot of attention has been given to Kalundborg due to Novo

Nordisk's expansion. This has accelerated developments taking place in Kalundborg. It's impossible to discuss Kalundborg today without mentioning this expansion.

Eliza Anna Berzina: Would you say that the industrial environment is what sets Kalundborg apart from other Danish cities?

Søren Stensgaard: Definitely. Without industrial workplaces, Kalundborg would be a very different city. We have been transitioning from Novo Nordisk being the biggest employer to expanding even more. Their 2021 investment of 60 billion DKK in production facilities - a very important asset, both as a workplace and as an income model for Kalundborg, creating an important impact on the city now and before.

Eliza Anna Berzina: How has industrial development shaped Kalundborg's planning priorities?

Søren Stensgaard: The current planning priorities are former planning priorities. The production facilities and residential areas have been separate, with little interconnection. We're spending just as much time planning and prioritizing new housing areas as we are on industry-related developments. The reason is that there's a major focus on getting production plans fulfilled, especially with the expansion aiming to double production capacity. That takes up a lot of focus in local planning, environmental permits, and other areas. But another important factor is the increasing number of people wanting to live in Kalundborg. In fact, that's actually more important for us than the industry itself because the industry is more of a means for us ensuring access to good living, well paid jobs and workplaces. We would like to work towards making Kalundborg a good and healthy place to live. Right now, we don't have enough housing to actually provide what people are looking for. We want to attract more people to live here and ensure they have a good quality of life and good affordable housing.

Eliza Anna Berzina: Are there strategies to attract young professionals and students?

Søren Stensgaard: Yes, we're working on expanding educational opportunities. Right now, six or seven higher education institutions are establishing themselves in Kalundborg. We aim to have 1,500 students, about 10% of the population, which will transform the city's culture and energy in a positive way. It has been a strategy for some years to attract and make it feasible for educations to take root in Kalundborg, creating a strong value chain—growing up, studying, working, and living in Kalundborg.

Eliza Anna Berzina: How has the city changed in recent years or even decades?

Søren Stensgaard: There has been significant housing expansion, with approximately 1,000 new dwellings planned, mainly on the city's outskirts. Industrial symbiosis and infrastructure developments have also shaped Kalundborg's evolution.

Eliza Anna Berzina: I read that efforts are being made to densify the city center. How is that progressing?

Søren Stensgaard: We are working on it, but progress is slow. Developers tend to prefer large-scale

projects outside the city center. The municipality is trying to relocate space-intensive businesses like car dealerships to free up central areas for housing, but it's a gradual process.

Eliza Anna Berzina: What are Kalundborg's approaches to sustainable infrastructure?

Søren Stensgaard: We're focusing on strengthening bicycle and pedestrian connections., getting more people to use bicycles. The challenge is that Kalundborg is a stretched-out city, so people often have to bike long distances, for example to get from the city center to the education areas. We're also working on improving railway connections. The train service isn't currently ideal in terms of frequency and speed, but we're collaborating with DSB to improve it. We want more people to use trains instead of cars, both for sustainability and to reduce the load on our roads, they are kind of congested right now at certain times of the day. We've also initiated the Green Transportation Hub Kalundborg, working with local companies to improve freight transport sustainability. We're exploring shared transport facilities, electric truck infrastructure, and efficient logistics to reduce empty truck trips. We just started this a few months ago, so we are not fairly advanced with it.

Eliza Anna Berzina: You mentioned green transportation. What's the approach there? Is it focused on vehicles, infrastructure, or something else?

Søren Stensgaard: It's a mix. We're working on shared transport facilities to make logistics more efficient. It's better to have fully loaded trucks than half-empty ones, even if they're electric. At the same time, we're looking into providing charging stations for electric trucks, particularly to support smaller transport companies. Large companies like Novo Nordisk already have their own green transport strategies, but smaller businesses need help transitioning.

Eliza Anna Berzina: You mentioned Kalundborg's layout as a challenge for mobility. Are there other obstacles besides geography?

Søren Stensgaard: Yes. One issue is that there's limited road capacity. If anything happens on those two main roads, we get traffic breakdowns. We're already seeing congestion during peak hours.

Eliza Anna Berzina: So the congestion is mostly at the entrances to the city?

Søren Stensgaard: Yes. The main problem is access to the city, especially around Novo Nordisk's facilities. The city center itself doesn't have serious congestion.

Eliza Anna Berzina: Regarding trains, do you have data on where commuters are coming from and going to?

Søren Stensgaard: We don't have the exact data ourselves, but DSB does. They did a study last fall and found significant potential to shift more people from cars to trains. One of the outcomes of that study is that DSB will commit to higher frequency train service in Kalundborg starting with their next schedule update. In return, we're working to increase ridership so the service remains financially viable for them.

Eliza Anna Berzina: Let's shift to green-blue infrastructure. How is Kalundborg integrating these elements into urban planning?

Søren Stensgaard: We're trying to do more now. Historically, it hasn't been a high priority, but we're revising our municipal plan, and water management is the number one topic. We're already experiencing flooding issues, and with the expansion of both residential and industrial areas, we're running out of space to handle excess water.

Eliza Anna Berzina: What strategies are you implementing?

Søren Stensgaard: One major change is requiring new developments to manage more rainwater on-site instead of relying on pipes. We're also pushing for more nature-based solutions to slow and store stormwater, preventing floods. At the same time, we're working on expanding biodiversity corridors. Kalundborg hasn't historically prioritized green space connectivity, but we're now trying to combine water management with nature restoration.

Eliza Anna Berzina: What are the main barriers to implementing these solutions?

Søren Stensgaard: Space and money. Retrofitting existing areas is difficult because there's very little extra space. We're working with Kalundborg Forsyning (the utility company) to find solutions, but large-scale implementation is expensive.

Eliza Anna Berzina: Is space the only limitation, or are there historical or aesthetic concerns?

Søren Stensgaard: Mainly space and money. There are historical sites, but they don't significantly impact these projects. A couple of years ago, there was a student project about flooding the medieval city's old moat, but that was more of a theoretical exercise. The real challenges are financing and space constraints.

Eliza Anna Berzina: Since industry plays such a major role in Kalundborg and generates significant revenue, and yet there's still a lack of funding for infrastructure improvements—why is that? Where is the budget primarily focused?

Søren Stensgaard: In the Municipality of Kalundborg, a large portion of the budget is allocated to schools and elder care. That's a traditional priority, and politicians tend to focus on ensuring good basic education and care for both children and the elderly. That's where most of the funding goes. That said, some funds have been allocated for climate adaptation projects. One of the initiatives we're working on in collaboration with local companies is the development of the Kærby Å wetlands. This area is key to climate adaptation because it affects large parts of Kalundborg. Together with the utility company and local businesses, we're exploring how to enhance the wetlands' capacity to retain water and protect the area from sea flooding. There's also potential co-funding from the companies, who are interested in contributing financially to this green-blue infrastructure project.

Eliza Anna Berzina: You mentioned the wetlands. Where exactly are they located? I understand they're

near the industrial area?

Søren Stensgaard: Yes, they're located in the eastern part of Kalundborg. The area is called Kærby Å, or Kærby Eng. If we talk about long-term priorities, the masterplan for these wetlands is central. It's not only about protecting the city's existing development but also about creating a nearby nature area. The utility company has presented the project briefly, but unfortunately, most of the material isn't available in English. This project is crucial. It will help us build resilience against climate change and strengthen biodiversity while managing excess water more effectively. Right now, the project is still in the administrative phase. The financing hasn't been finalized, so it will take a few years before implementation begins.

Eliza Anna Berzina: Now let's shift to the social aspects of urban life in Kalundborg. How does the city ensure a good quality of life for its residents?

Søren Stensgaard: Within physical planning and municipal development, the strategy has been to create a city center that is more livable and interconnected. One major investment has been the renewal of the harbor park, connecting the waterfront to the city's main thoroughfares. That project is more or less completed. Another big initiative is the planned cultural house by the harbor, which will include a library and other cultural functions.

Eliza Anna Berzina: Is the cultural house already built, or is it still in the planning phase?

Søren Stensgaard: It's planned, but funds have been allocated, so it's happening. The planning is ongoing now, and construction is expected to begin in 2026.

Eliza Anna Berzina: So it's not just an idea—it's actually moving forward.

Søren Stensgaard: Yes, it's on the table. It's part of the city center development plan. Another project is converting an old hardware store (XL Byg) into a four-story residential building. That's in development now. We're also working to move space-intensive businesses like car dealerships out of the city center to make room for more housing and pedestrian-friendly spaces.

Eliza Anna Berzina: How does the city currently encourage social interaction? Aside from the cultural house and harbor park, are there other initiatives?

Søren Stensgaard: Yes, we organize city events to bring people together in the center. Some educational institutions are also situated in the city center. The architecture school, for example, is located in the old railway station building. DSB (the national railway company) has actually allocated 20 million DKK to improve the quality of the station area, which will enhance the urban environment there.

Eliza Anna Berzina: That's interesting. How do you see green-blue infrastructure contributing to social life, beyond environmental benefits?

Søren Stensgaard: A greener city is simply a nicer place to be. Access to parks and natural spaces

improves well-being and makes the city more inviting. We already have some parks and green areas, but we're trying to improve connectivity between them. Projects like the wetlands initiative in eastern Kalundborg will also include small-scale transport connections - bicycle lanes and footpaths - to make it easier for people to use these areas recreationally.

Eliza Anna Berzina: Would you say there are socially active or inactive areas within the city? What contributes to that?

Søren Stensgaard: I don't have the full picture, but there are definitely areas that are more or less active. You'd probably need to talk to someone else for specifics.

Eliza Anna Berzina: I was in Kalundborg on Monday, walking around and observing. I noticed that in the city center, many spaces - like the square by the big church - are mostly used for parking rather than social activity.

Søren Stensgaard: Yes, that's true. Cars don't create a great urban environment. But I have to be honest, I don't think that's going to change drastically anytime soon.

Eliza Anna Berzina: I also saw that the church square was mentioned in the city's 2019 strategic master plan as a focal point. Has there been any progress on that?

Søren Stensgaard: Not much. A few small-scale projects, like the parking lot renovation I mentioned earlier, are part of that plan, but there haven't been major changes.

Eliza Anna Berzina: Why not?

Søren Stensgaard: Money. The municipal budget prioritizes things like schools and elderly care, which is understandable. The city council wants to implement the master plan, but they have other pressing issues to fund first. Another factor is that the municipality governs not just Kalundborg city, but the entire surrounding area. There are other towns that also need development, so resources are spread out.

Eliza Anna Berzina: Can green-blue infrastructure contribute to social benefits?

Søren Stensgaard: Absolutely. A greener city is more inviting and livable. Green spaces provide recreational opportunities and improve overall well-being. We are incorporating trees and stormwater management into urban projects to enhance public spaces.

Eliza Anna Berzina: Looking ahead, what do you see as the most significant uncertainties or risks that could affect Kalundborg's development?

Søren Stensgaard: Climate change. Kalundborg is a low-lying city at the bottom of a fjord. If we don't create the necessary solutions, we will have serious problems with flooding. That's one of the biggest risks. Another uncertainty is whether we can successfully attract and retain students. We've put a lot of effort into bringing more education to Kalundborg, but we still need to ensure that students actually want to live here. Many students would prefer to live in Copenhagen or Aarhus instead. So we need

to make Kalundborg attractive enough that they stay. Another challenge is housing. Right now, we're struggling with a housing shortage. We have around 4,000-5,000 temporary workers in Kalundborg due to the factory expansions. They're taking up most of the available and affordable housing - housing that students would normally move into. So even though we're increasing student enrollment, we don't have enough places for them to live. We're working on temporary student housing, but we still need a breakthrough on that.

Eliza Anna Berzina: So let's say you succeed in creating student housing and increasing educational opportunities. Would students still want to stay, or would they move to Aarhus or Odense and commute instead?

Søren Stensgaard: That's a valid concern. We're also working to create a better student environment - ensuring students have things to do outside of their studies. Without that, Kalundborg will just be a place where people study but don't live long-term. Fortunately, I have colleagues working on student life initiatives, but we still need to succeed in making it attractive. Otherwise, people will just leave.

Eliza Anna Berzina: I saw on the municipal website that the city's vision is to be "a good place to live, work, and study." Which of these do you think is the hardest to achieve?

Søren Stensgaard: If I'm being a bit cheeky, that slogan could apply to any city. Which city wouldn't want to be a good place to live, work, and study?

Eliza Anna Berzina: True.

Søren Stensgaard: The biggest challenge is making it a great place to live. Having jobs and educational institutions is important, but if Kalundborg isn't a desirable place to live, people won't stay. We do need companies providing jobs, and we do need students, but ultimately, people should want to stay and build a life here. That's the hardest part. (...)

D Interview Transcript: Camilla Mollerup Top (Knowledge Hub Zealand)

Note: This transcript has been edited to remove small talk and filler words for clarity and improved readability.

Eliza Anna Berzina: (...) So first, I would like to know what is your current role, how long you've been working in this field, and maybe what do you find most motivating about your work?

Camilla Mollerup Top: Well, I've been employed at Knowledge Hub Zealand since 2002. And in the beginning, my role was centred around different projects. The first project I was on was called Lighthouse Zealand, which was a project about cooperation with the educational institutions—so lifelong learning activities, case competition activities. There was also some analysis work regarding a new education coming to Kalundborg from the University of Copenhagen. We did some work regarding that in that project as well. So that was the first project I was involved in.

And then from there, my focus was very much centred around the partnership we call the Biotech City Alliance. And that's also now currently some of the things—the partnership—that I'm working very much towards. It's a partnership between different stakeholders in Kalundborg. So, the industry partners like Novo Nordisk, Novonesis, Kalundborg Utility, and also smaller companies and all the educational institutions, as well as the municipality. And organisations like ours that are kind of in-between organisations, so to speak, and also Kalundborg Symbiosis and different other stakeholders and partners involved in the development of Kalundborg—especially focused on the biotech area, of course.

Besides that, most of my work is actually about creating, maintaining, and developing networks and relations between all the partners in Kalundborg. So it's a very fluffy kind of task—but there's a lot of actual tasks in between, like very specific tasks as well. But it's very much about relation-building and networking.

And I also have a big role in the—don't know if you've heard about it—the Campus Kalundborg project. That's the main project going on in Kalundborg right now. It's a big project where we got the funding for creating a campus where six different educational institutions are together under the same roof, managing and developing their educations together. So it's not just each institution with their own education, but also a matter of combining these and collaborating between the educations and across different levels of education—from vocational educations to PhDs. Actually, we have the whole line of education in between—bachelor's and master's educations. And that's the main goal of the project. Within that project, we're going from 500 students—which is around the number we have right now—to 1,500 students within the next five years. We just started—we started in January—and we got the grant for about 300 million DKK to develop the collaborations and the network around this project. A

lot of that funding is going to be spent on high-quality equipment for the labs, and the other half is going toward developing these collaborations—between the educations and between education and the industry. That's the main point. That's where we differ from other campuses—that really close collaboration with the industry and also between the different educations. There's not a building yet, but that's part of the project. In 2028, there's supposed to be a new building where these six educational institutions will be teaching, doing projects and labs, and using common areas to network, work, and collaborate.

Eliza Anna Berzina: OK, that's interesting. I was also looking at the current campus and I was like—how could all these students fit in there?

Camilla Mollerup Top: Yeah, the current campus now is just actually—well, it's on the address "Campus Kalundborg"—that's one educational institution, called Absalon, where there are three educations. And then there's Helix Lab—it's right next to it—and Helix Lab is an educational centre where master's students can come and write their thesis in close collaboration with the industry. And that's what the physical campus is right now. We're also about to move into new temporary buildings within a month. These will be shared with Teknika, DTU, KU, and Absalon.

Eliza Anna Berzina: Now more generally, from your perspective, how would you describe the current identity or reputation of Kalundborg? For example, is it seen as an industrial hub, or still a small, overlooked town—or something else?

Camilla Mollerup Top: Yeah, actually... it's kind of difficult to answer, because that will be from my inside point of view. But with that in mind—I think, internally, within the big partnership we're a part of with all the stakeholders—I think we see Kalundborg as a very visionary city. And a visionary partnership.

We actually have this—well, we named our method or way of collaborating as The Kalundborg Model. And it's a way of thinking, a way of working and collaborating that I think defines how we see Kalundborg, and how the partnership sees Kalundborg. What it's about is: instead of looking at each other as competitors—like University of Copenhagen and DTU would normally see themselves—we see each other as partners.

In Kalundborg, we collaborate to create the best possible environment, the best possible collaborations with the industry, and the best possible place to study, to work, and to live. But... yeah, that's our internal vision. I think most people living in Kalundborg would also say there's a very big unused potential. Like, we could do so much more. But it's... I don't know if this is an expression in English, but in Danish you'd say "it's a big ship to turn." It's not easy to develop all of this and create all these new things, because there are so many stakeholders who need to be on the same page, and so many people who need to engage in the development of Kalundborg—not just as a place where education wants to be, where students want to be, and where people want to work—but also as a place where people live and grow up. It's also about people who live here getting involved in voluntary work around leisure, culture, sports—developing activities, places, and networks that people want to be part of.

Eliza Anna Berzina: Yeah, like community building. Would you say this development is important for the success of the local industries?

Camilla Mollerup Top: Yeah, I think community and culture—and the physical spaces, the actual places we can be—are really, really important for success. It should be a place where students and young people want to be. It should be a nice place, not just for working, but also for everything outside of work. That's key to the success of the whole project.

Eliza Anna Berzina: So what is Knowledge Hub Zealand, or the industries themselves—how are they involved in this development?

Camilla Mollerup Top: Knowledge Hub Zealand—we're kind of in between all the stakeholders: the industry, the educational institutions. We work on different projects. The Campus Kalundborg project is the biggest one. And I think our most important task is to facilitate those relationships and collaborations. We should figure out different models for collaboration and try to find effective ways of working together. Because what we do now with 500 students will very soon need to work for 1,500 students. If we want to succeed in that, we'll have to do things differently. There will be so many more students collaborating with the industry, and that takes a lot of resources from the companies as well. So we need to do it smarter than we do now. And that's our role: to facilitate the dialogue and collaboration and, together with all the partners, develop new models for how we can do that.

And the industries—they're into this because it's a really good way to brand themselves to new talents. It's a way to create a talent pipeline, so they can hire people once they graduate. They're involved as guest teachers in the programs, as project partners, and by developing real cases for students to work on. They also act as supervisors for thesis projects, bachelor projects, and internships. Right now, we're working on mapping out how many different types of collaborations exist between the industry and the educational institutions. For example, in one course we have a workshop that involves direct engagement with the industry, and in another, there's a specific 'project-in-practice' course that also relies on collaboration. We're trying to get an overview of these different types of collaborations—how the industry and education sectors work together.

Eliza Anna Berzina: What about the extent of the international community? I know a lot of the programs are in English, and people from outside Denmark are coming in-

Camilla Mollerup Top: Yeah, I don't know the exact numbers right now, but the goal is that one-third of the 1,500 students we expect in five years will be international. So it already is, and will be even more so in the future, a very international environment.

Eliza Anna Berzina: And why is that a goal?

Camilla Mollerup Top: It's because we need it. We don't have enough within Denmark, so we need to attract talent from outside Denmark in order to fill all the industry positions. But that's also a huge task, city-wise—not just in terms of education-industry collaboration. The city itself needs to adapt to

an international environment. Even small things, like restaurants having their menus in English—that's important. Not just for students, but also for the many international families living here. They need to feel at home. They need to feel like "there's a place for me here," and that they can read a menu and talk to people.

Eliza Anna Berzina: How do the locals feel about the influx of internationals? Do they feel threatened in terms of identity or culture?

Camilla Mollerup Top: No, actually, I don't think so. I might not be the best person to answer that—but my first thought is that people are pretty open-minded about it. Of course, for people who aren't used to speaking English, it can be a bit scary. And yes, there's still a lot of work to be done. But I think there is a fairly large international community already in Kalundborg. Again, I'm probably biased because I'm so involved in it all.

Eliza Anna Berzina: That's okay! Besides networking and community building—are there other specific needs or concerns, like housing, services, or transportation?

Camilla Mollerup Top: Yeah, housing is a big issue in Kalundborg. It's starting to be addressed, but it's a long process. One of the current issues is that so many people are here building the factories—construction workers—so they take up a lot of the available housing. That makes it hard to just come to Kalundborg and buy a house—there aren't many available right now. But when those construction projects are finished—not tomorrow or next year, but maybe in three, four, or five years—then we'll have much more housing available. Also, there's already construction of new housing underway, including student housing. The municipality is working on establishing student-focused housing close to where the new campus will be.

Eliza Anna Berzina: And what about transportation or services in terms of that?

Camilla Mollerup Top: There's a train from Copenhagen to Kalundborg. There are some problems with that because it's really full, and there are maybe one or two per hour. That is somehow problematic—you can't just go to the train; you need to plan, since there's maybe one, maybe two every hour.

Eliza Anna Berzina: Yeah, that is frustrating.

Camilla Mollerup Top: It is. It can be very frustrating if you are relying on that train. But also, going by car is challenging right now because so many people are going into the Novo site every day. That makes it difficult to have a smooth commute to Kalundborg if you live outside the area. The highway is being built—the last section toward Kalundborg is currently in progress. I think it's supposed to be finished by 2028. That will help with these problems. As for the housing problems, they're also being addressed. The municipality is very focused on these infrastructure-related issues. They are being handled, solutions are being developed.

Eliza Anna Berzina: That actually touches upon the next section I want to ask about. Do the employees

working at Knowledge Hub Zealand or the industries actually live in the city, or do they commute from other areas? What's the ratio?

Camilla Mollerup Top: Both. A lot of people commute every day.

Eliza Anna Berzina: Would you say it's most of them?

Camilla Mollerup Top: I think most commute, but more and more are moving to Kalundborg. Then we see the housing problem—it's not easy to get a house because so many construction workers are renting. But it's also something that will solve itself when the factories are finished. It's a balance between securing enough housing but not building too much, because when all the construction workers leave, there could be too many empty houses, which would lower housing prices.

Eliza Anna Berzina: For those who commute, do you know the main reasons for them living outside of Kalundborg?

Camilla Mollerup Top: I think a lot of people live in Copenhagen or around Copenhagen. If you're used to that area, Kalundborg feels very far away—distant from the city, and not "cool" enough. Kalundborg is still a very small town. It's not for everyone. It's not a big city, not the capital. There's not enough culture, not enough restaurants or nice places to go, but that's a process - it will never be Copenhagen... But we're in a process of creating a very nice place that could also be attractive for people used to living in Copenhagen or the surrounding areas.

Eliza Anna Berzina: That's what we hope for here. For those that do reside in Kalundborg-like you, for example-what do you value most in the city?

Camilla Mollerup Top: I can speak for myself only, but I really value the community and the closeness of people. I really like going downtown and meeting people I know. That doesn't happen in Copenhagen in the same way. I like that you meet people you work with, people you see in the grocery store, at gymnastics class with your kids. I like the community in my everyday life.

Eliza Anna Berzina: Apart from the community, more in terms of the physical aspects?

Camilla Mollerup Top: I like that we're so close to nature. The water is right down here. There's a small forest just in the back. I actually also like that I'm not tempted- I don't feel the FOMO every day like I would in Copenhagen. There, every day, you see places to go, events to attend—things you won't be able to do because you can't do it all. I like that here, there are options, but not all the time and not too many. We have what we have. But I still miss something—there could be more culture, more concerts, talks, events, creativity. But it's coming, slowly.

Eliza Anna Berzina: And how do you get to work? And how do you move around in your free time? By car, bike...?

Camilla Mollerup Top: Both car and bike—and walking.

Eliza Anna Berzina: Have you noticed any areas where movement feels unsafe or unpleasant?

Camilla Mollerup Top: No, I think it's a really safe place to be. It feels safe. I've never felt unsafe in Kalundborg.

Eliza Anna Berzina: Is there, for example, heavy traffic, disconnected bike lanes, smells...?

Camilla Mollerup Top: Well, the bike lanes are very poor. They need to be updated. There are places that are not optimized for biking. But that's not something I'm very concerned about.

Eliza Anna Berzina: You mentioned meeting people spontaneously. For example, do you have team outings in the city? Where do you usually spend those gatherings—cafés, nature spots?

Camilla Mollerup Top: It could be cafés, restaurants, the sports hall, or the harbor front. There's a café and a place recently renovated where you can swim, and where the boats are. Recently, a new organization was established at the harbor with kayaking. There's also opportunities for beach volleyball. There's a playground for kids—that's a very nice place to meet in the summer. I have two little kids, so it's often with them. There are different playgrounds. And again, there aren't ten different options, but maybe three. That makes it possible to meet people you already know—because everyone is at one of those three places.

Eliza Anna Berzina: And moving on to more of the green and blue aspect. How is that aspect important in your daily life or your colleagues?

Camilla Mollerup Top: Can you elaborate on that—green or blue?

Eliza Anna Berzina: Yeah. So for example, green or blue is anything you see from Mother Nature: the greenery, for example parks, tree-lined streets or waterfront. How is that important in your daily life? For example, we see sometimes cities or neighbourhoods that are just houses, streets, concrete—all of that.

Camilla Mollerup Top: It's something that really attracts me. I mean, like going to the water mostly during the summertime or a little bit warmer time. But going to the beach to just throw rocks in the water, or having a quick swim, or just go for a walk. Being close to the water is something that I really, really enjoy. So just walking outside the house, in the little wood or forest in the backyard—that's also very nice. I really like being surrounded by blue and green, yeah.

Eliza Anna Berzina: And would you say, for example, when you commute to work or any place else, that you would pick a route that is with these nature elements more than just the quickest and straightest way?

Camilla Mollerup Top: I just go the quickest and straightest way - it's busy, busy life with the kids.

Eliza Anna Berzina: And do you have near your offices or the facilities also some specific green or blue spaces that are maybe appreciated by your colleagues?

Camilla Mollerup Top: No, actually not. But our office right now is very close to the campus. And with the new campus also supposed to be built...There's not much yet, but there are plans to make a very nice outside—the areas around the campus should be attracting and should be a place where you want to hang out and want to spend your time. But there's not much yet. We have plans on establishing nice areas around the campus.

Eliza Anna Berzina: Maybe sometimes you have the urge during lunch break to go outside and then eat there. Are there options for that?

Camilla Mollerup Top: No, not really. Well, we could go out to sit on a bench and a table, but not something that is very nice yet. But it will. It will be there.

Eliza Anna Berzina: Are there specific areas that are often mentioned positively or negatively? For example, if I were a tourist and I asked you where to go—where should I go today?

Camilla Mollerup Top: Rosnæs.

Eliza Anna Berzina: Rosnæs? The peninsula?

Camilla Mollerup Top: Yep. That is very, very nice nature area. It's a bit out of the city—you need to go by bike or by car—but it's beautiful out there.

Eliza Anna Berzina: And what about inside the city?

Camilla Mollerup Top: Hmm, well, there's Møllebakken. That's above the city, and when you go up there, you have the view of the whole city. And that's a very nice and big green area. And the harbour front is also a very nice place. And Gisseløre—that's the beachfront. It's not like a pretty nice beach. There are many stones. But there's a place where you can walk out and jump in the water—what's it called? A bridge. A bridge out in the water. I would say that's the main one. And then the areas around Kalundborg also have nice beaches. But Rosnæs is always the one thing that people mention when it comes to great nature in Kalundborg.

Eliza Anna Berzina: And I'm also curious about how different groups might see the city in different ways. So do you think the priorities are completely different for, let's say, employees, students, and newcomers when it comes to appreciating these nature spaces?

Camilla Mollerup Top: I don't think that the differences are defined by if you're a student, or a worker, or a newcomer. Of course, there will be different people looking differently on enjoying being in nature. And maybe that's also one of the things that attracts people to here—maybe especially those from Denmark.

I'm not sure that the nature is something that—if you are international in Denmark—that's why you choose Kalundborg. I think you choose Kalundborg because it's a place where biotech is very important and where you can really dig into your field of expertise - more than its nature. I think the nature is a very nice add-on for when you come here to Denmark as an international student or worker. But I think it

could be. I mean, if you're from another place—Copenhagen, for instance—I think for some, the nature in Kalundborg or around Kalundborg would be a driver for coming here.

Eliza Anna Berzina: Of course, the city is a place for, let's say, survival—you know, the basic essentials. But there's also the quality of life and mental well-being.

Camilla Mollerup Top: Yeah, or course.

Eliza Anna Berzina: But do you think these nature elements could also support smaller local businesses? For example, by encouraging people to stay, get a coffee or a bagel, and then explore more of the surroundings?

Camilla Mollerup Top: Can you repeat that?

Eliza Anna Berzina: Yeah. So do you think that these green-blue infrastructure elements could support local businesses in the sense that, for example—what I have noticed in Aarhus—by the channel in the city centre, people go to the local café, get coffee and then sit by the channel.

Camilla Mollerup Top: Yeah, I think it could be. But I think, as I mentioned before, there's not too many places to go. And one of the biggest places is at the harbour front where there's a playground, where there's beach volley, where there's a place where you can swim in the harbour. And that together, I think—that's a place where many people go to have a cup of coffee, or a cake, or an ice cream, and then you go and sit by the harbour, or at the playground watching your kids play. But if it's because there's—I mean, would people go there if it wasn't at the harbour front? I don't know. It's difficult to say.

Eliza Anna Berzina: What if there wasn't a café?

Camilla Mollerup Top: Yeah, if there wasn't a café...I think people would go anyway. And maybe they would bring a cup of coffee from another place. I don't know. That's—I think that's difficult to answer.

Eliza Anna Berzina: Yeah. That's more like a scenario.

Camilla Mollerup Top: Yeah.

Eliza Anna Berzina: So for now, that is all the questions I have prepared for you. Maybe you have anything else you would like to add or you feel often gets overlooked, either in relation to these topics or something else?

Camilla Mollerup Top: Hmm. Well, I don't know if I have something to add. I don't think so. But we have another education here in Kalundborg, which is architecture, and I think maybe some of those students could be interesting for you to talk to because they view the city in another perspective and see options and opportunities from another angle that I might not. I don't know if that would be interesting for you, or if they are too biased and too involved, but...

Eliza Anna Berzina: Yeah. It's actually been very hard to reach out to these kinds of students.

Camilla Mollerup Top: I could try to put you in contact with the daily leader of the architect school, and maybe she could find someone who could elaborate a little bit on your questions. Maybe. I could give it a go.

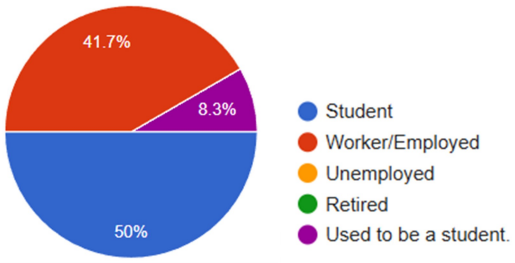
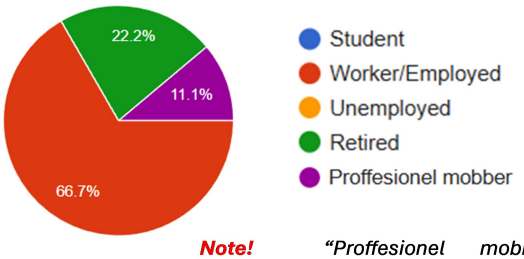
Eliza Anna Berzina: I appreciate that. All right—and your insights have been incredibly valuable. Thank you for that. I really appreciate your help in this and the depth of the information you've shared. I actually didn't expect that - that's why we went over 30 minutes. Thanks again for your help.

Camilla Mollerup Top: No problem, no problem. Happy to help.

E Online Survey Results

The following table presents the survey's four main sections, including the questions within each section (highlighted in a consistent color tone), and a summary of the responses presented either as text or charts (automatically generated by Google Forms).

The table is organized into two main columns based on the initial language preference selected by respondents: English and Danish. The survey then followed a conditional logic that separated the response summaries by language. As a result, this setup provides a side-by-side comparison between the two groups: English respondents that are mostly students and early-career professionals in their 20s, while the Danish respondents are generally older, employed individuals.

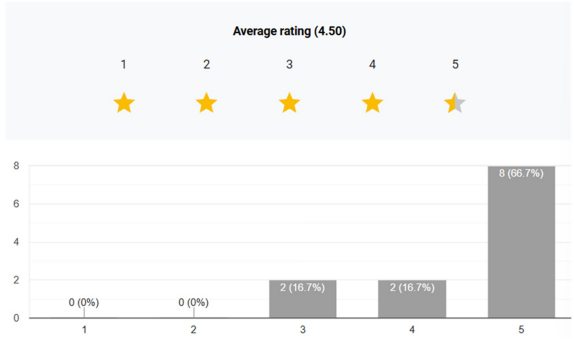
<table>
<tr><th colspan="2">Section 1: Respondent overview and key values</th></tr>
<tr><td>Preferred language:
ENGLISH</td><td>Preferred language:
DANISH</td></tr>
<tr><td>12 respondents (57.1%)</td><td>9 respondents (42.9%)</td></tr>
<tr><td>Ages:
20; 21; 22; 22; 22; 23; 23; 24; 25; 26; 28; 35</td><td>Ages:
30; 34; 42; 43; 44; 50; 62; 69; 75</td></tr>
<tr><td colspan="2">Do you currently live in Kalundborg (the city)?</td></tr>
<tr><td>11 = Yes
1 = No (Copenhagen)</td><td>8 = Yes
1 = No (Gentofte)</td></tr>
<tr><td colspan="2">What is your main occupation in Kalundborg (the city)?</td></tr>
<tr><td> 
</td><td> 

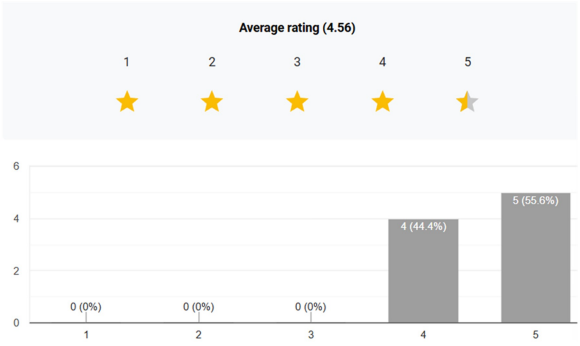
Note! "Proffesionel mobber" translates to "professional bully" which is not a real occupation. It most likely is a joke; however, such humour may have been used to remain anonymous. Therefore, the rest of their responses are still included in the data.</td></tr>
<tr><td>6 students at Absalon University College
4 employees at Novo Nordisk
1 employee at a car dealership</td><td>6 employees:
Construction management, APM (likely APM Terminals), System architect, Electrician, Novo Nordisk, Kalundborg refinery</td></tr>
</table>

What do you value most in any city you live in?

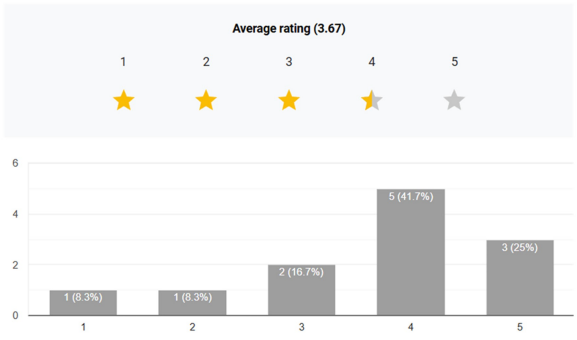
Please rate the importance of each aspect from 1 to 5, where:
1 = Not important at all
5 = Very important

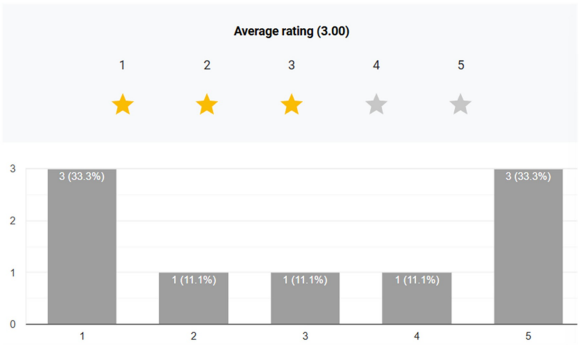
Opportunities for work or study



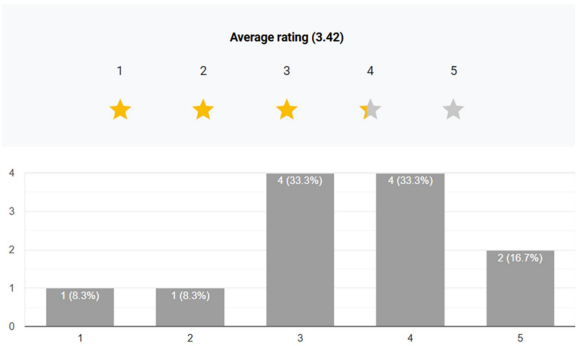


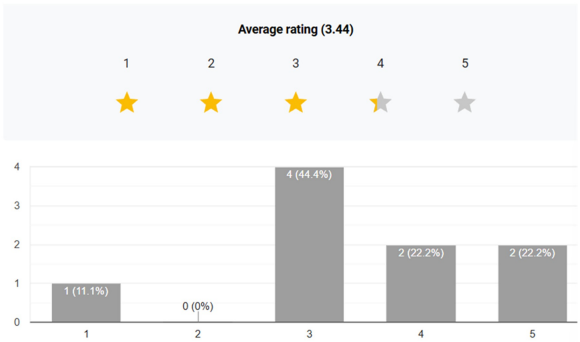
Good public transportation



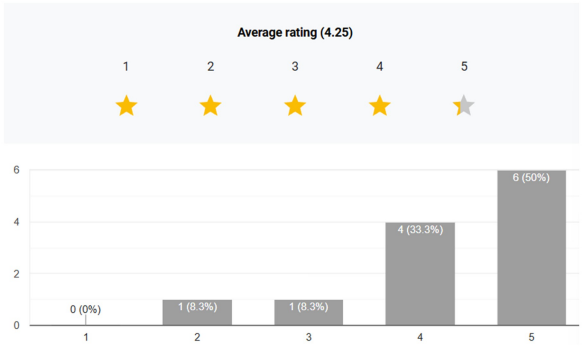


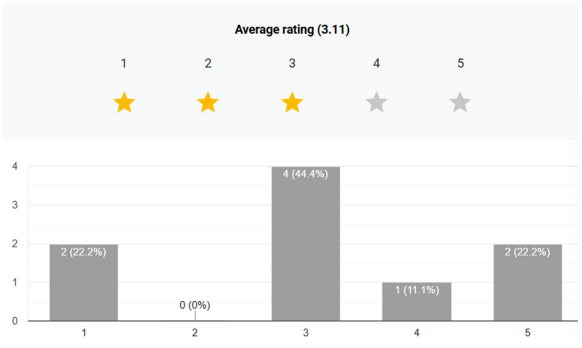
Lively community and social life



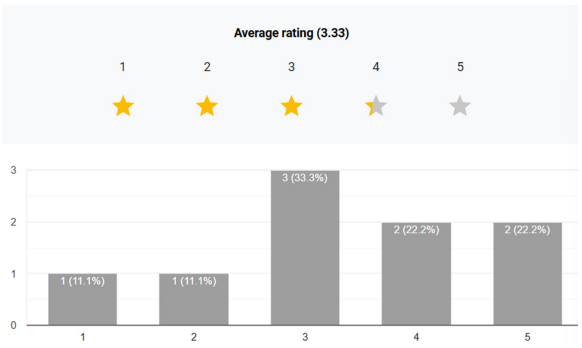


Walkability and bike-friendliness

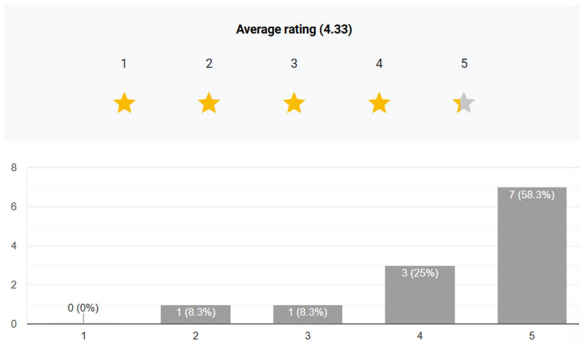


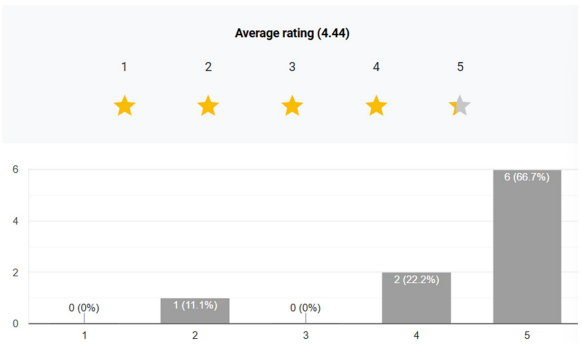


Vibrant city centre / cafes / shops / nightlife

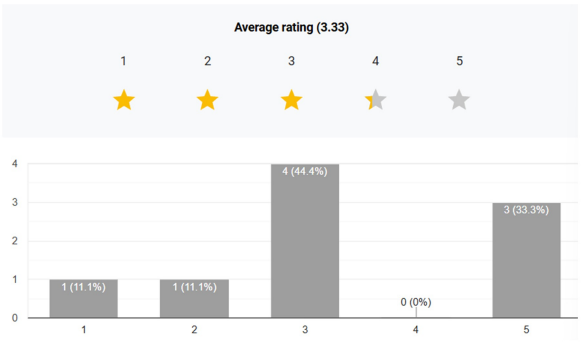


Access to nature

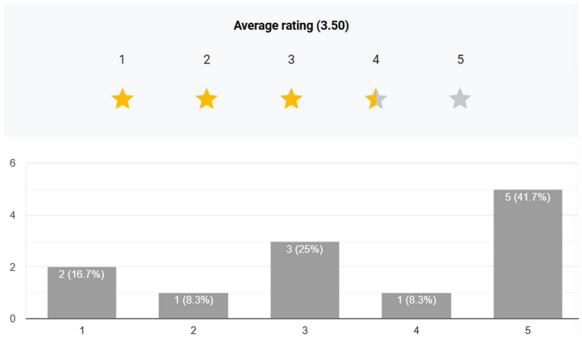


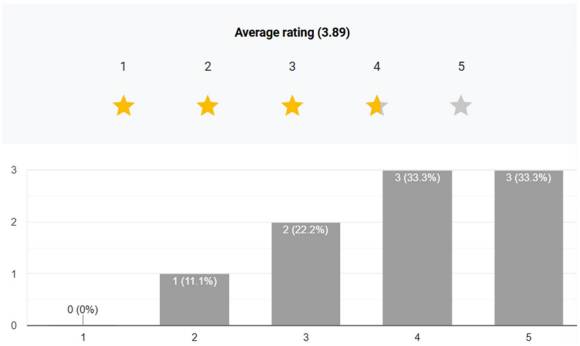


Cultural life and events

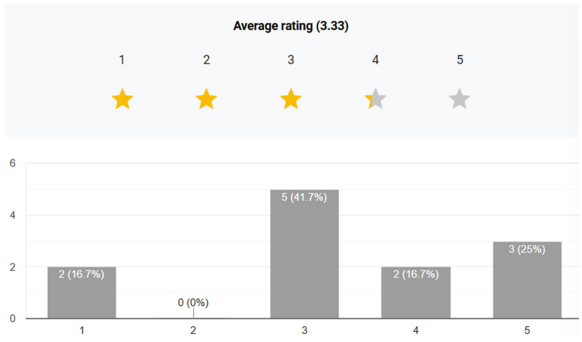


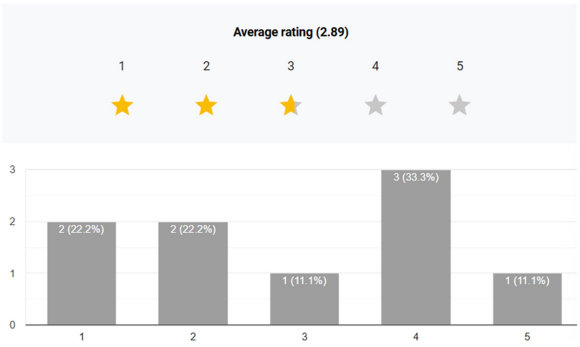
Affordable housing





Overall aesthetic and beauty





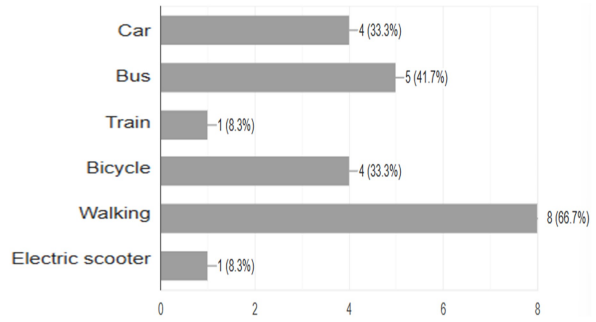
Ranking of values

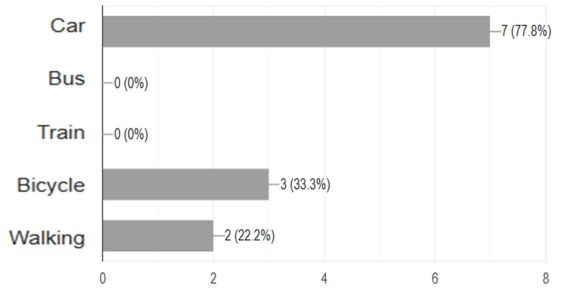
1. Opportunities for work or study (4.50)
2. Access to nature (4.33)
3. Walkability and bike-friendliness (4.25)
4. Good public transportation (3.67)
5. Vibrant city centre / cafes / shops / nightlife (3.50)
6. Affordable housing (3.50)
7. Lively community and social life (3.42)
8. Overall aesthetic and beauty (3.33)
9. Cultural life and events (3.08)

1. Opportunities for work or study (4.56)
2. Access to nature (4.44)
3. Affordable housing (3.89)
4. Lively community and social life (3.44)
5. Vibrant city centre / cafes / shops / nightlife (3.33)
6. Cultural life and events (3.33)
7. Walkability and bike-friendliness (3.11)
8. Good public transportation (3.00)
9. Overall aesthetic and beauty (2.89)

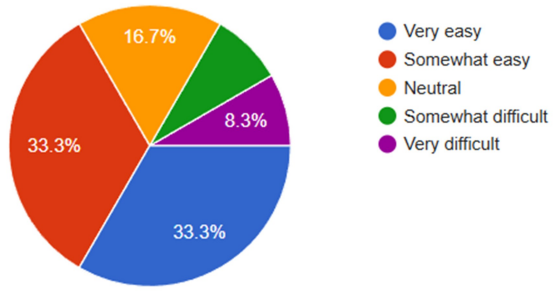
Section 2: Mobility and movement patterns

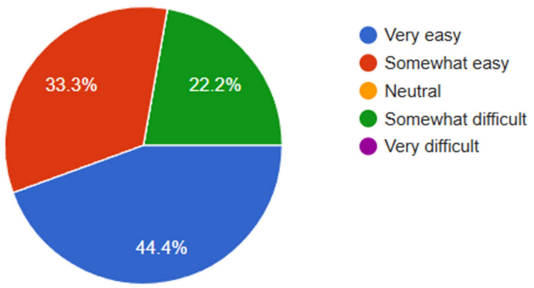
What are your main ways of getting around Kalundborg?





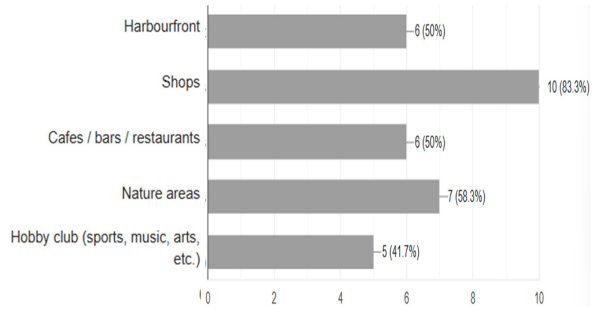
How easy is it for you to get around Kalundborg?

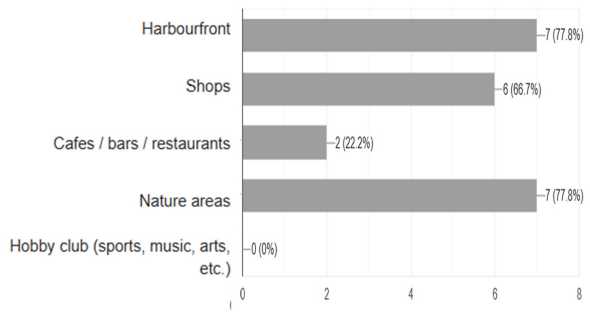




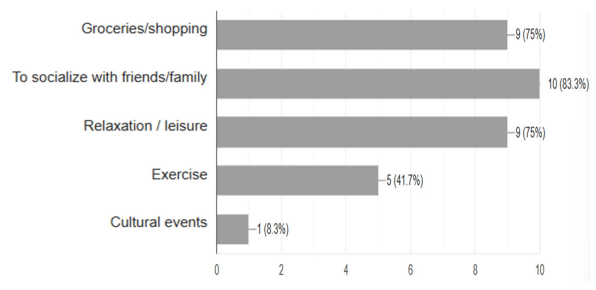
What are the places you go to most often (apart from your workplace/school)?

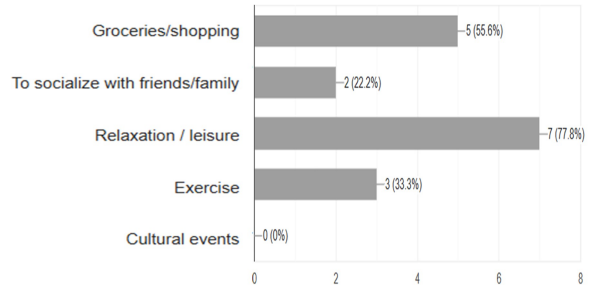
(Please select up to 3 options only)





Why do you typically go to these places?





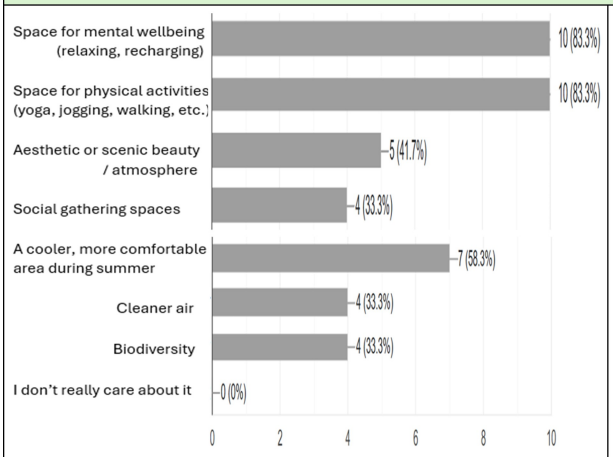
Are there specific routes or areas where your movement or presence feels unpleasant, unattractive, unsafe, or confusing? *(for example, heavy traffic, noise, parking lots, steep terrain, disconnected or lack of sidewalks or bike lanes, isolated or empty areas, unpleasant smells, etc.)*	
The unpleasant smells are a problem across the entire city, but especially close to Novo. It feels unsafe to walk up from rema1000 on Klosterparkvej after it gets dark.	*Elmegade er en død gade. Meget central men uden beboelse. Bilforhandlere, foderforretning og ruin af bowlingbane. Mere beboelse og mere grønt ønskes.* *Translation:* Elmegade is a dead street. Very central but without any residences. Car dealerships, an animal feed store, and ruins of bowling alley. More housing and more greenery are desired.
The main road next to the industries can have quite a lot of traffic.	*Cykelstier* *Translation:* Bicycle paths
I don’t know the street name, however the way towards Biltema, Jysk, Haarald Nyborg it is quite unsafe for people without cars. Drivers tend to be quite aggressive and it s quite unsettling.	*Fisk* *Translation:* Fish
Many places the signage for bikes is not existing even when the municipality says it is allowed to bike. E.g. in small part of the walking street towards the highschool it should be allowed but it doesn't say anywhere. Or in the train crossing at ok gas station it is allowed to go straight on a red light going towards the city by bike but there is no sign. Also many places cars are prioritized over bike and walking which makes the city louder and more unsafe. Especially for children going to school.	
No, but sometimes due to Novo Nordisk there is very specific smell in the city	
As you move north-west from the city centre, the walkability drastically decreases. In the suburb area moving into Raklev, car is king, and most roads either have no sidewalks or have disconnected sections of sidewalk.	
the big stairs in the main street next to the mexican restaurant at night are scary bc they only have lights until half way	
Anywhere remotely outside of the citys main street?	
Kalundborg after work and specially at night is very isolated / empty. It’s so empty that I don’t like walking back home after it gets dark	

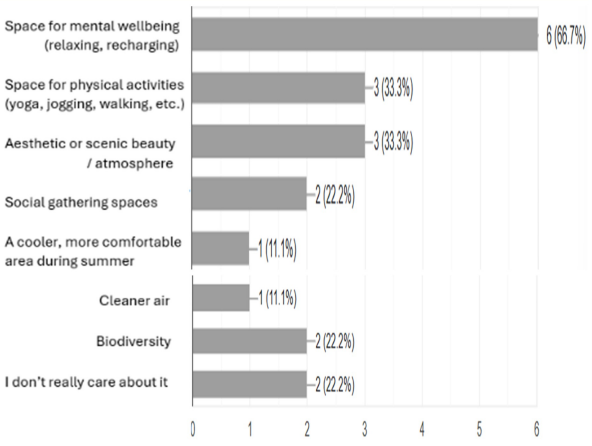
Section 3: Green and blue spaces in Kalundborg

Green = trees, parks, grass areas, gardens etc.
Blue = water, such as the fjord, ponds, streams, canals etc.

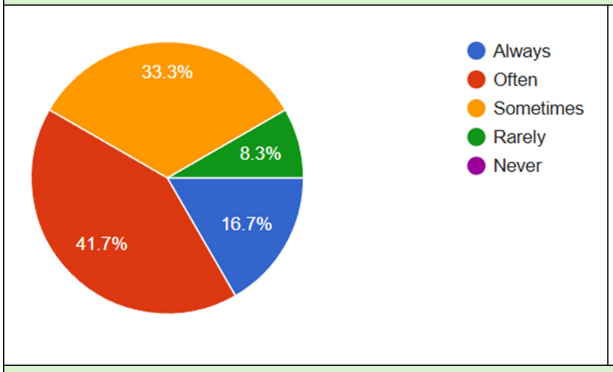
What do you personally value most about greenery and water in cities?

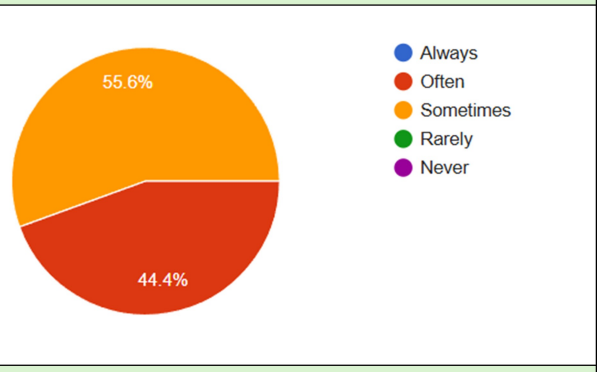
(Please select up to 3 options only)



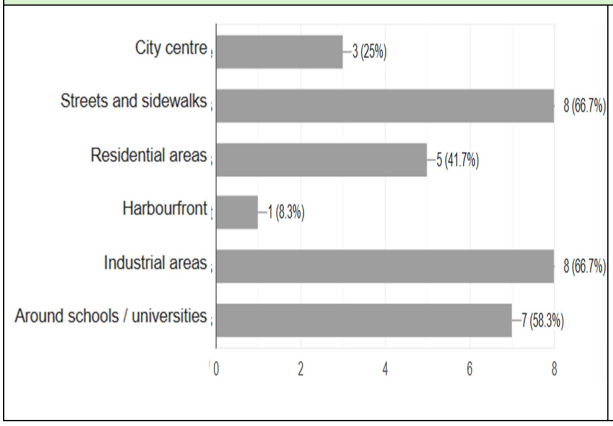


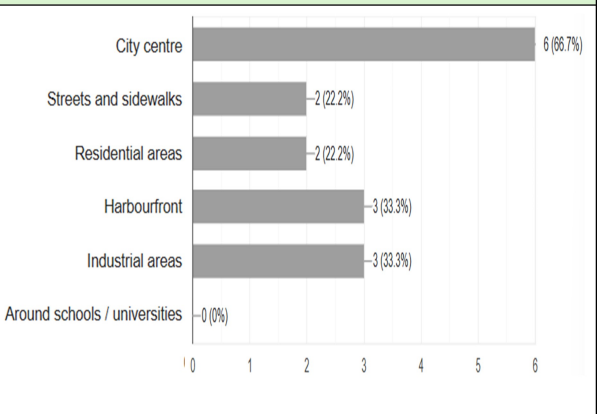
How often would you choose a route with green/blue elements *(e.g., through tree-lined streets, parks, along the fjord)* instead of a quicker or shorter alternative route?



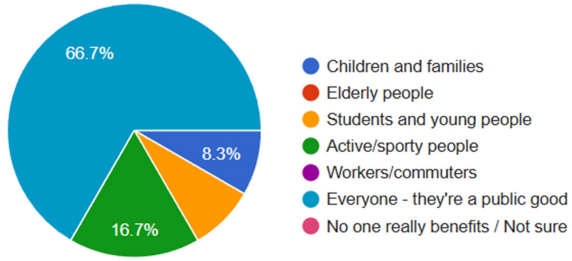


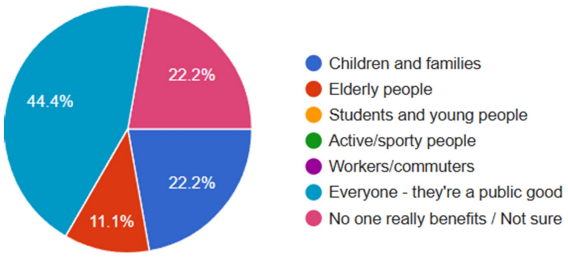
In your ideal Kalundborg, where would you like to see more greenery or water elements integrated or improved?



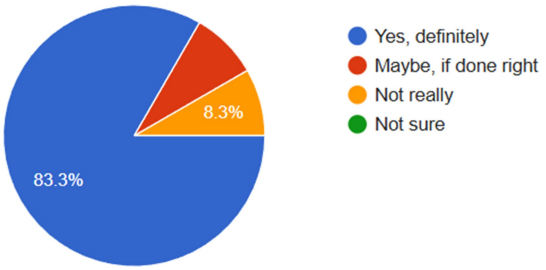


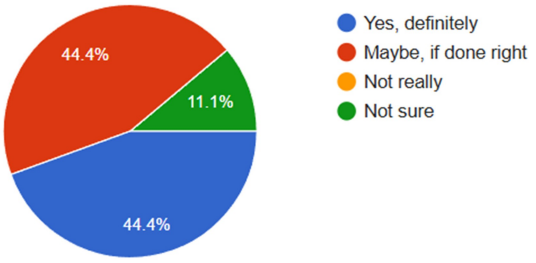
Who do you think benefits most from green/blue areas in Kalundborg?



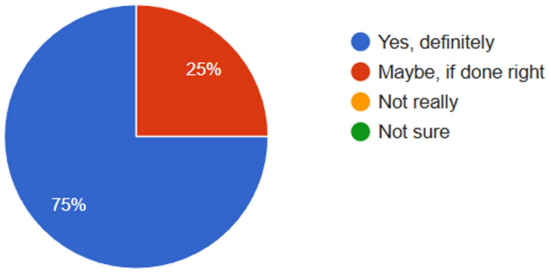


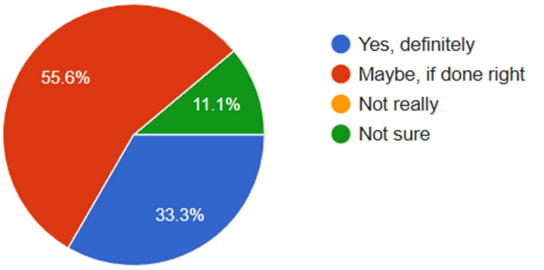
Do you think green/blue elements can make Kalundborg more attractive for future students and workers?





In your opinion, can green/blue spaces support local urban life and businesses by encouraging people to stay longer, meet others, and visiting nearby places like cafes or shops?





Section 4: Final comments	
Do you have any additional thoughts or ideas about movement, infrastructure, or green and blue areas in Kalundborg that you'd like to share?	
Green and blue areas naturally create points of interest. They're something you would base your route around and spaces for people to interact with nature and each other. Kalundborg, broadly speaking, has a good amount of these areas: there's two major forest-parks, as well as many patches of greenery (even near city centre), in addition to the numerous ponds and, of course, the harbour. The problem is more with the convenience with which these spaces are accessible. To get to the forest-parks, one will need to trudge through a good deal of residential areas with subpar walking/biking infrastructure, and there's usually no reason to go to these places unless you want to go to a forest. There's green spaces close to town centre but most are "out of the way", meaning usually you would have to deliberately choose to go through the green area, it's almost never the optimal path. If you want to see the sea, there's at least some eateries and shops around, but that covers only a small path of shore, so most people only really go to one spot in the whole shoreline. The green and blue spaces are there, and it's not too difficult to get to them, but reaching them is almost always a choice one has to make intentionally. It would be great to see a direction of infrastructure where people would go through green and blue spaces as part of their day, simply because it's the fastest way to go.	*Børnefri områder* *Translation:* Child-free areas
Better public transport, cleaner streets, more shops, and more houses and apartments.	

E.1 Conclusions and Reflections

The rough split into two distinct demographics – students/young professionals versus older/experienced individuals – has provided valuable insights into how people in Kalundborg experience their daily urban lives. It revealed differences, highlighted problems, key values and preferences, and showed what role GBI plays in their lives, as well as their thoughts on future developments. Opportunities for work/studies and access to nature have were strongly prioritised as general key urban values for both groups. However, differences emerged in secondary priorities. While younger respondents emphasized walkability, bike-friendliness, and public transportation, older respondents placed more value on affordable housing and a lively social life. These differences may reflect various factors, such as car (in)dependency, family structure, career status, or even generational upbringing and lifestyle. Both groups also appreciated a vibrant city centre and its amenities, implying a shared appreciation for a lively urban atmosphere with social, cultural, and economic vitality.

Regarding mobility and movement patterns, the younger respondent group reported using more varied transportation options compared to the older group where none of the respondents reported using public transport, instead relying primarily on cars, followed by cycling and walking. These differences may be linked to income, and thus the ability to afford a personal vehicle, or linked to convenience and responsibilities – for example, the need to drive children to school. The main leisure destinations among all respondents include Kalundborg's harbourfront, nature areas, and shops, whereas food and drink venues and hobby clubs are more frequently visited by the younger respondent group. While these places typically are visited to relax, exercise, or buy groceries, younger respondents also revealed that they would most often socialize with others in these settings. This may suggest that the younger population tends to have a more active lifestyle in Kalundborg, where socializing is a central part of these activities.

Although most respondents reported being able to move around Kalundborg with relative ease, some specific concerns, challenges, and desires were revealed (see figure 5.7 in main report). General issues include unpleasant smells across the city due to Novo Nordisk, frequent prioritization of cars over cyclists and pedestrians, which creates a loud and unsafe environment for more vulnerable people like children, as well as overall reflections on the city feeling isolated and empty, which creates an unsettling movement experience – especially after it gets dark.

Regarding green and blue spaces, most survey respondents value them as places to relax and recharge, enhancing mental wellbeing. Younger respondents also highly value them for physical activity and as comfortable spaces in warm weather. Some respondents also value the aesthetic and scenery qualities of green and blue spaces, while only a few respondents value the environmental benefits of cleaner air and biodiversity. Moreover, most respondents revealed that they would sometimes or often choose a route with green and blue elements over a shorter or faster alternative. This suggests that people are generally drawn to – or at least intrigued by – green and blue design to the extent that they would choose to place themselves in these settings instead of more "hard and bland" areas (e.g., dominated

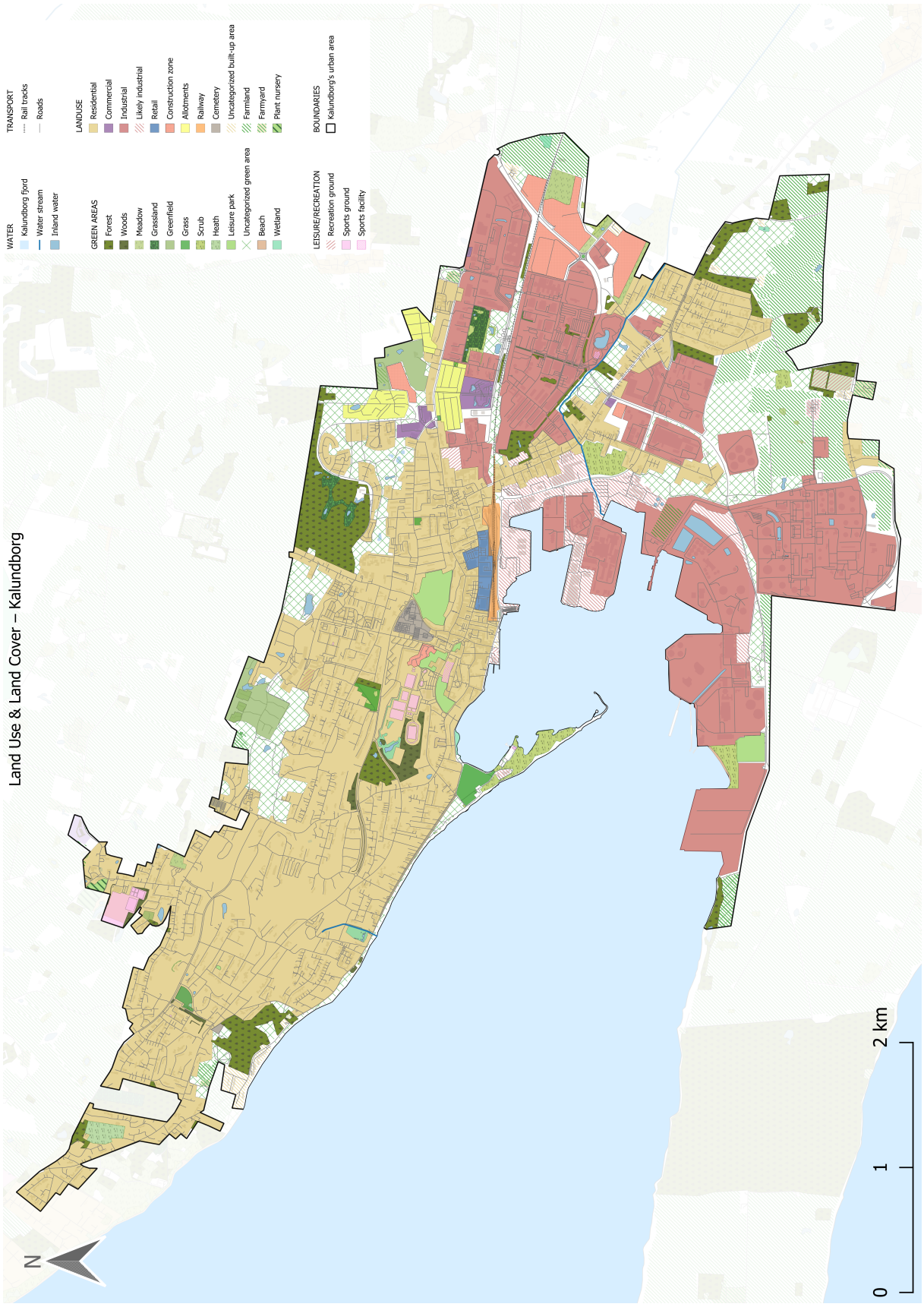
by concrete and asphalt), even if those are more direct and convenient.

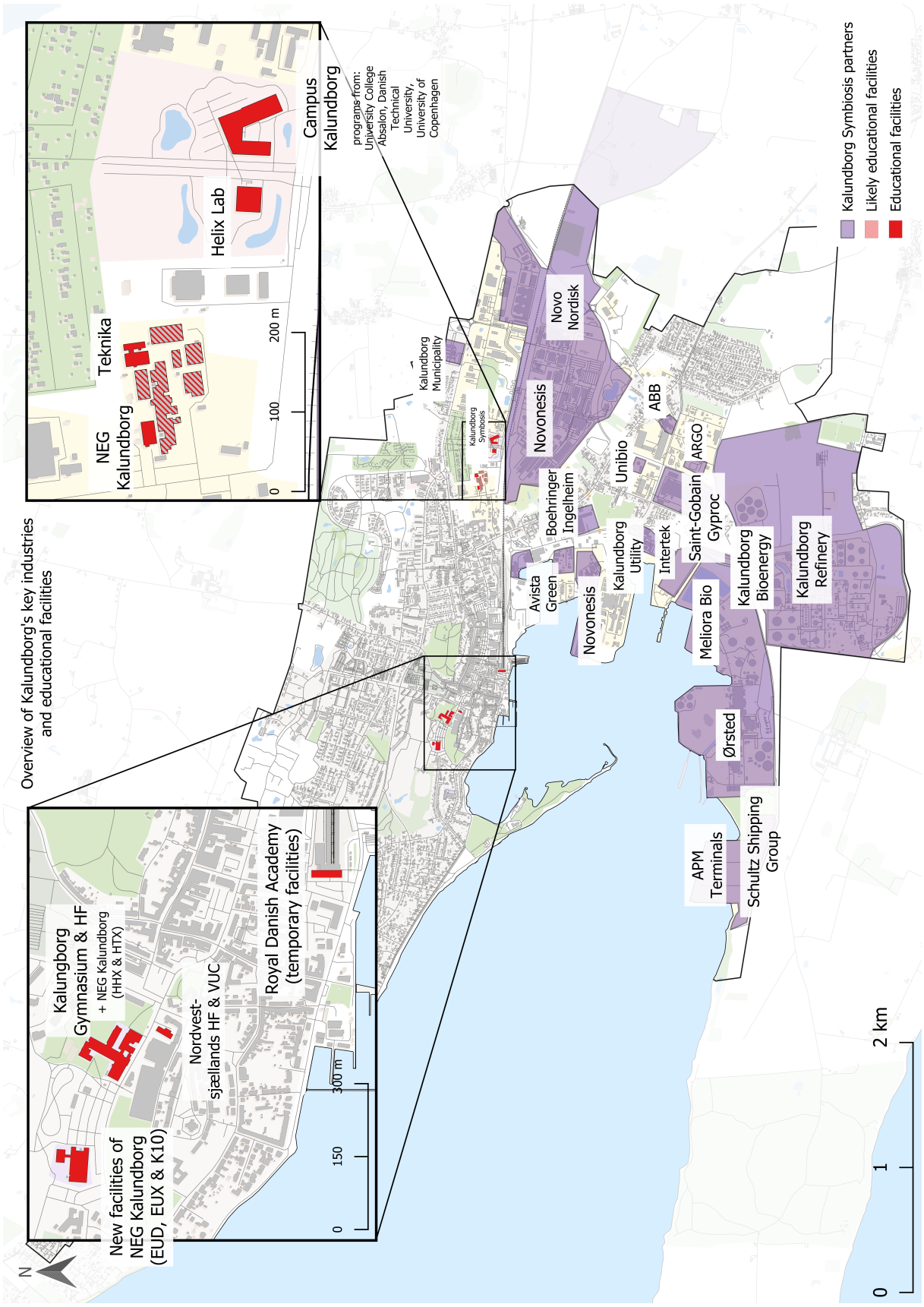
The older respondent group expressed a desire for more greenery and water elements in the city centre, while additionally the younger respondents want to see these elements integrated on streets and sidewalks in general, as well as around industrial and educational areas. Most respondents believe that green and blue areas in Kalundborg benefit everyone, though some noted it being beneficial mostly for specific groups like children and families, the elderly, or active people. Moreover, most younger respondents believe that green and blue spaces can make Kalundborg more attractive to future students and workers. While a large proportion of older respondents think the same, many are cautious and critical – stating that it depends on how it is implemented, e.g., strategic or thoughtful design. Similar responses were given on thoughts about the ability of GBI to support local urban life and city functions – most responders either definitely or cautiously believe that green and blue spaces can encourage exploration, social interaction, and support for small businesses like coffeeshops.

The final section inviting any additional comments on the topic was optional, resulting in only three responses. However, one of the responses solely stated “child-free areas”, which is difficult to interpret and may be controversial or simply humorous; therefore, this comment will not be considered a relevant contribution to the analysis. In contrast, the other two responses are more informative. One respondent expressed the need for better public transport, cleaner streets, more shopping and housing opportunities. The third and final response reflected clearly on Kalundborg’s green and blue areas, mentioning that the city has a fair amount of these areas. However, further elaboration mentions issues of accessibility, insufficiency, and inconvenience of these areas – they are poorly integrated into Kalundborg’s everyday infrastructure where one requires intentional effort to visit them. This respondent suggests that there is a need for urban infrastructure that naturally leads people through green and blue environments as part of their daily routines. Additionally, they suggest improved walking and cycling access, and better connection between green areas and central parts of Kalundborg.

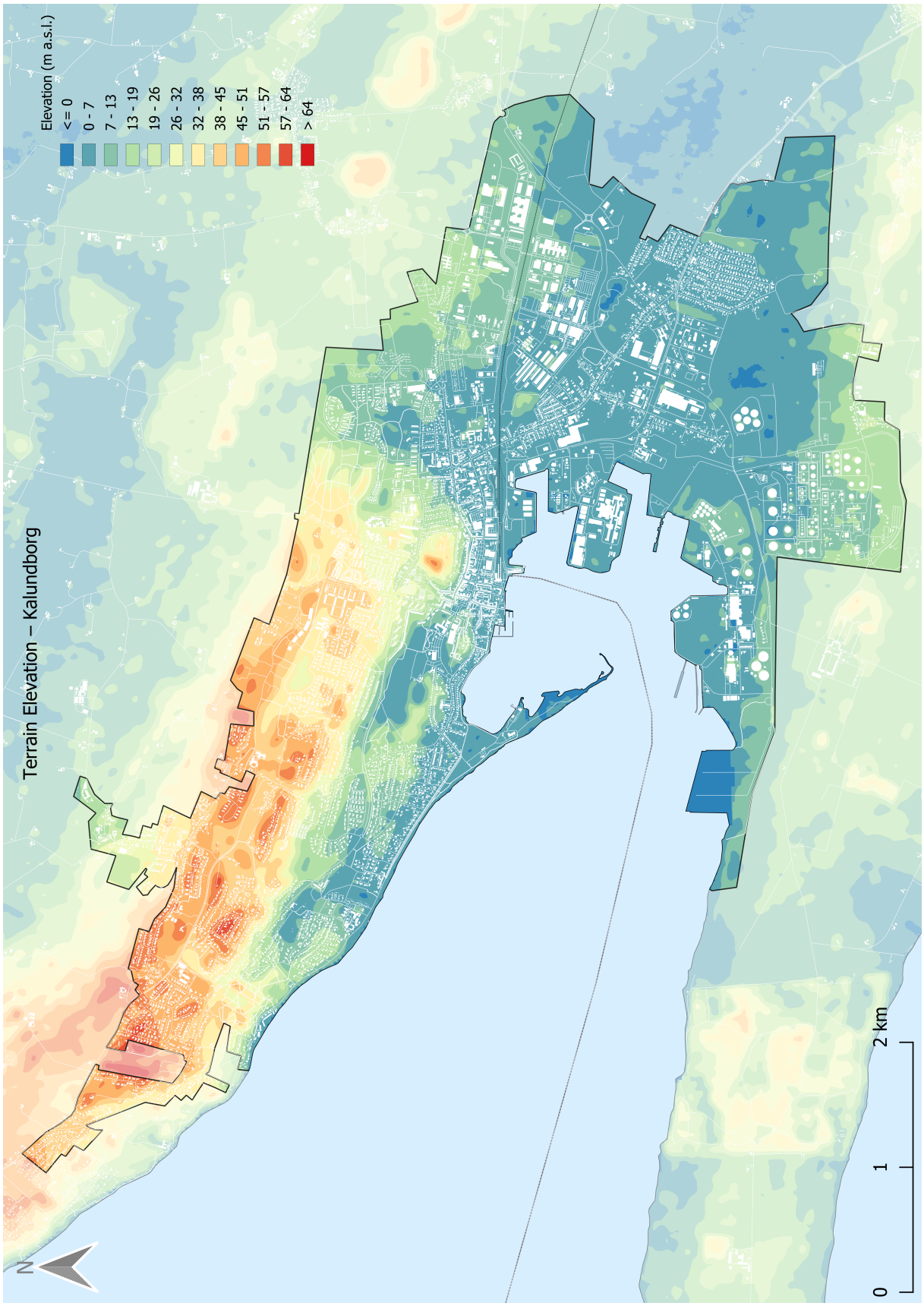
It is important to note that with just 21 responses, this survey provides limited grounds for detailed analysis and reliable interpretation – especially when comparing across different demographic groups. While these findings offer useful indications, some trends may look significantly different if more respondents participated in the survey.

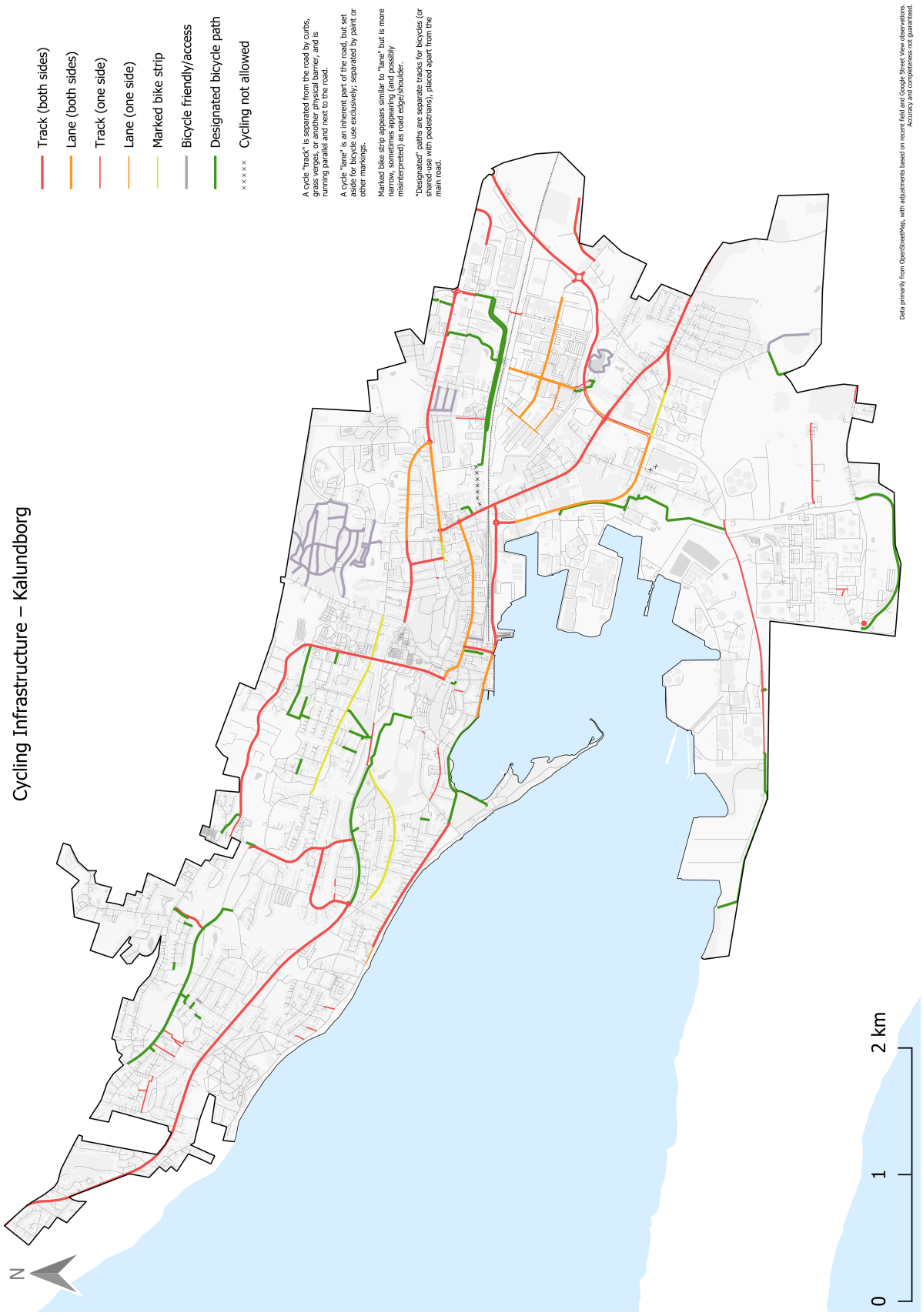
F Produced Maps

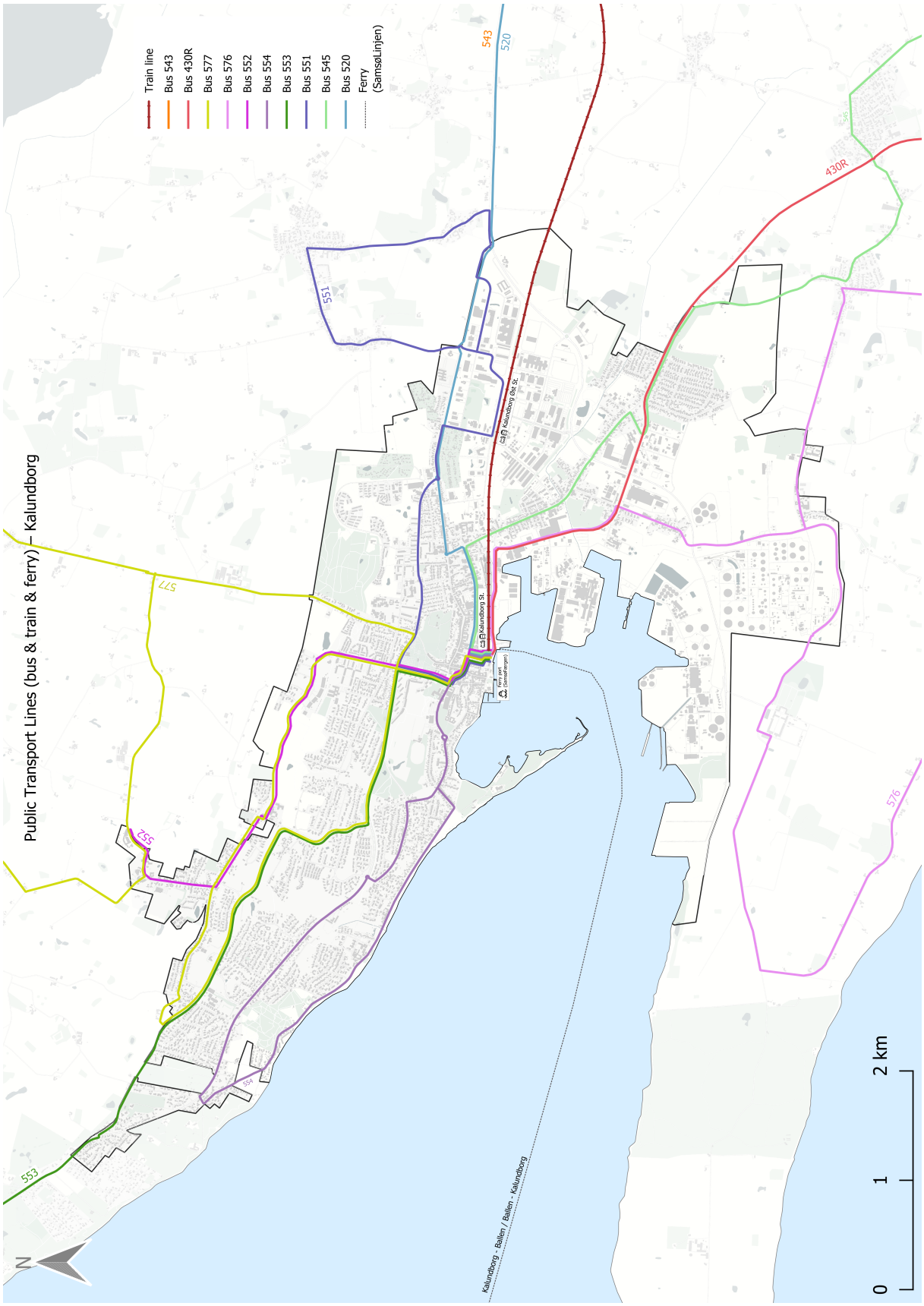


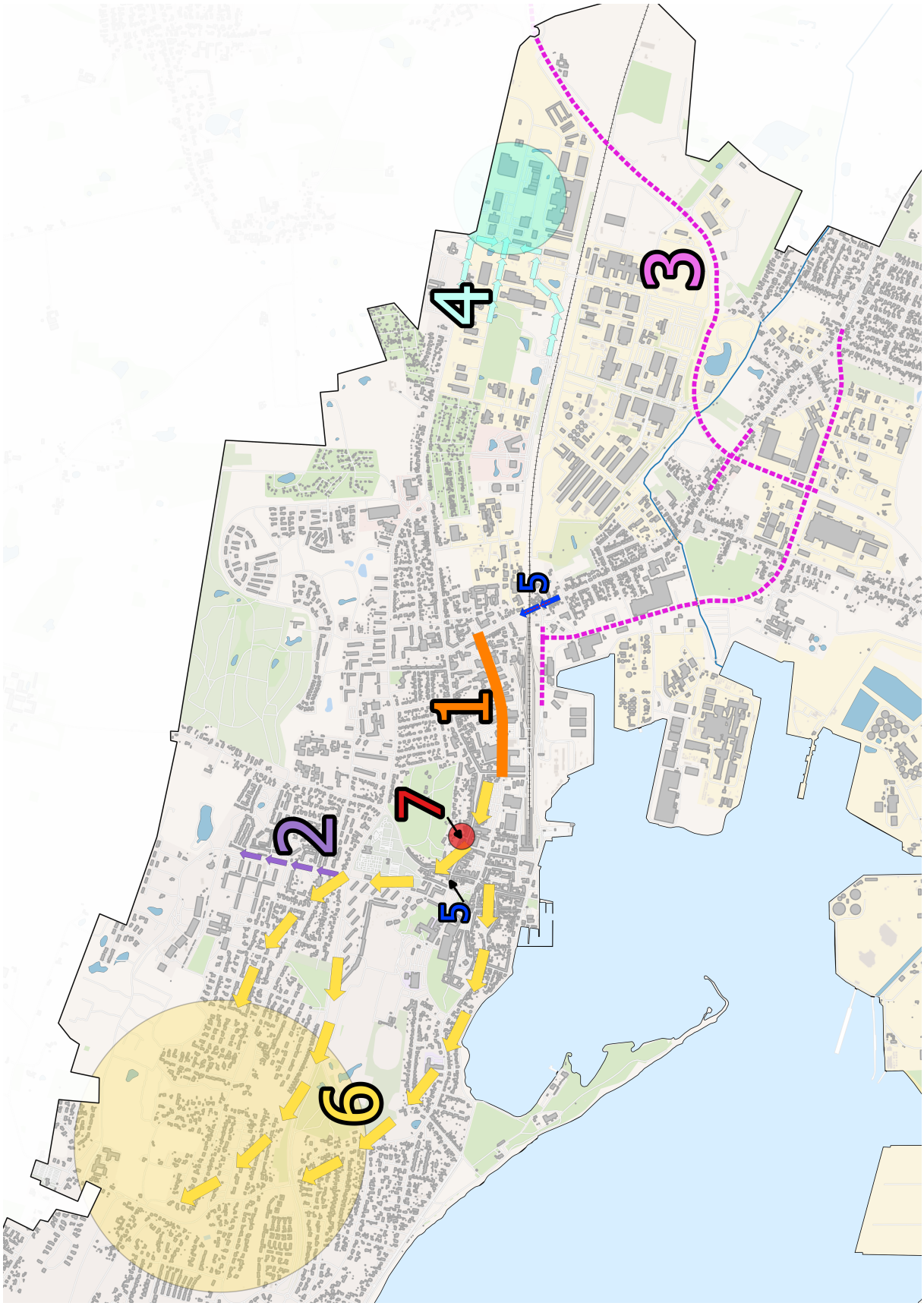

Overview of Kalundborg's key industries and educational facilities
Kalundborg Symbiosis partners
Likely educational facilities
Educational facilities
Campus Kalundborg
programs from: University College Absalon, Danish Technical University, University of Copenhagen
Helix Lab
Teknika
NEG Kalundborg
0
100
200 m
Kalundborg Municipality
Kalundborg Symbosis
Novo Nordisk
Novonesis
ABB
Unibio
ARGO
Boehringer Ingelheim
Avista Green
Novonesis
Kalundborg Utility
Intertek
Saint-Gobain Gyproc
Meliora Bio
Kalundborg Bioenergy
Kalundborg Refinery
Ørsted
APM Terminals
Schultz Shipping Group
0
1
2 km
N
New facilities of NEG Kalundborg (EUD, EUX & K10)
Kalungborg Gymnasium & HF
+ NEG Kalundborg (HHX & HTX)
Nordvest-sjællands HF & VUC
Royal Danish Academy (temporary facilities)
0
150
300 m


Key Urban Areas & Destinations – Kalundborg
Nature and Recreation
Central shopping district (Pedestrian street)
Transportation hub
Novo Group area
Education
Student housing
Historical
Retail
Musisk Skole Kalundborg
SKØL Brygkompagni
Penselstrøg Krea Café
Kontoret Kalundborg
Padel fun4all
Town Hall
(Kalundborg Kommune Rådhus)
Big-Box retail
Novo Group cluster
Biotekbyen
Kalundborg Øst
(train station)
Campus Kalundborg
STARK
Meny
Klosterskoven
Kalundborg Kollegiet
Møllebakken
Central shopping hub
Kordilgade
Main train station & Bus terminal
Ferry terminal
Harbourfront
Kalundborg Gymnasium & HF
Højbyen
(Vor Frue Kirke)
Munkesøen Stadion and other sports fields
Gisselore beach
N
0
0,5
1 km

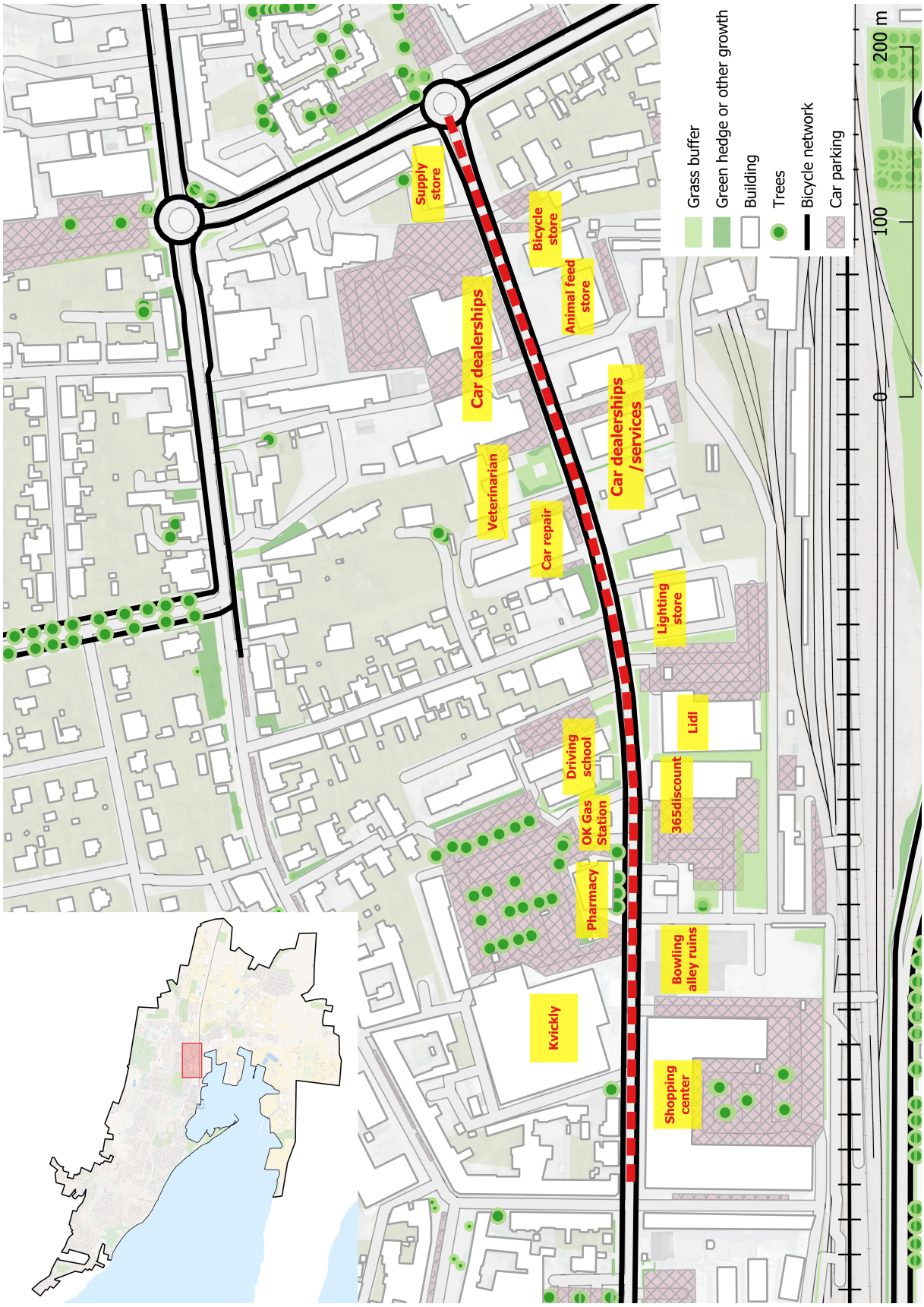

Terrain Elevation – Kalundborg
Elevation (m a.s.l.)
<= 0
0 - 7
7 - 13
13 - 19
19 - 26
26 - 32
32 - 38
38 - 45
45 - 51
51 - 57
57 - 64
> 64
N
0
1
2 km


Cycling Infrastructure – Kalundborg
Track (both sides)
Lane (both sides)
Track (one side)
Lane (one side)
Marked bike strip
Bicycle friendly/access
Designated bicycle path
Cycling not allowed
A cycle "track" is separated from the road by curbs, grass verges, or another physical barrier, and is running parallel and next to the road.
A cycle "lane" is an inherent part of the road, but set aside for bicycle use exclusively, separated by paint or other markings.
Marked bike strip appears similar to "lane" but is more narrow, sometimes appearing (and possibly misinterpreted) as road edge/shoulder.
"Designated" paths are separate tracks for bicycles (or shared-use with pedestrians), placed apart from the main road.
Data primarily from OpenStreetMap, with adjustments based on recent field and Google Street View observations.
Accuracy and completeness not guaranteed.
N
0
1
2 km


Public Transport Lines (bus & train & ferry) – Kalundborg
Train line
Bus 543
Bus 430R
Bus 577
Bus 576
Bus 552
Bus 554
Bus 553
Bus 551
Bus 545
Bus 520
Ferry
(SamsøLinjen)
543
520
551
430R
545
577
552
553
576
Kalundborg St.
Kalundborg Gbf. St.
Ferry port
Kalundborg - Ballen / Ballen - Kalundborg
N
0
1
2 km


4
3
5
1
7
2
5
6


Trees
Bicycle network
Grass
Car parking
Kalundborg Kollegiet
Møllebakken
Central train & bus station
Harbourfront
1
2
3
4
5
6
7
8
9
10
11
N
0
100
200 m


Supply store
Bicycle store
Animal feed store
Car dealerships
Car dealerships /services
Veterinarian
Car repair
Lighting store
Lidl
Driving school
365discount
OK Gas Station
Pharmacy
Bowling alley ruins
Kvickly
Shopping center
Grass buffer
Green hedge or other growth
Building
Trees
Bicycle network
Car parking
0
100
200 m

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