The Mobility Hub

A Link between Mobility Systems and Urban Spaces





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(Kulash, 1996, p. 49)

"Engineers, who have traditionally dominated transportation planning and design, will ultimately respond with creativity in devising operable standards for assuring new qualities, such as livability."

Abstract

Dansk

'The Mobility Hub – A Link between Mobility Systems and Urban Spaces' er en kandidatafhandling, der undersøger udviklingen af den levende by gennem den interdisciplinære tilgang af 'mobilitets design'. Et mobilitets hub er et udviklingsværktøj, der kan bruges til at omdanne 'unheeded mobility spaces', hvor den effektive trafikmaskine bliver forbundet med de rumlige bymæssige kvaliteter. Dette speciale definerer mobilitets hub'et som et rumligt bindeled mellem mobilitetssystemerne og byrummene. For at designe et mobilitets hub ud fra denne definition er der udarbejdet en teoretisk rammesætning. Den kombinerer definitionen af 'place' af Agnew, 'legibility' af Lynch, 'global sense of place' af Massey og mobilitetsbegreberne: 'sociofugal og -petal spaces' af Osmond, 'critical points of contacts' af Jensen og Morelli. Teorirammen har gjort det muligt at undersøge dualiteten mellem bevægelse og materialiteter, samt synergien mellem disse for at designe et mobilitets hub der forbinder mobilitetssystemer og byrum.

Den valgte case, Viby Torv, er blevet analyseret og kortlagt gennem flere metodiske tilgange såsom kvalitative interviews, litteratur review og felttur, der har dannet en forståelse af konteksten for Viby Torv. Resultatet af analysen opsummerer en række potentialer for, hvordan man kan designe et mobilitets hub på Viby Torv. Viby Torv består af forskelligartede materialiteter og bebyggelse, der adskiller området i to identiteter: 'byen' og 'landsbyen'. Derudover er området domineret af biltrafik og offentlig transport, og dermed er fodgængere og skiftende passagerer lavt prioriteret. De omkringliggende funktioner tiltrækker forskellige brugergrupper, men selve området på Viby Torv fungerer som parkeringsplads og gennemfartssted opdelt af tre veje. Analysen viser, at Viby Torv har brug for en balanceret kobling mellem mobilitetssystemerne og byrummene.

Viby Centrum er et designforslag, der rummer de mange potentialer. Som et mobilitets hub skaber Viby Centrum et genkendeligt og uniformt bindeled mellem mobilitetssystemerne og byrummene. Masterplanen skitserer forskellige design elementer, der skaber sammenhæng mellem funktionerne, mobilitetsmuligheder og brugergrupper. Udformningen af mobilitets hub'et prioriterer således både den bløde mobilitet samt visualiserer de urbane attraktioner og aktiviteter, hvilket skaber et interdisciplinært mobilitets design af Viby Centrum.

Som et resultat af denne kandidatafhandling er designforslaget blevet reflekteret over ved at diskutere, mobilitets hub'ets forbindelse til et netværk. Viby Centrum er designet gennem stedspecifikke elementer for at skabe et attraktivt byrum, der understøtter det eksisterende potentiale i materialiteterne, der gør Viby Centrum til et 'sted'. Viby Centrum er også designet gennem genkendelige elementer, hvor de enkelte borgere kan koble det konkrete mobilitets hub til det samlede mobilitetssystemer (og et potentielt netværk af mobilitets hubs), der forbinder de mange funktioner og områder i Aarhus Kommune.

Viby Centrum er derfor en kombination af det genkendelige netværk af mobilitets hubs og det unikke sted i Aarhus Kommune. Som et mobilitets hub, designet gennem den interdisciplinær tilgang 'mobilitets design', skaber Viby Centrum en kobling mellem den effektive trafikmaskine og det attraktive byrum.

English

'The Mobility Hub – A Link between Mobility Systems and Urban Spaces' is a master's thesis investigating the development of the liveable city through the interdisciplinary approach of 'mobilities design'. A mobility hub is a development tool that can be used to redesign 'unheeded mobility spaces' where the efficient traffic machine gets linked with the spatial urban qualities. This thesis defines the mobility hub as a spatial link between the mobility systems and the urban spaces. In order to design a mobility hub with this definition, a theoretical framework has been conducted. It combines the definition of 'place' by Agnew, 'legibility' by Lynch, 'global sense of place' by Massey, and the mobility concepts: 'sociofugal and -petal spaces' by Osmond, 'critical points of contacts' by Jensen and Morelli. The framework has made it possible to investigate the duality between movement and material setting and the synergy between them to design a mobility hub with a link between mobility systems and urban spaces.

The chosen site, Viby Torv, has been analysed and mapped through several methodological approaches such as qualitative interviews, literature review, and a site visit which has provided an understanding of the context of Viby Torv. The output of the analysis summarises a series of potentials of how to design a mobility hub within Viby Torv. Viby Torv consists of diverse material settings and built environment, dividing the area into two identities: the 'city' and the 'village'. Additionally, the area is dominated by car traffic and public transport, and thus the pedestrian and shifting passengers are low prioritised within the area. The surrounding functions attract different user groups, but the area of Viby Torv functions as a parking lot and transit point divided by three roads. The analysis shows that Viby Torv needs a balanced link between the mobility systems and the urban spaces.

Viby Centrum is a design proposal that accommodates the many potentials. With the development tool of a mobility hub, Viby Centrum creates a recognisable and uniform link between the mobility systems and urban spaces. The masterplan outlines different urban elements that create coherency between the functions, mobility opportunities, and user groups. Thus, the design of the mobility hub prioritises soft mobility and visualises the urban attractions and activities, creating an interdisciplinary design of Viby Centrum.

As an outcome of this thesis, the design proposal has been reflected upon by discussing the mobility hubs' interconnection within a network. Viby Centrum is designed through site-specific elements to generate an attractive urban space that supports the existing potential of the material settings that makes Viby Centrum a 'place'. However, Viby Centrum is also designed through recognisable elements where the individual citizens can connect the specific mobility hub to the collected mobility systems (and a potential mobility hub network) that interconnect the many functions and areas within Aarhus Municipality.

Viby Centrum is, therefore, a combination of the recognisable mobility hub network and the unique place in Aarhus Municipality. As a mobility hub designed through the interdisciplinary approach of 'mobilities design', Viby Centrum creates the linkage between the efficient traffic machine and the attractive urban space.

Preface

'The Mobility Hub – A Link between Mobility Systems and Urban Spaces' is a master thesis on the program of MSc Urban Architecture and MSc Mobilities & Urban Studies at the Institution of Architecture and Design, Aalborg University. This thesis has been conducted by Simone Andresen and Olivia Hecht Stenum in the spring semester of 2022.

First, we want to thank our supervisor Ole B. Jensen for proficient supervision throughout the thesis period. You have provided great guidance in the interdisciplinary collaboration between urban design and mobilities studies. Furthermore, we want to thank Ditte Bendix Lanng from Aalborg University for additional reflections on the work with mobility hubs and a thank you to Line Ellesøe Jarlholm from Midttrafik. Not only did you provide significant insights into the area of Viby Torv and the region of East Jutland's work with mobility hubs, but you have also brought a considerable amount of positivity into this thesis. Furthermore, we want to thank Maria Wass-Danielsen from Urban Creators for providing an exciting and inspiring discussion of the thesis' analytical aspects. We want to thank our interviewees from Aarhus Municipality and Viby Parish for enabling this thesis, as well as Viby Lokalhistoriske Arkiv and Ida Riber Leerbeck for their curiosity of the thesis and providing access to historical data.

This master thesis focuses on how mobility hubs can be one of many tools when developing liveable cities. Through an interdisciplinary approach to 'mobilities design', the thesis will propose how a mobility hub can be a hybrid between mobility systems and urban space. The thesis is divided into nine main chapters: Introduction, Research Question, Mobility + Design, Methodology, Analysis, Prerequisites, Viby Centrum, The Network and Epilogue. All maps within the thesis are north-facing, and the references are cited using the Harvard method. Supplementary materials references to the appendices.

Motivation

The motivation for writing this master thesis arises from a curiosity about an interdisciplinary collaboration between urban design and mobilities studies. As undergrads, we both studied Urban-, Energy-, and Environmental Planning at Aalborg University, but our roads split between different master's programs.

After two-semester projects, a series of courses, and internships, we are reunited again with specialised knowledge in two separate disciplines. Simone Andresen focuses on mobilities studies with an emphasis on mobility behaviour and an internship in The Danish Road Directorate. Moreover, Olivia Hecht Stenum focuses on urban design focusing on mobility within urban space, and an internship in Urban Creators. We have worked previously with mobility hubs during our internships but from two very different perspectives. Whereas one perspective focused on the efficient intermodal traffic machine, the other focused on the classification of mobility hubs concerning the urban environment. These two perspectives have been the ground for initial discussions of how mobility hubs can be designed and what purpose they serve.

This master thesis group is formed with a deep interest and acknowledgement of how mobilities studies and urban design are interdisciplinary fields themselves. There can be threads in architecture, engineering, geography, and social science. Therefore, the motivation for this thesis is heavily influenced by the existing interdisciplinary approach used at both Center for Mobilities & Urban Studies and Institute for Architecture and Design. The interdisciplinary approach is also used within real-world scenarios. The municipalities, engineering consultancies, and many more have an increasing focus on interdisciplinary solutions, thus moving away from thinking in silos based on a single discipline.

Thus, the motivation of this thesis arises from a common interest in mobilities and urban design as well as different academic and professional journeys. With mobility hubs being the focal point of this thesis, we seek to tear down the silo thinking and combine two disciplines of mobilities studies and urban design.

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INTRO-DUCTION

The contemporary city is shaped by a historical development focused on separating the city, the citizens, and the systems to increase safety and reduce the risk of conflicts (Sim, 2019). The necessity of this separation of functions and space is surrounded by the car-depended society (Kulash, 1996). With the car came a new hierarchy of the roads prioritising the motor through high road capacity and parking areas for storage and neglecting the pedestrians, public areas of the city, and social relations among the citizens interacting in public (Gehl, 2010). The car gave citizens independence and freedom to travel, which increased the city's global connectivity (Jensen, 2020). However, by planning for a car-depended society, the city's network has led to a downward spiral, diminishing the city's liveability and increasing the challenges such as congestion and pollution while trying to solve them (Kulash, 1996). Jacobs (Gehl, 2010) points out that the city is no longer developed with a holistic mind between urban areas and buildings. As Kulash (1996) describes, by prioritising the car on the road, the fine masked network and infrastructure disappear and thus increase the distance between the functions even more, which means that even more citizens become car-dependent. The car creates silos within the city, and the infrastructure for the car can be described as "[...] traffic arteries splintering urban centres [...]" (Martin, 2021, p. 20).

"We are now realising that trying to cure traffic congestion with more capacity is like trying to cure obesity by loosening your belt. We've loosened the belt for fifty years, but the problem has only become worse." (Kulash, 1996, p. 45)

With the car being the primary transport mode for most citizens comes the problems of congestion, pollution, and noise (Gehl, 2010). To prevent this, the city has been developed to reduce congestion by increasing road capacity, leading to even more car dependency and separation to minimise the risk of conflict and so forth.

Liveable Cities for Humans

"[...] citizens' revolt against urban freeways, that public acceptance of continued road expansion might be limited. [...] We are entering a new motor age, one in which the goal of maximising traffic speed and volume is being balanced against other goals for creating livable urban settings." (Kulash, 1996, p. 42)

The contemporary city is being developed to regain the balance between transport systems and urban function and thus create cities for humans (Gehl, 2010). According to Gehl (2010), a liveable city needs to be walkable, so the city encourages the contact between citizens and society. To achieve a walkable city, it is necessary to increase the urban quality of public spaces to invite people to change their usage patterns of the city and embrace and create urban life. This calls for the development of public spaces that attract local meeting points and engage the local community. Meaning, the city not only consists of necessary functions such as shopping, working, or being at home, but it calls for attractions that engage social and non-needed activities. Thus, the liveable city is designed to encourage people to sit down on a bench and observe the public space or use the outdoor to have social engagements.

"[N]o matter how well different activities are integrated locally, there is still a need for a range of mobility options. [...] there is another layer to mobility that is about the interface between the modes of transportation and people, and about how mobility systems, however large and complex, are integrated into the small scale of a neighbourhood street." (Sim, 2019, p. 96)

The liveable city is not only defined through the urban quality and physical settings but is seen in the holistic context of mobility and urban design (Sim, 2019; Jensen, 2020). By developing the public spaces for the local communities and the systems that connect the public spaces, the city becomes accessible and an agent for urban life, creating value for the citizens (Gehl, 2010). Urban life has not only been developed by technologies such as the car but is also influenced by the digital age, which enables people to use online platforms to socialise, gain information or perform everyday activities, such as grocery shopping (Lyons, 2015). This digital age exists concurrently with the car-dependent city and can be perceived as an argument against the need for the development of public spaces within the city (Lyons, 2015; Gehl, 2010). However, Gehl (2010) points out that the digital age only encourages people to engage and experience the activities within the city as the online platform provides knowledge about the opportunities within the liveable cities.

To achieve the goal of a liveable city, it is necessary to rethink the use of areas, which initially prioritised the car, to make room for the urban space but still enable mobility options. However, a critique of the discourse on the car-free city points to how the car has shaped the daily life of citizens and who perceive a need for a car to be able to participate in social activities, go to work or school (Martin, 2021). Thus, when designing for a liveable city, it will impact the citizens' daily mobility. However, it calls for changes as those not dependent on the car are being affected, and the overall quality of urban life is diminished. It calls for changes in the hierarchy of the user groups within the city and for new ways of affecting usage patterns of the city (Martin, 2021; Gehl, 2010; Kulash, 1996).

Tools

Examples of planning tools and concepts that can encourage a reduction of car traffic within cities.

Superblocks

To reduce the number of cars in the city, Barcelona works with the model of 'superblocks' (Martin, 2021). Barcelona has a grid structure that allows the city to develop a system of traffic-regulated cells that consists of nine apartment blocks (appx. 400 m²) called 'superblocks'. Buses and cars circulate the blocks, and inside the blocks, the space is reserved for pedestrians, cyclists, and residents.

Circulation Plan

In Ghent, the city has developed a 'circulation plan' to create areas with less car traffic and more space for urban activities (Martin, 2021). The circulation plan consists of six traffic islands surrounded by main roads. It is impossible to drive between the traffic islands without accessing the main roads. The 'circulation plan' creates a barrier for the car traffic but enables a network for public transport and soft mobility.

15 Minutes City

The concept of a '15 minutes city' is to design cities where residents can reach everything they need within 15 minutes by either foot, bicycle, or public transport (Sisson, 2020). By enabling access to activities and functions within the city without the need for a car, it can change the citizens' usage patterns of both the city and transit to other modes of transport as the city is designed for soft mobility.

Mobility Hubs

The concept of mobility hubs is a new way of understanding original transport nodes where different modes of transport meet (Andersen & Lanng, 2020). Not only is it focusing on improving the urban quality of the specific hub and sustaining efficient shifts, but it also supports the transport network within the city. This tool will be the focus of this thesis, thus elaborated and exemplified later in this chapter.

Development in Aarhus Municipality

This thesis takes a point of departure in the Danish municipality of Aarhus due to their current development towards creating a liveable city through a holistic and strategic mindset between mobility and urban planning (Aarhus Kommune, 2017). The specific context of Aarhus Municipality will be presented in Chapter 05, p. 31.

The transport sector pollutes 48% of Aarhus Municipality's CO_2 emissions, and beyond this creates challenges with air pollution, noise, and congestion (Aarhus Kommune, 2019a). The population of the city of Aarhus is expected to increase by 50,000 residents by 2030 (Aarhus Kommune, 2018). Meaning, that the municipality needs to create housing, urban attractions, and transport systems that can, without an increase in the population and handle the challenges derived from the current transport sector.

Aarhus Municipality has published two plans named: 'Mobility Plan Aarhus City Centre' (*Mobilitetsplan Aarhus Midtby*) and 'Mobility towards 2050' (*Mobilitet frem mod 2050*) (Aarhus Kommune, 2018; 2019a). Even with an ongoing increase in the population, buildings and businesses within the city centre between 2005-2015, Aarhus Municipality has managed to limit the increase of car traffic within the same area compared to the whole municipality (Aarhus Kommune, 2018). The municipality's challenges demand future development, which continues this limitation of car traffic. This is done by focussing on creating density in the city, which limits the need for transportation, and creating a mobility system that supports intermodal shifts, carpooling, and better public transport (Aarhus Kommune, 2019a). Aarhus municipality emphasises the necessity of viewing the different means of transport as one collected transport unit that supports the citizens' individual mobility needs, as it provides a network which connects the city's functions and activities as well as ensure alternative choices to the car by keeping the citizens' need in mind.

The development within the city centre should support both the green mobility options to reduce transport-related challenges (Aarhus Kommune, 2018). However, the plan also focuses on the importance of supporting the social activities in urban spaces and regaining a balance between the functions of the city to support the urban functions as well as the mobility connecting these functions. This is similar to the concept of liveable cities by securing the citizens' need to be mobile as well as engage with the urban space. The municipality will ensure this development by measuring the urban life against the mobility of the city centre, especially at intersections, roads with heavy traffic and public spaces (Aarhus Kommune, 2018). The mindset of the liveable city is also visible in the longstanding mobility plan towards 2050, where Aarhus Municipality (2019a, p. 11) describes: "Roads and streets are therefore both traffic and flow as well as urban space and urban life." Thus, the development of a liveable city is a holistic and strategic mindset that goes beyond the city centre and includes the whole municipality.

Aarhus Municipality has produced a set of goals to ensure the future development of both the city and its mobility system:

• Enabling intermodal shifts between the car, bicycle, walk and public transport. Especially within appointed mobility hubs (Aarhus Kommune, 2019a, p. 58).

• Public transport should support a decrease in CO_2 emissions, air pollution, congestion, and problems with parking. It is necessary that public transport is strong. It should be an attractive alternative to the private car (Aarhus Kommune, 2019a, p. 59).

• In these corridors, the high-class public transport network must be an attractive and reliable means of transport that is not affected by congestion on the road network. To ensure this, it is essential that the routing is as direct as possible and that the high-class network runs in a separate route separated from the remaining traffic. Where public transport cannot have its own route, it is important that public transport is given priority in signalling systems (Aarhus Kommune, 2019a, p. 60).

• Urban densification allows more people to go for many purposes. It must therefore continue to be possible and attractive to go to Aarhus. Not only in the city centre but also in the local communities. Walking can support the individual's experiences in the city's spaces and support the general state of health of the citizens (Aarhus Kommune, 2019a, p. 68).

• It is very important to have an ongoing focus in the local communities on making cycling or walking on streets, paths and urban spaces as attractive as possible, as well as to traffic hubs that can transport citizens further (Aarhus Kommune, 2019a, p. 69).

In addition, Aarhus Municipality has a desire to make a facility for intermodal shifts at Viby Torv:

"Viby Torv can become a new hub for public transport with connections to public transport along Ringvejen and Skanderborgvej. The close location to Aarhus Syd Motorvejen makes it a good location for a facility for intermodal shifts, where changes can be made between means of transport." (Aarhus Kommune, 2019a, p. 66)

Viby Torv is Aarhus Municipality's second-largest bus transit point with several parking lots, and the area has a close connection to the city centre and the motorway (Aarhus Kommune, 2019a; Letbanesamarbejdet, 2021). With Aarhus Municipality's mindset of integrating mobility and urban planning, perhaps it is possible to look even further into the potential of enhancing both the mobilities flows and urban space at Viby Torv with the use of a mobility hub.



Ill. 01 The location of Aarhus in Denmark

What is a Mobility Hub?

This definition of the mobility hub should be seen in the light of the previous description of how cities are being developed with a strategic mindset of creating mobility flows between function and urban spaces as well as creating a liveable city through walkable and attractive urban spaces. All with the citizens' individual needs in mind. Lanng and Olesen (2020) define the mobility hub as:

"The hub has potential as a structuring point for multimodal transport systems that integrate bus, train, sharing concepts and emerging technologies. And it has an urban potential like the place in the city where people are flowing through. There is energy and life in that situation. The hub brings together flows, exchanges and quality." (Lanng & Olesen, 2020, p. 36)

Based on this definition of the mobility hub, its functions, and potential, it is a matter of integrating the functional requirements for the mobility system with good urban space and urban development (Andersen & Lanng, 2020). There is thus a two-sidedness of the mobility hub that must be designed based on a transport need and a desire to create inviting urban spaces.

Andersen and Lanng (2020) describe how creating transport systems where the car is no longer in focus but involves intermodal shifts and soft mobility frees up space in the city to achieve and develop new urban qualities. With this definition of a mobility hub, it is ideal to integrate this tool in the development of Aarhus Municipality, as their development focuses on developing transport options that cover the individual's transport needs through public transport and soft mobility without increasing overall car ownership (Aarhus Kommune, 2018). Lanng and Olesen (2020) focus on the fact that the hub gathers mobility flows and shifts and recognises that the hub must occur in areas where there is the possibility of intermodal shifts. This intermodality can be between private and public transport or soft to hard mobility. The clash between the transport system and attractive urban spaces creates a need to think across disciplines and integrate the city's functions and network (Andersen & Lanng, 2020). It is necessary to take into account the site-specific context in order to understand which functions and potentials must be considered in the specific mobility hub and to avoid "[t]he different functions, users and interests' fighting for space' with traffic [...]" (Andersen & Lanng, 2020, p. 138).

Thus, mobility hubs consider both the city's mobility system and connections with functions. At the same time, it creates opportunities for site-specific development of urban space quality, see Ill. 02. In the work of developing mobility hubs, it is, therefore, necessary to think in a systemic network and understand the local context with a focus on the individual citizens' needs. This is done to create a comprehensive mobility offer for the individual transport needs as well as support the site's activities and urban space quality. Meaning, that mobility hubs can be one of the many tools that can be applied in mobility- and urban development to create liveable cities.



However, when drawing inspiration on designing a mobility hub with synergy between mobility systems and urban space, the examples are either focusing on achieving the efficient shift and transport machine or a high-quality urban space. These two focusses are showcased through the example of Reis via Hub in the Netherlands and the light rail transit project in Odense, which are both described on the next page. The question is whether it is possible to create a synergy between mobility systems and urban space? If this synergy is achievable in areas where either the mobility system or the urban space is dominant in the mindset of the development - even though the goal is to create a mobility hub?

Examples of Mobility Hubs

Reis via Hub

Reis via Hub is a network of 57 mobility hubs in the province of Groningen and Drenthe in the Netherlands (REG LAB, 2021). The two provinces have worked strategically since 2000 on creating a network of hubs of different sizes, and scales, with multiple functions and facilities in rural and urban areas.

In 2016, the provinces and the transport agency 'OV-Bureau Groningen Drenthe' took the initiative to develop a network of hubs in collaboration with several actors (REG LAB, 2021). The organisation was i.a. established because of a challenged cohesion between city and country in the provinces due to the centralisation of services and functions and an aging population. The network of hubs is based on a well-established and high-frequency public transport consisting of buses called Qliners, and the hubs enable intermodal shifts between transportation while offering various facilities such as bicycle lockers, real-time travel information, shops, water taps, outdoor fitness facilities, and charging stations for electric bicycles which contribute to making the hubs attractive.

When developing the hub network, a steering group was established who was in charge of choosing existing stops and stations which should be transformed into mobility hubs (REG LAB, 2021). The steering group also created a standard design line for Reis via Hub, and they made general programmes for the hubs. When the individual hubs were to be created a group of stakeholders, with relation to the surrounding area and context, made the design and program for the specific hub. Reis via Hub has thus worked with the general design line and overall expression to create a recognisable network while working with each hub's programming and design to suit the local context and specific needs.

The mobility hubs in the Ries via Hub network are not a destination but a place where people change transportation and transfer (Appendix 1). The facilities should support the function of a hub; if the hub has an urban connection, the facilities should support the surrounding urban qualities. However, if the hub's only function is to be a place of transfer, and the facilities should reflect that.

Odense Letbane

In Odense, the establishment of a new light rail transit (LRT) has become the driving force for urban development in the city centre (Midttrafik, 2022). The construction of the 14,5 km LRT started in 2015, and it will start operating in May 2022. The LRT connects the city's essential functions and increases access to public transport options within the city. This includes the connections from the city centre and Odense Central Station to the University of Southern Denmark and the new Odense University Hospital. Two 'Park & Ride' areas have been established in the southern and western parts of the LRT, which makes it possible to change from car to the LRT at the mobility hubs. Odense Municipality has also developed mobility hubs in the city centre, focusing on prioritising the soft mobility within the city centre and enhancing the urban quality at the new LRT stations.

The LRT has been used as a strategic tool for urban development in several European cities (Odense Letbane, 2019). This includes cities such as Bergen, Freiburg, and Angers. The cities have created high frequency and effective public transport systems while also creating urban development and quality. The establishment of the LRT cannot be the only tool to ensure urban development but needs to be incorporated with mobility hubs and other agents. If political initiatives that encourage urban development are generated simultaneously, such as allowing urban densification, it will have a greater effect on shifting towards a liveable city. An LRT has the advantage that it runs on open road areas, and this means that the interaction between shops and transport is easy for passengers, as it is possible to see urban spaces while driving with the LRT. This contrasts with, e.g., metros, where passengers do not have an unobstructed view underground and urban qualities occur only around the metro station, where the LRT has the potential to create urban qualities and urban development along the entire stretch.

Odense Municipality's goal of developing an LRT in Odense was to secure urban development and make Odense more coherent by linking the city with a high frequency and effective public transport arteries (Odense Letbane, 2019).

Defining Mobility Hubs:





RESEARCH QUESTION

How can a mobility hub be designed at Viby Torv to support the development of the liveable city through an interdisciplinary focus on the link between mobility systems and urban spaces?

MOBILITY DESIGN

This chapter unfolds a theoretical understanding of the mobility systems and urban spaces that can be linked in a mobility hub. This is done through the mindset of the interdisciplinary field of 'mobilities design', which combines the discipline of urban design and mobilities studies. To understand mobility hubs as both a physical setting and within the network of a city Agnew's (Cresswell, 2004) definition of 'place' will be unfolded. This will provide insight and reflection on how a place is affected and created through the human individual. The place will additionally be explored by Lynch's (1960) concept of 'mental mapping' and through Massey's (1991) interpretation of the 'global sense of place'. Lastly, Jensen's and Morelli's (2011) approach of 'critical points of contacts' will be presented to understand how the mobility systems and human flows interact within a place and on a systemic scale.

Mobilities Design

To be able to understand how to design a mobility hub that links mobility systems and urban spaces, there is a need to understand how mobility research affects the design and vice versa.

The car-dependent city was developed through the mindset of the traditional perception of transport planning, which aims at moving people efficiently and safely from A to B (Gehl, 2010; Jensen, Lanng & Wind, 2017). As described in the introduction, Chapter 01 p. 3, the car-dependent city has resulted in challenges of congestion, a further dependency on the car, and an increase in car ownership, with the car being the primary mode of transportation (Kulash, 1996; Gehl, 2010). During the traditional development of the car-dependent city, the road network and public spaces have been seen as technical areas to accommodate the increased need for parking and expansion of roads to reduce the challenges of congestion. When comparing the different modes of transportation, the car needs more space than, e.g., a bus or a pedestrian both on the road as well as storage in a parking lot. Therefore, the road network and public spaces within the car-dependent city are prioritised for cars, as the traditional planning perspective has focused on accommodating increasing car ownership and reducing congestion. Meaning, that the network and public spaces are technical areas for cars rather than people. Jensen, Lanng, and Wind (2017) term these public spaces, which prioritise the car and are developed by transport engineers, as mobilities spaces, as they serve only one function of supporting the transport system of the city. Creating mobility spaces with only these dimensions in mind does not appeal to soft mobility and can thus be characterised as an 'unheeded mobility space'.

"[O]rdinary mobilities spaces – such as parking lots, pedestrian tunnels, and road lay-bys – tend to be criticised as typologies that lack consideration for the people who use them and for their wider social, aesthetic, cultural, and ecological agency in the city." (Jensen, Lanng & Wind, 2017, p. 69)

The development of the liveable city has increased the focus of the built environment and urban spaces to provide atmosphere, texture and spatial aesthetic to the user of the city (Jensen, Lanng & Wind, 2017). However, there are still mobility spaces within the liveable city that sustain their technical form, as they are planned to accommodate the technical issues of the car-dependent city. There is a potential to rethink these areas beyond their technical construction. However, this requires a new mindset, which differs from traditional transport planning.

Mobilities studies move beyond the technical mindset of transport planning (Jensen, Lanng & Wind, 2017). Sheller and Urry (2006) describe the differences between these two mindsets through the 'mobilities turn', which merges transport with social science, and thus "[...] putting social relations into travel and connecting different forms of transport with complex patterns of social experience [...]" (Sheller & Urry, 2006, p. 208). Mobilities studies investigate how societies are structured within the everyday life of the citizens. This includes the underlying reason for movement and how the individual is affected during this movement (Sheller, 2021). Mobilities studies contribute to a socio-technical understanding of the daily journeys undertaken through mobilities spaces (Jensen, Lanng & Wind, 2017). Therefore, the 'mobilities turn' provides a new mindset to rethink the technical areas of unheeded mobilities spaces to achieve the transition

from the car-dependent city towards the liveable city as well as supporting the social interactions within the mobilities space.

"This acute focus on the travellers, i.e. the users of the material environments in which mobilities happen, makes the mobilities perspective attractive as a possible analytical approach and field of knowledge for urban design." (Jensen, Lanng & Wind, 2017, p. 74)

This socio-technical perspective can also be applicable when defining liveable cities. According to Gehl (2010), the physical setting of the city affects specific interactions. Whereas the street invites movement and flow (space for movement), the public space invites temporary stay and experiences (space for rest). In this way, the material setting of the city becomes a tool within the urban design to encourage certain human behaviour. At the same time, the urban space enables social interaction between people. However, Gehl (2010) distinguishes between 'space for movement' and 'space for rest' rather than uniting them. Through the 'mobilities turn', defined after Gehl's (2010) interpretation, Jensen (2014) seeks to connect and redefine the mindset of urban design to exceed the distinction of 'space for movement' and 'space for rest' and instead focus on how the materialities affect the social interactions and mobility of the individual.

'Mobilities design' is defined by the linkage between urban design and mobilities research and has become a discipline that focuses on how material setting affects the human interaction and experience of mobility spaces (Jensen, 2014; Jensen, Lanng & Wind, 2017). The perspective of designing cities focusing on the social-technical elements is proposed in both the understanding of the 'mobilities turn' and the liveable

city. Urban planners, designers, and architects develop and shape urban spaces in order to create the desired behaviour from people's flow and interactions (Jensen, 2014). This is conditional on people being influenced by the socio-technical materialities. Gehl (2010) argues that cities are influenced by people, but people are also influenced by cities. 'Mobilities design' can therefore affect and change peoples' interaction and mobility behaviours within the city. As described in the introduction, Chapter 01 p. 3, the technical solution to congestion has led to more roads which have increased car traffic. However, Gehl (2010, p. 29) argues that "[...] improved conditions for pedestrians strengthen not only better pedestrian traffic, but also, and in particular: urban life [...]". Through 'mobilities design', it becomes possible to redesign unheeded mobilities spaces focusing on potential social interactions. Thus, the mobilities spaces become spaces which should be designed to support both social interactions and mobilities of everyday life.

Throughout this section, the 'mobilities design' is a possibility to rethink mobilities spaces within the city to accommodate the everyday life of citizens. However, it has also been reflected that the liveable city consists of both networks of movement as well as public spaces for stay. As described in the introduction, Chapter 01 p. 7, mobility hubs can be analysed both as a part of a network and an individual space which connects the urban space and mobility system. The following section will provide theoretical reflections on how a place is defined through individual perceptions.

Understanding Places

"Mobility is always located and materialised and occurs through mobilisations of locality and rearrangements of the materiality of places [...]" (Sheller & Urry, 2006, p. 210)

As defined in Chapter 01 p. 3, the mobility hub consists of both mobility systems and urban spaces. To be able to understand how mobility hubs can be defined as a place. This section will focus on Agnew's (Cresswell, 2004) definition of 'place', Lynch's (1960) concept of 'mental mapping', and Massey's (1991) interpretation of 'global sense of place'.

Definition of Place

Agnew (Cresswell, 2004) defines a 'place' through three aspects: 'location', 'locale' and 'sense of place', see Ill. 04.



Ill. 04 Agnew's definition of place

The Location of a place defines the geographical boundaries of the area; however, Agnew (Cresswell, 2004) argues that the 'location' can be both stationary and unfixed. E.g., a location could be Aarhus City Centre, which have a set of coordinates and administrative city borders. Nevertheless, 'a train' can also be defined as a 'location': *"I am on the train"* but is not located to a specific set of coordinates, and thus a place's 'location' can also be moveable.

Locale describes the material setting of a place where human interaction and everyday life are unfolded (Cresswell, 2004). The material setting is the physical objects of a place, which can be, e.g., the buildings, the trees or the pavement. However, Agnew (Cresswell, 2004) argues that these material settings can also describe imaginary places such as Narnia in the books of 'The Lion, The Witch and The Wardrobe', which can be described through its material settings of trees, castles and lampposts.

Sense of Place relates to the subject attachment and the relational link individuals have to a specific place (Cresswell, 2004). E.g., the feeling of 'a home' is perceived differently between people and will change over time when moving away from one's childhood home to their first flat. A 'sense of place' can also be implied through movies and novels that can bring an attachment to a place without physical attendance.

Mapping a Place

Lynch (1960) presents an approach to investigate the human understanding of the material setting within a place through the concept of 'the environmental image'. This relates to the individual observer's interpretation of the recognition, the relation, and emotional value of the urban elements and thus the material setting within a place. According to Lynch (1960), the understanding and the translation of the material setting of a place depends on the individual observer. When describing the materiality of a place, it is thus necessary to acknowledge the subjectivity of the observer.

"The environment suggests distinctions and relations, and the observer – with great adaptability and in the light of his own purposes – selects, organises, and endows with meaning what he sees." (Lynch, 1960, p. 6)

Lynch (1960) describes how the observer's interaction and experience of the material setting enables a 'mental map', which relies on their physical presence within a place. Meaning, that the 'mental map' depends on the observer's knowledge, perception and experience of the urban elements. The 'mental map' is based on an understanding of how the cityscape and the urban elements can be read, recognised, and organised into coherent patterns, which Lynch (1960) terms 'legibility'.

"Just as this printed page, if it is legible, can be visually grasped as a related pattern of recognisable symbols, so a legible city would be one whose districts or landmarks or pathways are easily identifiable and easily grouped into an over-all pattern." (Lynch, 1960, p. 3)

People use their maps to navigate and orient themselves in urban situations (Lynch, 1960). A clear and 'legible mental map' gives people a sense of emotional security to not disorientate in the complex and composite urban environment. The 'mental map' consists of five elements, which exist in correlation.

Paths are the channels where movement exists, e.g., streets, routes, corridors, and are usually the unique elements of people's 'mental map' as they observe cities through movement.

Edges are linear elements that are not perceived as paths but are boundaries of continuity for the observer. They are used to delimit an area, city, or district and are crucial in organising, separating, and comparing generalised areas of the 'mental map'.

Districts are areas that are recognisable by a common identity, characteristics, or character. Most people either have districts or paths as a prominent element of their 'mental map' and organise their 'map' by these two elements.

Nodes are the points of systems crossing and are essential for the observers travelling as the journey will go to and from a node. It can be either condensation of some functions or junctions, which are often related to paths as the crossing of paths can lead to a node.

Landmarks are point of references in the city and are often a physical object like buildings or mountains. They can vary in size and scale and are often used as points of orientation in the 'mental map'.

"The perceptive and familiar observer could absorb new sensuous impacts without disruption of his basic image, and each new impact would touch upon many previous elements. He would be well oriented, and he could move easily. He would be highly aware of his environment [...]" (Lynch, 1960, p. 10)

According to Lynch (Lange, 2009; Lynch, 1960), places should be designed so that the observer can acquire a clear 'mental map' of the place, learn to navigate within the place, and interact with the place. Thus, the place should be designed to be visible, organised and through identifiable materialities, which enables the observers to describe the place through individual perceptions.

Global Sense of Place

Massey (1991) elaborates on the 'sense of place' by discussing how places can be defined through the 'global sense of place'. Both in a physical and digital sense, globalisation has resulted in a change of places to be interconnected in other senses than the two before mentioned elements: location and locale. Globalisation has enabled an interchange of cultures and materiality and thus demolished original borders of places. E.g., when travelling, it is possible to find the 'same' Mcdonald's restaurants in New York City and Aarhus. Massey (1991) describes that the 'global sense of place' enables an individual to understand a place in relation to other places. Meaning, that the individual creates a network of places from which they define the relational connection to see a specific place as a unique part of their network.

Through the unfolded definition of place, mobility hubs need to be developed in the understanding of its location, material setting, and 'sense of place' in relation to other places. This section has elaborated on how the individual plays a part in interpreting and creating a place. However, there is a need to understand how the interaction within a place and within a network can be understood. This will be elaborated on in the next section of this theoretical chapter.

Critical Points of Contacts



Ill. 05 Critical points of contacts

Sociofugal

Sociopetal



Ill. 06 Sociofugal and sociopetal spaces

Mobility Concepts

Mobility hubs can be viewed as individual places which support the mobility systems within a city, but mobility hubs within a system can also be viewed as a network supporting the connection between the city's urban spaces as well as mobilising people, see Chapter 01 p. 7.

The mobility hub can be understood on two levels: The individual hub as a specific place and a network of mobility hubs connected through a mobility system. The two levels are relevant to investigating how the socio-technical interaction and flow affect the material setting of a place and the relational sense of place within a network.

"In contemporary urban societies multiple networks and systems interact, overlap, exist in parallel, converge, conflict etc. creating unforeseen complexity and less transparency." (Jensen & Morelli, 2011, p. 36)

As Jensen & Morelli (2011) describes, the city consists of several flows and systems, which are interwoven within a network. These flows and networks are not visible or noticeable to the user in their daily journeys unless the systems break down and stop the flows that connect the places within the network. Jensen & Morelli (2011) propose 'critical points of contacts' (CPC) as an analytical tool to recognise the 'critical' nodes and interactions within the networks, see Ill. 05.

"[The nodes] become critical when the one system changes/influences the conditions of the other as where entities, flows and qualities are modified as a consequence of the CPC (e.g. as when I become a passenger by a function of the CPC of the metro station and my economic resources and other capabilities to embark)." (Jensen & Morelli, 2011, p. 38) The concept of CPC can be applied in many different contexts, and the view of CPC depends on the purpose to which the tool is applied (Jensen & Morelli, 2011). There is a difference between focusing on an individual user or a whole system as the user interacts with several systems. In contrast, the system interacts with several users and other systems. When applying the concept of CPC, it is possible to investigate different scales of the network, e.g., regional, within a city, or at a specific place. Within the place, CPC can be used to understand the interaction between flows in terms of intermodal shifts, friction, barriers, or speed differentials between users and between the flows. Meaning, that CPC can be used to investigate the interactions between human and non-human actors.

Furthermore, a place can be analysed through its immobility (physical and material setting) and mobility (human flow and systems) (Jensen, 2013). Osmond (Jensen 2013) introduces the concept of 'sociofugal and sociopetal spaces'. These concepts focus on how the functions within a place affect human interactions and flow. The 'sociofugal space' distributes flows, whereas 'sociopetal spaces' attract flows, see Ill. 06. The flow is thus dependent on the functions and material setting of the urban space.

In this thesis, CPC will be applied when analysing the many systems and networks within the area of Viby Torv. CPC is applied to investigate which nodes are 'critical' in order to create a mobility hub in terms of connecting the multiple functions (both the activities, which support the urban space, as well as the efficient shifts of the mobility systems).

Movements and Materialities

With a point of departure on how to design a mobility hub that links the efficient mobility system with the attractive urban space, this theoretical chapter has focused on several elements. First, the 'mobilities design' is an interdisciplinary approach where design dictates both the mobilities behaviour and social interactions within a place. Thus, enhancing the potential social interaction of mobilities spaces, as well as affecting a certain mobility behaviour within the everyday lives of citizens. Second, how places are defined through location, local, and 'sense of place', which can be mapped through the material setting of a place. However, the material setting is perceived through the individual observer, but the individual also interprets the place in relation to other places. Third, the places can be seen in relation to the mobility systems interacting within the place or how the individual user interacts with the systems. Creating critical nodes that should be considered within the 'mobilities design'.

Within this thesis, the theoretical chapter is used to understand how a place can be interpreted through two different perspectives the movements (the individual and social mobile interactions) and the materialities (the urban elements and functions) of the place, see Ill. 07. A mobility hub should provide a synergy between the material setting and the movements. Therefore, there is a need to apply the approach of 'mobilities design', which unites these two perspectives, when designing a mobility hub within Viby Torv.



Ill. 07 Synergy between movements and materialities



METHOD-OLOGY

This chapter will unfold the methodological approach within this thesis and describe how this thesis' applied data was conducted. The data has been applied to describe and analyse the area of Viby Torv as well as the connecting mobility systems and context to Aarhus Municipality. Furthermore, a presentation of the iterative approach, which this thesis is a result of, will be provided.

The Iterative Process

Throughout the interdisciplinary process of this thesis, an iterative approach has been used to support both the theoretical foundation and creative procedure of a 'mobilities design' project. The iterative process is based on a hermeneutic approach. The researcher goes back and forth between the different elements and phases within the iterative process, thus reviewing the process with new ideas and knowledge gained throughout the thesis semester (Gadamer, 1975). Furthermore, the hermeneutic approach also includes the researcher's knowledge from previous research, and thus the iterative process goes beyond the phases within the current thesis period. This thesis presents a synthesis of the several phases, and therefore the iterative approach is the background of this final presentation.

The process began with an initial literature review, which will be elaborated on below, to understand the problems within research and design of mobility hubs. Secondly, the thesis site was chosen. The research question was based on this initial research and site-specific area. Afterwards, the theoretical framework was conducted while gathering data through qualitative interviews and a site visit to support the analytical phase. During this phase, the collected data was transformed into maps through Corner's (1999) approach of 'mapping'. The design proposal is based on an open-minded and creative sketching phase that is founded on the analytical output and the design parameters (Appendix 9). Lastly, the site-specific design proposal was discussed based on the theoretical framework.

Literature Review

The literature review has been applied through several chapters within this thesis. Both during the iterative process and before the final decision on the thesis' thematic. This method has contributed to a cohesive strategy to gain in-depth knowledge of the different topics and sections where it has been applied. The initial task of identifying relevant sources and gaining detailed insight has been helpful in understanding the problematics within the thematic of mobility hubs. During this part of the thesis, the literature review was conducted using libraries or open-source databases, such as Aalborg University Library or ScienceDirect. With the use of a 'snow-ball effect', further knowledge was gained by reading the cited references used within the scientific papers and thus locating new sources within a specific topic. This method provided a broad set of reflections and perspectives on the thematic. To structure the literature review, a sheet was made to describe the relevance of the literature and what thematic it applied to, see example in Appendix 2. To ensure reliability and validity, the sources consisted of peer-reviewed scientific papers and official planning documents and political decisions, further supported by the interviewees included in this thesis.

Both visual documentation and newspaper articles were used as historical data within the historical analysis. The data can be considered valid and reliable by using historical databases, Det Kongelige Bibliotek and Viby Lokalhistoriske Arkiv, as the documentation has been appropriately dated and descriptive. The analysis focuses on the visual changes of Viby Torv during the last decade; however, if it was to understand, e.g., changes in the daily life of the citizens, an in-depth critical literature study was needed.

Qualitative Interviews

To get an in-depth understanding of the different perspectives on the potential development of Viby Torv, qualitative interviews were conducted with planners from Midttratik and Aarhus Municipality as well as the chairman of Viby Parish Council. In the following section, the interviewees will be presented as well as their relevance to the thesis and how they contributed to the thesis.

All four interviews were conducted as semi-structured interviews to enable a pre-defined framework through

an interview guide but still ensure a joint discussion and the possibility to follow the hunch of the interviewer (Brinkmann & Kvale, 2008). The interview guides were based on thematic questions based on literature reviews. The interviews differed in how loose the semi-structured interview was conducted, as the first interview was a part of understanding the potential research theme of the thesis with a focus on Viby Torv. In contrast, the last interview focused specifically on the potential development of Viby Torv. Common for the interview guides were a beginning briefing to establish a friendly-minded relation with the interviewee and to describe the process and themes within the interview. The interviews were recorded in order to process the interviews precisely during the semester (Appendix 3).

Line Ellesøe Jarlholm

Mobility Advisor at Midttrafik

This physical interview was conducted early in the semester to gain knowledge on how the traffic company in the region of East Jutland works with mobility hubs as a tool (Appendix 3a). The interview took place on the 3rd of March. Prior to the interview were a literature review of Midttrafik's mobility plan, collaboration with Aarhus Municipality, and their work on mobility hubs - among this a study trip to Drenthe-Groeningen's Reis via Hub. Besides the focus on mobility hubs, Line E. Jarlholm provided relevant insight into how Viby Torv functions as a mobility node within Aarhus Municipality. Furthermore, she described how Midttrafik cooperates with the municipalities and how Aarhus Municipality develops the mobility systems along with the urban environment. After the interview, Line E. Jarlholm gave access to Midttrafik's passenger data, which has been applied in this thesis (Appendix 4).

Helle Hansen

Project Manager in Aarhus Municipality

During the site visit, a physical interview was conducted with Helle Hansen from Aarhus Municipality on the 10th of March (Appendix 3b). Helle Hansen is the project manager on the bus rapid transit project, which goes through Viby Torv. Therefore, she was able to provide insight into Aarhus Municipality's general development plan for the municipal mobility systems as well as reflect on the potential and challenges of the mobility systems within Viby Torv. After the interview, Helle Hansen provided access to traffic data at Viby Torv as well as Aarhus Municipality's proposed routes of the bus rapid transport (Appendix 5).

Thomas Ager Hostrup

Traffic Engineer in Aarhus Municipality

An online interview with Thomas A. Hostrup from Aarhus Municipality was conducted on the 14th of March (Appendix 3c). Thomas A. Hostrup is a traffic engineer in Aarhus Municipality and has been a part of the strategic development plan of Skanderborgvej in Viby (Teknik og Miljø, 2021) which was also a part of the preparatory literature study. This interview was conducted after the site visit to Viby Torv, and Thomas A. Hostrup provided great insight into the physical setting of the technical design of the area. Furthermore, he elaborated on the municipal framework of the future development along Skanderborgvej.

Hans Christian Feindor-Christensen

Chairman of Viby Parish Council

During the literature study of Viby Torv's future development, it became clear that Viby Parish is planning to develop a culture house at Viby Kirke (Johansen, 2021). Therefore, a phone interview was conducted with the chairman of Viby Parish Council, Hans Christian Feindor-Christensen, on the 5th of April (Appendix 3d). Hans Christian Feindor-Christensen provided a broad knowledge on the future development of Viby Torv's identity and the collaboration between Viby Parish and other functions near Viby Torv. Furthermore, he elaborated on the ideas behind establishing a culture house in the existing parish house at Viby Torv.

Site Visit

A site visit at Viby Torv was done from the 9th to the 11th of March to gather data on the area's mobility systems, physical settings, atmosphere, and the surrounding context. The March weather was around 4-5 degrees Celsius and shifted between cloudy and sunny days. Thus, the weather did not call for sitting on a bench and enjoying the sun due to the cold temperatures. The purpose of the site visit was to understand the general use of Viby Torv in a weekday setting.

Several types of observations were conducted to support the site-specific mapping and analysis during the site visit. To understand the usage of the parking lots, a series of counts was done within the rush hour between 7:30-8:30 in the morning on the 10th and 11th, including a count on parked cars during the day on timestamps of 7:30, 12:30, and 20:30. This was done to gain insights about what time of day the parking lots were used – during the business hours to support the business or during the night to support the residential areas? According to Gehl and Svarre (2013), this data set is only interesting when they are comparable. Thus, the counting was done several times during the site visit within the same timeframe to ensure comparable factors.

To examine the material setting and atmosphere, Cullen (1961) contributed with the approach of serial vision, which focuses on capturing different angles of the city through the pedestrian's view. During the site visit, several routes within Viby Torv as well as in the surrounding areas were chosen to examine both the material setting within the area and the neighbouring context through serial visions. At the same time, while walking these routes, pictures were taken of the physical environment and visual perceptions. The graphic material presents the materialities and shapes of the physical setting. It shows the connections between the city and the human journeys and interactions that take place within the city (Gehl & Svarre, 2013).

During these routes, notes were taken to describe the barriers and perceived atmosphere from the view of a pedestrian. For example, this included counting the time of green and red lights in the intersection between the ring road and Skanderborgvej. This provided practical insight into the distance and waiting time within the area compared to a theoretical idea of distances based on a map (Gehl & Svarre, 2013).

Gehl and Svarre (2013, p. 41) proclaims that "[...] the described [observation] tools only provide samples of the interplay between the city's form and life." This thesis mainly focuses on the potential of the design, which can create new journeys and urban life within Viby Torv. Therefore, the observation data combined with qualitative interviews, literature reviews and mapping can support an analysis of the current potential that should be considered in the design.



Ill. 08 Pictures from the site visit to Viby Torv



ANALYSIS

The following chapter will unfold the analysis and mapping of Aarhus Municipality and Viby Torv. The analysis takes a point of departure in the theoretical framework to investigate Viby Torv as a place through Agnew's (Cresswell, 2004) definition of 'place' and Lynch's (1960) concept of 'legibility' and 'mental mapping'. Furthermore, the mobility systems and flow within Viby Torv and Aarhus Municipality are analysed through Jensen's and Morelli's (2011) concept of 'critical points of contacts'. Thus, the analysis focus on the physical setting, the movement, and the synergy, to understand the place of Viby Torv. The analysis concludes potentials that should be considered when designing a mobility hub at Viby Torv that ensures a linkage between urban space and mobility systems.



Context of Aarhus

Aarhus Municipality (2017) describes Aarhus as "[a]ttractive for living, studying, working and investing in, attractive to visit [...]". This attraction value is due to the many functions of the city, which include a university, innovative businesses, cultural attractions, and museums. The population, as of 2021, is approximately 350,000 citizens; thus, Aarhus is the second-largest city in Denmark (Danmarks Statistik, 2022). Within the perimeter of the municipal border is a diverse city with a dense city centre surrounded by an active harbour front, suburban and business areas, as well as lakes and nature, see Ill. 09. The different functions are connecting with seven main roads running towards Aarhus City Centre, which is linked by two ring roads that connect.

As described in the introduction, Chapter 01 p. 5, Aarhus Municipality focus on creating liveability and accessibility to remain an attractive and expandable city (Aarhus Kommune, 2017).

"The development of Aarhus must provide space for diversity and the development of one's own identity in the different urban areas, by taking point of departure in the areas' qualities, distinctiveness and stories, so that Aarhus offers versatile opportunities for everyday life." (Aarhus Kommune, 2019b, p. 9)

Aarhus Municipality's development strategy aims to sustain the existing functions of the city and bring forward the diversity to support the individual citizens' needs and opportunities as well as create a multi-modal mobility system, see Chapter 01 p. 5.

When applying the interdisciplinary mindset of liveable cities as socio-technical hybrids between urban spaces and mobilities, Aarhus can be described through its function that creates "[...] versatile opportunities for everyday life [...]" (Aarhus Kommune, 2019b, p. 9). The diverse functions within Aarhus Municipality - businesses, a university, cultural institutions, etc. - are attractions that sustain human interaction and activity. They can be seen as large 'sociofugal and -petal spaces' that create flows within the city. Thus, they are connected by technical structures of roads and multi-modal mobility, which supports the accessibility to these opportunities of everyday life and creates a network of mobility systems in Aarhus Municipality. Meaning, that both the urban areas and activities as well as the mobility system is necessary factors within the liveable city. The duality between urban spaces that provide diverse human interactions and the technical connections through mobility systems can be linked when using mobility hubs as a tool to sustain and develop Aarhus as an attractive, liveable city.



Connection

The complex mobility system within Aarhus Municipality crosses, intersects, and thus creates nodes within the city. Through Jensen's and Morelli's (2011) analytical approach of 'critical points of contacts', it is possible to point out the interfaces between the systems and between the systems and the individual users.

One of the critical nodes within Aarhus Municipality is Viby Torv, which is the second-largest transit area of public transport in Aarhus (Appendix 3a & 4). Viby Torv is located where the second ring road intersects with the four-lane main road, Skanderborgvej, connecting Viby Torv to Aarhus City Centre and Aarhus Central Station. Thus, there are several modes of mobility systems and flow coming through Viby Torv and connecting the area to other functions and mobility systems in Aarhus Municipality, which are evident in everyday life of citizens, see Ill. 09. E.g., the connection and short distance to Viby J Station, where local and regional trains depart from, supports a connection between Viby Torv and other parts of Denmark.

By comparing the absolute and the relative distance between Viby Torv and other destinations within Aar-



Ill. 10 Absolute and relative distances including public transport (PT), cars (C), and bicycles (B) in minutes.

hus, see Ill. 10, it is evident that the different modes of transport are competitive in terms of time difference. Through CPC, Viby Torv can be analysed as a critical node focusing on the mobility systems and flows. The critical nodes between the mobility systems can be exemplified through the intersection between the ring road and Skanderborgvej. With several transport modes flowing through the intersections, the relative distance between the car and the buses is equal. If the traffic light breaks down at Viby Torv, there is a risk of congestion, affecting many other critical nodes within the mobility systems on the road. If a traffic jam is created at Viby Torv, it is likely that the car's relative distance will increase. In contrast, the bicycle is more likely to find a new route or become a pedestrian and walk onto another street. Furthermore, the bus can have prioritised bus lanes, which can have a positive impact if congestion is created due to other breakdowns within the overall road network. Thus, the bus will be prioritised through the bus lanes and achieve a shorter relative distance than the cars affected by congestion.



Focus Area The following sections of the analysis will focus on the area of Viby Torv. 36



Entrance to Viby Torv

When arriving at Viby Tory, there is no sense of feeling connected to Aarhus other than signage directing cars towards Aarhus City Centre. It quickly becomes apparent that cars in other matters are also prioritised. The bus stops are located on opposite sides of the intersection where Skanderborgvej and the ring road are united. The roads feel dominated by cars, buses, and lorries. Most of the traffic is occupied by cars in a traffic jam, waiting for the traffic light to turn green so they can continue their journey. The roads are creating an edge for the pedestrians, and they must wait for the green light as well to cross the roads. During the pedestrians' journey towards the southeast part of Viby Tory, the trip is again stopped by an edge as the pedestrian is met by Grundtvigsvej where the green light again must give access for the trip to continue.

Besides creating an edge, Skanderborgvej divides the area into a southeast district and a northwest district of Viby Torv and creates a separation of two different identities. Viby Torv seems to be split between large building volumes of glass and concrete on one side of Skanderborgvej and low-scale housing with greenery on the other side. In between these districts are a triangular gap that is reserved as storage for parked cars. These parking areas are framed by hedges and trees, which increase the diversity in materialities between the two districts. However, it creates yet another edge for the pedestrian, who must take a detour and walk around the parking lots to get from one district to another. On the northwest side of Skanderborgvej, the gap continues and shapes an open square in front of Viby Centret. Decorated with tall hedges, a dismantled fountain, and benches facing heavy traffic, the area is a transit point between the intersection, the bus stop, and the entrance to the shopping mall. As Lanng, Jensen, and Wind (2017) argue, this gap between the districts can be perceived as an 'unheeded mobility space' as the area prioritise the technical and engineering dimensions of a mobility space and has minimal consideration for other dimensions that appeal to the soft mobility or invites to a peaceful stay.



Ill.13 Panoramic view of Skanderborgvej, where the identity of the 'city' and the 'village' meet.

City



Ill.14 Pictures of the identity as the 'city'

Village







Ill.15 Pictures of the identity as the 'village'

The duality between the north and south of Skanderborgvej becomes dominant when comparing several factors. E.g., the scale, materialities, and density. The two identities within Viby Torv can be described as two districts: the 'city' and the 'village'. The 'city', see Ill. 14, consists of buildings of large volume and scale built in concrete, and glass, contains heavy traffic and prioritises the cars. The 'village', see Ill. 15, consists of greenery, low buildings, single houses, bricks and cobblestone, as well as less traffic, thus, enabling pedestrians to cross the streets of Grundtvigsvej, Bjørnbaksvej and Kirkevej.

History of Viby Torv

During the last decade, the area around Viby Torv has been developed from a village square to a traffic junction near the ring road and Skanderborgvej. Viby Torv was previously an independent municipality (Viby Municipality) before the merging of municipalities in 1970, where Viby Torv was placed under the administration of Aarhus Municipality (Kommunalreformen, 1970). The merge has impacted the physical development of Viby Torv, which will be investigated in the historical analysis.

Between 1920 and 1960, Viby Municipality's population increased from 3,500 to 15,000 citizens (Aarhus Amtstidende, 1960). During this period, Viby Municipality experienced a high degree of development, and Viby Torv was the focal point of the existing city centre that contained local businesses and shops. On Viby Torv, which was surrounded by two-lane roads and low-rise buildings, there was a petrol station 'Esso', a hotel, and a green area toward Viby Kirke and Viby Skole, see Ill. 16. In 1960 the two southern parking lots, which still exist, were built with entrances and exits to Grundtvigsvej and Bjørnbaksvej.

A newspaper article in Jyllandsposten from 1964 describes how Viby Parish Council (*Viby Sogneråd*), which was the executive power in the municipality, had a high level of development plans which aimed at supporting the increasing population and goals of renewing the city to become an attractive suburban municipality to Aarhus (Jyllandsposten, 1964). When investigating the description of the development during the 1960s, they focus on how to develop the urban area around Viby Torv and Kongevejen (now Skanderborgvej), which was connected to Aarhus City Centre. One of the development plans was to build a new town hall to support a growing municipal administration (Demokraten 1960, 1962; Aarhus Amtstidende 1962a, 1962b). In 1962, the plans for the town hall on Viby Torv were approved with a budget of 4 million DKK (Aarhus Amtstidende, 1962b). The town hall was located in the area of the existing hotel, which was expropriated by the municipality (Aarhus Amtstidende, 1962a; Demokraten, 1962). During the same period, an application for building two new apartment blocks in the same area was rejected by Viby Parish Council, which approved the development plan for the town hall. The town hall was designed by architect C. K. Gjerrild, see Ill. 18, and the four-story building was located along Kongevej (Aarhus Amtstidende, 1963).

In 1963, the building permit had not yet been granted for the town hall, but the same year Viby Parish Council approved the plans to build a shopping mall (Viby Centret) and an additional hotel (the existing hotel). However, in 1967, the plans for constructing the town hall were put on hold due to uncertainties about the future merges of municipalities (Aarhus Amtstidende, 1967). This municipal amalgamation took place in 1970 when Viby Municipality was enclosed with Aarhus Municipality (Kommunalreformen, 1970), and thus, the need to establish a new town hall in Viby became obsolete. In an attempt to replace the town hall, a collection was made to fund a sculpture or a fountain at Viby Torv that served no purpose and was an empty lot (Demokraten, 1973). However, through graphic



Ill. 16 Viby Torv 1960



Ill. 17 Viby Torv 1974



Ill. 18 Model of Viby Torv 1964

material, there are examples of how Viby Torv became an area with the possibilities of big arrangements and temporary markets and amusement parks, see Ill. 17.

In 1967, 24 residential properties across Viby Torv were expropriated to make way for the new shopping mall, Viby Centret, and an expansion of Kongevejen to a four-lane main road to Aarhus City Centre (Aarhus Amtstidende, 1967). Viby Centret opened in 1973 and was an enclosed shopping street (Demokraten, 1973), which later was covered with a roof as it is today. The shopping mall attracted customers and increased the financial turnovers of the business owners. It was not until 1979 that the entirety of Viby Torv became car parking when the oval parking lot



Ill. 19 Viby Torv 1979

was built, see Ill. 19. When studying the picture, see Ill. 20, Viby Torv has not changed in terms of function and is still a parking lot with access to the shopping mall, school and church.

Through this historical literature review, it becomes evident that Viby Torv has been a product of the car-dependent city, see Chapter 01 p. 3. With the abolishment of the original plans of the town hall that would have expanded the urban development across Kongevejen, Viby Torv became an empty gap between the original village and the modern development during the 1960s and 1970s. Thus, it was developed to support the technical needs of the car-dependent city.



Ill. 20 Viby Torv 1990

Tracing



Traffic

Viby Torv is located at the intersection of the second ring road and Skanderborgvej, which is a fourlane main road connecting the ring road to Aarhus City Centre. Within the area is also two-lane roads, Grundtvigsvej and Kirkevej, and a shared road, Bjørnbaksvej. As illustrated, see Ill. 21, the area around Viby Torv is heavily affected by the traffic on Grundtvigsvej, the ring road and Skanderborgvej. The data shows that the main traffic flow travels along the ring road and thus only affects the intersection and is not going through the whole area of Viby Torv. However, the many cars and buses affect soft mobility when moving across Viby Torv, e.g., from Viby Skole to Viby Centret. Meaning, that there is a need for traffic lights to adjust the intersections of both the ring road and Skanderborgvej as well as at Grundtvigsvej and Kirkevej.





Morphology

The morphology in Viby Torv reflects the volume of the buildings and clarifies the spaces between the buildings, roads, parks, and parking lots. When comparing the different volumes of the buildings, there is a difference between the large buildings located northwest of Viby Torv near the ring road and Skanderborgvej. In contrast, the buildings near the southeast part of Viby Torv by Grundtvigsvej and Bjørnbaksvej consist of single houses and park areas. The density of the building is higher near Skanderborgvej than near Bjørnbaksvej. The roads create visual routes dividing the north and the south. The illustration, see Ill. 22, also shows that the parking lots at Viby Torv can be seen as empty spaces between the dense buildings and the residential areas.



Functions

The functions in the area of Viby Torv are diverse and attract many different user groups, see Ill. 23. Functions of a school, a shopping mall, businesses, a church, kindergartens, and a nursery home. The chairman of Viby Parish, Hans Christian Feindor-Christensen (Appendix 3d), explains that the different actors collaborate to offer a wide range of activities to the citizens living in Viby. E.g., Viby Kirke collaborates with the school and the nursing home to provide a variety of events and social activities such as movie nights and communal dining. Moreover, the church is a part of the social work within Viby by providing support groups and meeting places for lonely individuals, such as the Café Parasollen, which also creates job opportunities for vulnerable groups. The shopping mall attracts children from the school during lunchtime, meaning the functions support different needs within the area of Viby Torv.

There are green areas near Viby Torv, such as a small park and a cemetery. However, Line E. Jarlholm from Midttrafik (Appendix 3a) argues that there is no attraction value in these areas. The main recreational areas within Aarhus Municipality are Brabrand Sø (two kilometres northwest of Viby Torv) and Marselisborg Dyrehave (two kilometres east of Viby Torv).

Through the concept of 'sociofugal and -petal spaces', see Chapter 03 p. 20, it is possible to analyse how the functions attract and push people away. The traffic function such as the bus stops and parking lots enables people to move beyond the site; however, when arriving, either by bus, car, or bicycle, people become pedestrians that are distributed away from the function of a bus stop, bicycle rack or parking lot. On further investigation, the southeast parking lot at Bjørnbaksvej function as a 'Kiss & Ride' in the morning for parents dropping their kids off at school. The school, church, and shopping mall attract different users and become a destination rather than a shift point along a journey.

Through the mindset of CPC, see Chapter 03 p. 20, the many different functions create flow within the area. In the parking lot, the drivers become pedestrians, and pedestrians become drivers. In the 'Kiss & Ride' area at Bjørnbaksvej, it is observed that there are no outlined parking areas, and the pavement of the road and parking area consists of the same cobblestone. Thus, cars are driving in and out of the parking area, as well as cars driving along Bjørnbaksvej to the kindergartens. Furthermore, children and parents are walking to and from the school crossing Kirkevej. This node can be viewed as critical, as pedestrians and drivers must have situational awareness and follow the applicable traffic rules. Even though the area is not a defined parking lot, this is the only observed function it fulfils. Another area where the flow between functions meets in a node is between cars driving on Grundtvigsvej and pedestrians walking between the school and the shopping mall or bus stops. These flows are controlled by a light-regulated intersection, which is also the case in the intersection between the ring road and Skanderborgvej. During an observation in the morning, it was observed that the school provides school patrols at Grundtvigsvej to ensure that pedestrians, cars, and bicycles follow the traffic rules and thus controlling the flows within this critical node.



1 Bus stop 1



Ill. 25 The bus stop at Viby Ringvej



Ill. 26 The bus stop at Viby Torv



Ill. 27 The bus stop at Skanderborgvej



Ill. 28 Bus sign

Changing Bus

Viby Torv is the second-largest node for shifts between buses, with approximately 4500 passenger shifts per day (Letbanesamarbejdet, 2021; Appendix 4). In the interchange, the passengers become pedestrians and turn into passengers again when shifting from one bus to another. According to data from Midttrafik (Appendix 4), the main travel combination is between bus 1A, driving along Skanderborgvej, and bus 6A, driving along the ring road. The three bus stops at Viby Torv are placed in each corner of the intersection between Skanderborgvej and the ring road, meaning that passengers shifting buses need to cross the street through the intersection, see Ill. 24.

As previously stated, the intersection between the ring road and Skanderborgvej is a critical node between mobility systems. When focusing on the bus passengers, the intersection is also a critical node, as the passengers shifting between buses need to walk through the intersection before entering a new bus. The counted time where the light was green for the pedestrians where between 16-20 seconds. According to Thomas A. Hostrup (Appendix 3c), a traffic planner from Aarhus Municipality, the safety of the pedestrians is prioritised within the intersection by placing crossing platforms. However, when observing pedestrian behaviour at the intersection, several people ran over the crossing as the light turned green to red to avoid standing on the crossing platform and waiting.

The three bus stops are designed with the same elements – shelter, benches, timetables, garbage cans, and

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lightning. There is no digital timetable showing information in real-time about the next bus. However, it is possible to see the schedule and a small map of the entire public transport network of Aarhus Municipality. All the stops are used by more than one bus route, so the individual bus route is indicated on the bus. The three bus stops differ in placement and access from the shelter to the bus. Bus stop 1 and 2, see Ill. 25 & 26, are placed within an open area, giving the passenger access to the shopping mall, and the other provides access to the parking lot. However, bus stop 3, see Ill. 27, is placed along a façade of an empty, voluminous, and tall scaled building. There is no direct view between bus stop 2 and 3.

In terms of access, bus stop 2 is the only place with a platform between the bicycle lane and the road, enabling the passengers to leave the bus without a need to orientate before exiting the bus. At bus stops 1 and 3, there is no platform, and thus the bicycles need to stop whenever a bus is stopping, and the passengers need to orientate for bicycles before exiting or entering the bus. This crossing, from the bus to the pavement, is also a critical node, where the flow of the pedestrian and the flow of bicycles meets. The platform can ensure that pedestrians have time to orient themselves when exiting the bus and when waiting for the bus to slow down and open the doors without the risk of being run over by a bicycle.



View

The city's atmosphere depends on the environment, objects and human interactions, and activities (Albertsen, 2020). As described in The Entrance at Viby Torv, p. 37, the area is affected by different types of architecture, scales, density, and materiality. The scale difference between the seven-storage hotel, the four-storage flats, and Viby Kirke can seem dominant. However, the difference in the elevation equalises the difference in the scale. The elevation in the area, see Ill. 29, shows an elevation curve with 0.5 meters equidistance. The highest point is where Viby Kirke is located and has an elevation difference of three meters from the intersection at Skanderborgvej.

The elevation provides visibility through the site, as the buildings located south of Grundtvigsvej are elevated above the hedges that frame the parking lots. The hotel and the church are prominent in terms of the architectural shape and the size, scale, and volume and because they are visible from a distance, see Ill. 30 & 31. Thus, these two buildings can be seen as landmarks of Viby Torv, as they are unique and can be identified and explicitly connected to the area of Viby Torv. The area's elevation also enables a view directly from the hotel to the church and vice versa. Skanderborgvej, however, creates a visible edge between the two landmarks.



Ill. 30 View from Viby Kirke towards the hotel



Ill. 31 View from the hotel towards Viby Kirke

Microclimate



Wind

Viby Torv is located in Aarhus Municipality in East Jutland. The wind rose applicable from this area showcases that the wind is most likely to often come from the west, see Ill. 32. There are several factors that can reduce or increase windswept, funnels or wind speed. Some of these can be the scale and facades of the built environment. The physical setting of Viby Torv, the hedges and trees, can provide shelter from windswept. Therefore, the wind is not a crucial challenge in terms of changing the building structure within Viby Torv. However, the physical settings are necessary to prevent a further effect of the wind.



Hydrology

The hydrology analysis showcases how rain will gather within an area determined by the elevation, see Ill. 33. At Viby Torv, Skanderborgvej and the northern parking area are affected by rain, as this is the area's lowest point. However, this analysis should not be seen as flooding of a road whenever it rains, as this is solved through existing drainage within Viby Torv to ensure road safety. Thus, it is unnecessary to include further precautions to prevent flooding, as the area is not at risk with its current drainage. However, it is required to sustain or reconstruct the existing drainage to minimise the risk of flooding.



Noise

When mapping out the noise pollution within an area, it is necessary to understand that the noise is measured within specific time frames. Thus, the map showcases the average noise level. However, the noise level can vary throughout the day, as there is more activity during the daytime than at night. The noise levels showcased within the illustration, see Ill. 34, can seem abstract. To exemplify the noise levels, 60 dB can be compared to a normal conversation or background music, 70 dB can be compared to office noise or inside a car driving 100 km/h, whereas 75 dB is comparable to a vacuum cleaner (Heath, 2021). Within Viby Torv, the primary source of noise is derived from the heavy traffic load on the roads. This also means that the ring road, intersection, and Skanderborgvej are the main factors of the high level of noise within Viby Torv. The noise pollution is also higher when, e.g., a car accelerates when the light turns green (Bendtsen et al., 2004). Overall, this implies that the area near Viby Kirke and Bjørnbaksvej is less affected by noise, as there is less traffic compared to the main roads.

By Day



Ill. 35 Pictures of Viby Torv by day

The city changes after sunset. The streetlights become the source of visibility, corners of the streets become darks, and the dog walker becomes a safe strange. Viby Torv also changes when comparing observations made during the daytime and late in the evening, see Ill. 35 & 36. The heavy flow of traffic and many buses driving through decreases, and the different roads are experienced as less of a barrier than during the day (compare Ill. 35 E & Ill. 36 E). Sources of light from buildings and cars provide a feeling of safety, as the light creates a sense of eyes on the street and a feeling of presence from other people (see Ill. 36 A & B). During daylight, the eyes on the street come from other pedestrians within the area (see Ill. 35 G & H), whereas the cars are experienced as a united traffic flow creating barriers between the parking lots and on the roads (see Ill. 35 I). The areas further away from the Skanderborgvej and the parking lots themselves have dim light when it is dark (see Ill. 36 D). The hedges surrounding the parking lots limit the feeling of eyes on the street and the sense of other humans being present (see Ill. 36 D & F). During the daytime, the hedges provide greenery and hide the cars within the parking lots (see Ill. 35 D & F).

By Night



Ill. 36 Pictures of Viby Torv by night

The open areas, where the surroundings are visible, become predictable at night (see Ill. 36 C), as a hedge can limit visibility, create shadows, and hide what is around the corners. When arriving at Viby Torv, Viby Kirke is well lit and is thus still a visible landmark in the area (compare Ill. 35 F & Ill. 36 F).

Ill. 37 Location of pictures

Development

Congestion

Within the strategic development plan (helhedsplan) of Skanderborgvej in Viby, Aarhus Municipality elaborates solutions for reducing the congestion challenges on Skanderborgvej (Aarhus Kommune, 2021). Helle Hansen and Thomas A. Hostrup from Aarhus Municipality (Appendix 3b & 3c) both proclaim that it will not be ideal for placing a 'Park & Ride' facility at Viby Torv. A 'Park & Ride' aims to support travel combinations between a car and public transport for commuters that do not have access to public transport near their own home. However, Viby Torv is placed within four kilometres of Aarhus City Centre, and thus commuters are likely to continue their travel by car than shift to public transport. Furthermore, they elaborate that there will always be a need for cars within Aarhus Municipality. However, it is advantageous for the municipality to have heavy traffic along the ring road rather than through the city centre. One solution is bus rapid transit (BRT), described below. Another solution is to construct a new motorway ramp that connects the ring road to the motorway further away from Viby Torv (Aarhus Kommune, 2021). This directs the traffic onto the motorway rather than Skanderborgvej and thus leads to the heavy traffic flow around the residential areas in Viby. Furthermore, the ramp can be a solution to decreasing the traffic on Skanderborgvej, resulting in the potential to downsize the road from four lanes to two lanes.

Bus Rapid Transit



Ill. 38

Ill. 39

Aarhus Municipality plans to implement a BRT from Viby J. Station to Aarhus University Hospital, and the route passes Viby Torv (Appendix 5). Helle Hansen from Aarhus Municipality (Appendix 3b) describes the potential of the BRT as a high-frequency public transport with a recognisable and visible bus stop to ensure that the users are aware of the limited waiting time that the BRT provides. The route of the BRT will be a prioritised bus lane to limit the challenges of congestion (Aarhus Kommune, 2021). Helle Hansen (Appendix 3b) elaborates how the target group of the BRT are existing commuters travelling to the business areas and education institutions placed in the north of Aarhus. Furthermore, the BRT is routed to provide shifts between other public transportation routes between other municipalities and Aarhus City Centre.

Culture House

Viby Parish plans to renovate the existing parish building and convert its function into a culture house (Johansen, 2021). According to chairman Hans Christian Feindor-Christensen (Appendix 3d), the new community centre will be a place for concerts, weddings, and talks to create a unique meeting point and attractive function at Viby Torv. Furthermore, the culture house will collaborate with other culture houses within the parish located in both Brabrand and Åbyhøj to attract artists and performances. Hans Christian Feindor-Christensen ensures that the activities of Viby Kirke differ from the new attraction, and, thus, the culture house will also increase the diverse supply of functions that currently exist at Viby Torv. The parish building is placed next to the middle parking lot of Viby Torv, which is surrounded by dominant hedges. The idea is to demolish these hedges to create access and visibility from Viby Torv to the new culture house.

Identity

The dual identity of Viby Torv, described within this project as the 'village' and the 'city', is a crucial challenge pointed out by both Aarhus Municipality and Viby Parish. Hans Christian Feindor-Christensen (Appendix 3d) describes the area as "[...] sad, worn out and over trafficked [...]". Aarhus Municipality sees the potential of uniting the area in front of Viby Centret and the three parking lots and creating a sense of a square and city centre (Aarhus Kommune, 2021). This can be done by renovating the buildings within the area and creating a connection between the two districts in Viby Torv. By developing attractive urban spaces that consider the village's site-specific identity, the municipality seeks to develop Viby Torv into an attractive urban space. A mindset that Hans Christian Feindor-Christensen (Appendix 3d) also uses as a selling point when planning and funding the development of the new community centre.





Summary

The following section summarises the analysis and highlights the potential of how to develop Viby Torv. The output of the analysis will be concluded through a design concept and a set of design parameters that will be used in the design of an interdisciplinary mobility hub at Viby Torv. The illustration, see Ill. 42, substantiates the summary of the analysis in a legibility map of Viby Torv.

Historically, Viby Torv was developed to become a new city centre with a town hall, shopping mall and a main road connecting the area with Aarhus City Centre. The municipal amalgamation demolished the plans of a town hall at Viby Torv and thus created a leftover space. Today Viby Torv consists of three parking lots and an urban space in front of a shopping mall. These areas are divided by three roads: a heavily trafficked Skanderborgvej, which intersects with the second ring road in Aarhus Municipality, a trafficked Grundtvigsvej with access to the northern and middle parking lot and a small road, Bjørnbaksvej with access to the southern parking lot. The functions within Viby Torv are diverse and create different 'sociofugal and -petal spaces' within the area and between the functions. E.g., children walking between the school, the bus stop, and the shopping mall.

The functions at Viby Torv are placed across the area and therefore separated by the three roads. Viby Torv is a place prioritising the car and the technical functions throughout the area. There are three parking lots that are surrounded by hedges, which limits the access through the parking lots. Furthermore, the pedestrians can only cross the heavily trafficked Skanderborgvej at an intersection limited by a short amount of time. People are observed running or speedwalking across the intersection to prevent standing on a concrete platform in the middle of a heavily trafficked road. The parking lot at Bjørnbaksvej has a uniform pavement of cobblestones as the road, and the hierarchy between the pedestrians and cars is not defined. The area is primarily used as a 'Kiss & Ride' when parents drop off their children at school and as a transit road for cars to the kindergartens. Thus, there is an uncertainty in the hierarchy between pedestrians, cars parking, and those driving through the area. Even though the area is not defined as a parking lot, no other activities were observed than parking.

Viby Torv is the second-largest transit point in Aarhus Municipality, with a relative distance of 10 minutes to Aarhus Central Station. Thus, there are many combinations of travels with public transport within Viby Torv. This means that the functions within Viby Torv attract and distribute pedestrian flows, but there is also a flow of passengers shifting between buses. Aarhus Municipality works towards reducing the heavy traffic flow of cars on Skanderborgvej by implementing a bus rapid transit and a new ramp to the motorway to minimise congestion on both Skanderborgvej and the ring road. However, the car traffic must be placed somewhere within Aarhus Municipality, and the priority is to limit the heavy traffic within Aarhus City Centre.

When arriving at Viby Torv and observing the area, it becomes clear that there has been a historical development focusing on voluminous concrete buildings with a large scale in a dense area compared to the existing small scale, single houses built in bricks and tile roofs surrounded by greenery. The parking lots are a leftover space due to the historical development. However, it does not support either the identity of the original village or the modern city. Even though the area consists of building on different scales, the elevation enables visibility across the area of Viby Torv. Thus, Viby Kirke is visible from Skanderborgvej, and the shopping mall is visible from Bjørnbaksvej.

The parish of Viby plans to establish a culture house in the existing parish building to improve the existing supply of functions and activities at Viby Torv. The current functions attract different target groups – the school, kindergartens, and nursery home – with whom Viby Kirke collaborates in multiple activities and events. However, there is a lack of outdoor areas that supports public events. The parish's goal of the culture house is to support the need for rental premises for cultural events and private festivities. Furthermore, there is a shared vision between Aarhus Municipality and Viby Parish of how Viby Torv can become an attractive urban space within the municipality.

Throughout the analysis, it has become clear that Viby Torv has the potential and needs for being redesigned with a focus on both the mobility system and the urban space. Therefore, the design of the mobility hub should create a balanced and coherent link between the mobility system and the urban space at Viby Torv.



Potentials

- Creating a balanced link between mobility systems and urban spaces
- Design a recognisable transit point
- Prioritising accessibility for soft mobility

- Connecting the two identities of Viby Torv
- Supporting the visibility between the landmarks
- Supporting the collaboration between functions

Design Parameters



Focus on creating access between the 'sociofugal and –petal' functions within the area and supporting the existing mobility of Aarhus Municipality.

Functions



Encouraging the existing and upcoming functions within the area to provide activities to all user groups by focusing on borderless design.



Ensure the visibility between the existing landmarks of the area by incorporating the current elevation.

Ill. 44

Identity

Unite the different identities of the area by developing the unheeded mobility space into a mobility hub that links the functional mobility system and attractive urban areas.



Ill. 45



Concept

Viby Centrum is a centre in Aarhus Municipality that supports the liveable city and the everyday mobility of the citizens through a recognisable mobility hub and borderless functions that includes the surrounding areas. The new city centre fills out a leftover gap between buildings and becomes an active agent in improving the urban quality of Viby. Viby Centrum unites the identity between the concrete city and the historical village through site-specific elements that incorporate the existing landmarks and elevation. High-frequency public transport will support the many daily journeys to and from Viby Centrum. The temporal passenger shifting between transport modes - buses, shared mobility, soft mobility, or the private car - will experience a shift in the hierarchy as the pedestrians become the highest priority within the area. Viby Centrum will support the multiple functions that attract different user groups - both in age, interests, and needs - by creating access across the area. The landscape will combine the materiality of Viby Centrum but also provide aesthetic areas for residents and temporal pedestrians to stay and engage with the urban space. Viby Centrum will attract, connect, and distribute citizens through an attractive intermodal mobility system that provides opportunities for the individual's mobility needs. As a mobility hub, Viby Centrum will be a recognisable station for the intermodal mobility system and support the residential area's need for an attractive urban space and sustain the temporal passenger needs in everyday journeys. Thus, Viby Centrum will link the mobility systems with the urban spaces.







Ill. 47 The concept

PREREQUI-SITES

This chapter provides an overview of the conditions of the specific site where the mobility hub, Viby Centrum, will be designed. The prerequisites for the design proposal are based on achieving a mobility hub that links and balances the mobility systems and urban space. Through this chapter, three scenarios will be proposed with a focus on how a mobility hub will be balanced based on the prerequisites and site limits within each scenario.



SCENARIO A Focus on Mobility System

In this scenario, see Ill. 48, the site is determined by the placement of an efficient route for the new BRT that Aarhus Municipality suggests (Appendix 5). The BRT will drive in a prioritised bus lane, and other bus routes through the area will stay unchanged. Thus, the three current bus stops will remain spread across the intersection between the ring road and Skanderborgvej. Furthermore, Skanderborgvej and Grundtvigsvej will sustain their current capacity for traffic where the car is prioritised above soft mobility. This site includes the three parking lots, urban space in front of the shopping mall, and the intersection between the ring road and Skanderborgvej. When focusing on this site, the barriers of traffic through the site will remain and thus provide circumstances for a mobility hub that focuses primarily on efficient mobility system, see Ill. 49.





SCENARIO B Focus on Urban Space

This scenario, see Ill. 50, focuses on providing a united urban space within the framed site without the roads as barriers for pedestrians walking through the site. The BRT route will remain along the ring road. Skanderborgvej will either become a tunnel and thus lead the buses and cars underground to sustain the current capacity towards Aarhus City Centre or be closed like Grundtvigsvej and Bjørnbaksvej, with the need to redirect all the traffic around the site. This site includes the three parking lots and the urban space in front of the shopping mall. By closing the roads, the need for parking lots will be demolished, which could provide space for other urban attractions. A demolishing or reduction of the parking lot is described in Appendix 7. Within this site, the traffic is redirected, and the roads removed, leading to a potential mobility hub primarily focusing on the urban space. The circumstances of this site focus on the urban qualities rather than the efficient mobility system, see. Ill. 51.





SCENARIO C Focus on the Balance

The final scenario, see Ill. 50, shows a site where the BRT and other buses are redirected through the site on Skanderborgvej. The BRT is redirected along Skanderborgvej, Stenkildevej, and Ormslevvej before driving along the ring road (Appendix 8). This enables the placement of two bus stops on Skanderborgvej compared to the three current bus stops. Furthermore, Grundtvigsvej will be closed to allow an accessible urban area between Skanderborgvej and Bjørnbaksvej. A redirection of the traffic is described in Appendix 6. The site will include the three parking lots, the urban area in front of the shopping mall, and the two roads, Skanderborgvej and Bjørnbaksvej. The circumstances within this site enable a balanced mobility hub that includes both the mobility system and the urban space, see Ill. 53. This will be the site used within the design proposal of Viby Centrum.







VIBY CENTRUM

In this chapter, the design proposal of Viby Centrum will be presented. As described in Methodology, Chapter 04 p. 25, the design has been developed through an iterative process. However, this chapter will present the final stage of the design. First, the final masterplan will be presented to describe the linkage between the mobility system and the urban space. Thereafter, the site's different design elements and areas will be described. The sketching phase of the concept development and the examined references are presented in Appendix 9, 10 & 11.



Masterplan

Viby Centrum is a city centre for social interactions and urban activity that creates a gateway to the mobility system through the mobility hub. In this centre, the 'city' connects with the 'village' by using the existing elevation and thus creates a uniform urban space that stretches from Viby Centret in the northwest to Viby Kirke in the southeast. Furthermore, Viby Centrum with its dynamic landscape breaks the existing form of the squared built environment.

The function along Viby Centrum has become transgressive and moved across the cadastre and out in the urban space, making the functions visible and active for people passing by and existing users. The landscape's dynamic curves shape a basketball court, a scene and a platform for outdoor servings. The shape of the landscape reappears in the form of the hub pavilions and creates an overall dynamic expression and recognition of the different mobility services provided.

The functions exist in relation to each other, and the visitor can shift between the purpose of their stay at Viby Centrum. The passenger, who spends time waiting on a connecting bus, will become a part of the urban space during the temporary stillness of waiting time. Thus, the passenger can observe the activity unfolding in the landscape, grocery shop at Viby Centret, get a cup of coffee at the café, join a concert at the scene or watch a match of basketball carried out by children at Viby Skole. Waiting time becomes immersion time or turned into productive activities. The children playing basketball on the court can shift into a passenger when the bus arrives. This creates many flows and tempos in the mobility hub. The fast change between buses, the temporary stay, the extended stay, and those living in the area all benefit from the presence and activity each stay provides. The urban space benefits from the mobility system, but the mobility system also benefits from the urban space. Viby Centrum creates an entrance to the mobility system in the urban space and offers various mobility opportunities. Thus, this mobility hub supports the intermodal mobility system that focuses on providing for the needs of the individual citizens' journeys in everyday life.

1 Shielding traffic 2 Outdoor Serving 3 Bus Hub 4 Hot Dog Stand 5 Cafe & Kiosk

- 6 Carpooling & Flex
- 7 Park
- 8 Scene
- 9 Basketball Court
- 10 Kiss & Ride

Nørreport Station ------

Ill. 56 Aarhus University Park

Ill. 55

ll. 58 SEB Bank The green landscape, the open space, the elevating stairs, the hubs, and uniform pavement creates common materiality across Viby Centrum. A physical setting inviting to movement and rest. Flow and stillness. The stairs are dynamic, whereas the open spaces in the landscapes and between the hubs are motionless, but both support activities - a market, a coffee break, or an intermodal shift. The dynamic curves create a landscape, which supports the natural elevation within Viby Centrum, and becomes a park by ensuring greenery. The pavement becomes uniform, defines Viby Centrum's area, and creates visual connections across the roads. The two expanded light-regulated pedestrian crossings are made of the same material as the urban space and provide a safe crossing of Skanderborgvej and link the urban space in front of the mall with the rest of the area. The concrete pavilions become recognisable hubs that imitate the landscape and become connected with weathered steel lined in the pavement. The newcoming visitor will have a physical guideline within the mobility hub and an atmosphere inviting them to stay and rest. At the same time, the landscape supports the functions within Viby Centrum.

A New Skanderborgvej

Ill. 61

Skanderborgvej has become a transit point for high-frequency public transport and still supports cars and bicycles driving to or from the heart of Aarhus City Centre. A connecting road between the two centres: Aarhus City Centre and Viby Centrum. From being a four-lane road within a car-dominated hierarchy, a narrowing of Skanderborgvej creates an equal hierarchy between cars, public transport, and soft mobility. The mobility systems become smooth operations, where the passenger can enter and exit the bus without stopping the bicycles. The pedestrian on the sidewalk is sheltered from the traffic by both a bicycle lane and platform and can cross the road on a wide crossing with distance to the waiting cars. The bus drivers are undisturbed by the cars and are placed closest to the passengers, who can access public transport and the urban area. The car lanes are framed by greenery undisturbed by public transport. The shelters are placed at the square so the waiting passenger can be a part of the urban space and use the waiting time to observe the activities unfolding in the urban space.

Ill. 60 Section of Skanderborgvej

Recognising the Hub

When arriving at Viby Centrum – either as a passenger, a pedestrian, or a motorist – it is essential that the elements within the mobility hub are recognisable. The passenger has a hub pavilion that provides shelter from the weather, a place to rest, shift from bicycle to bus or gain information about the mobility system and the nearby functions. The motorist can park a shared car, shift to public transport, charge their car, or pick up a carpooling passenger. The pedestrian can walk between the hubs and, due to the recognisable materialities, follow the pavement and pavilions in their intermodal shift. In between all the hub pavilions is a staffed kiosk to provide personal guidance related to mobility opportunities and a sense of safety. There is somebody present throughout the day within Viby Centrum that keeps the eyes on the street and provides a cup of coffee for the busy passenger or the casual pedestrian passing by. At night the hubs light up and provide a visual connection and guidance between the hubs. The mobility elements support the intermodal mobility systems that Aarhus Municipality wish to provide for citizens' individual mobility needs.

G

Ill. 63 Pavilion for shelter, information, and rest when changing busses

Ill. 64 Pavilion for parking of shared cars, carpooling, bicycle parking, etc.

An Inviting Entrance

What once was an attractive and profitable shopping street in the open air is visible yet again by a landscape sustaining the flow of pedestrians streaming into the shopping mall. The landscapes frame the entrance of the shopping mall and create a perfect spot in the sun for resting, socialising and outdoor servings. Furthermore, the green landscapes create a visual and atmospheric barrier between the urban space and the heavy traffic along the ring road. The 'sociofugal' attractions of the shops and cafés inside the shopping malls create a flow of pedestrians - including the nearby residents buying groceries, the passengers in need of a restroom, and the curious pedestrian window shopping. Ill. 66 Section of the landscape and entrance to Viby Centret

The Dynamic Landscape

Ill. 67 Section of the dynamic landscape and functions

The shopping mall, the school, and the kindergartens are all functions needed in everyday life. The church, the culture house, and the park are functions needed within the social and spiritual life. Viby Centrum sustains the balance between these aspects. The necessities, enjoyments, and the forming of the modern, conscious human. The mobility hub is an efficient traffic machine supporting the human needs of movement, but Viby Centrums moves beyond and invites the cultural functions inside. A basketball court for children, bystanders and residents, and a scene for culture, education and activities. Through its diverse functions, Viby Centrum is a hybrid space that invites all individuals to the area no matter gender, religion or age. Nevertheless, it is a place that invites the long-term resident and the temporal passerby.

Scene activities

Ill. 69 Diagrams of activities at the scene

Kiss & Ride

Ill. 70 Section of 'Kiss & Ride'

A school and a kindergarten are necessary institutions in everyday life of a parent with young children. They are needed to educate and take care of children and enable free time to work, allowing the parents to support their family. There are many demands within the everyday life structures, and time is limited. Many parents choose to drive their kids to these institutions. Thus, a school and kindergarten are 'sociofugals' of children and 'sociopetals' of parents that have just handed their children to a caretaker or a teacher. The parking lot in front of Viby Skole is such a place that it needs to provide efficiency during the morning rush of everyday life. The 'Kiss & Ride' becomes a drop-off zone for children rushing to school or being followed by a parent, who will shortly enter their car again. Therefore, the parking area is also an efficient hub that supports the short drop-off, temporary parking, children who ride a bicycle to school, and cars driving through to surrounding kindergartens. Furthermore, the church can provide a parking area for visitors attending a wedding, funeral or Sunday sermon. By establishing defined spaces, it becomes possible to distinguish the parking from the driving, the pedestrians from the passengers, and the short drop-off from those following their children to class. Thus, the parking lot becomes a function within Viby Centrum rather than an unheeded mobility space of uncertainty within the hierarchy.

THE NETWORK

The chapter reflects upon the design proposal and discusses how the individual mobility hubs are dependent on a network of hubs within the mobility system. The discussion takes a point of departure in Massey's (1991) interpretation of 'sense of place' and Lynch's (1960) concept of 'mental mapping' to describe how the network of mobility hubs can be linked between the individual hubs. The mobility hub in Viby Centrum is designed through recognisable and site-specific materialities with the purpose of serving both the neighbourhood and the temporal user of the mobility system. Therefore, this discussion aims to reflect upon how the network of mobility hubs can be come recognised within the individual mobility hubs through a notion of the 'sense of network'.

A mobility hub is a link between an efficient traffic machine and an attractive urban space, see Chapter 01 p. 7. It provides qualities for both the neighbouring resident and the temporal passenger. Furthermore, the mobility hub can be seen as an individual place but also as a united system interconnecting the many mobility hubs within a network. Thus, a mobility hub represents both a network of high-frequency mobility systems and a place defined by mobility opportunities, material setting, and urban activities.

Through the theoretical chapter, see Chapter 03 p. 17, a place is defined through 'location', 'locale', and a 'sense of place'. Massey (1991) argues how the 'sense of place' has become global and needs to be seen within a network where the individual compares places and applies a unique identity of a place in relation to other places. This interpretation can also be combined with Lynch's (1960) notion of 'mental mapping', where the individual creates a 'mental map' of places to navigate and thus must recognise the network of places. The 'mental mapping' and the 'global sense of place' both relate to Agnew's 'sense of place' as the concepts focus on the individual's perception of a place. Mobility hubs can be understood as an individual hub, but also as a network of mobility hubs. Thus, the 'sense of place' becomes a part of defining the unique, individual mobility hub. However, is it possible to also define a unique network of mobility hubs through a 'sense of network'? To take this thought further the 'sense of network can become a part of a 'mental mapping' where the places are connected through the design of the material setting and recognisable urban elements. With this perspective, it is important to create a visual connection of the functions and mobility systems within the place to enable the individual observer to recognise the network of mobility hubs.

Within Viby Centrum, see Chapter 07 p. 76, the different elements support the 'sense of place' by focusing on gathering, leading, and spreading flows of passengers going to other parts of the city or users of the surrounding functions. By using a uniform and dynamic landscape, the two districts - the city and the village - become united, and the surrounding functions become integrated into Viby Centrum. Thus, the landscape is a site-specific design element that incorporates the existing elevation and enhances the site's potential to support the need for an attractive urban space and comfortable material setting. The landscape brings forth coherency and sustains the visibility from one end of the area to the other, between the functions, and between the dominant landmarks of Viby Kirke and the hotel. Other elements that support the 'sense of place' are the different mobility hub elements. With their recognisable design of pavilions shaped as the landscape to connect to the site-specific elements, these hubs should make it clear for the user of the mobility system were to catch a high-frequency bus, carpool, or ask for direction. The hub elements make the mobility system visible, both for the resident, the everyday commuter, and the newcoming visitor. It should be clear that this mobility hub enables access to high-frequency mobility opportunities. Through the design of the mobility hub, the urban space should provide activities for both the residents and the temporal user. In Viby Centrum, it is possible to go to school, grab a cup of coffee to go, or buy groceries. Thus, supporting the everyday life of citizens - both the resident and the commuter.

However, a question arises when creating the storytelling of Viby Centrum. Is it possible to have a 'sense of network'? The uniqueness and 'sense of place' become apparent through the site-specific design, identity, and functions. However, the mobility system running through the mobility hub connects the commuter to their final destination and connects the mobility hub with other mobility hubs in a united network. The high-frequency mobility system should be visible within the mobility hub. No matter the knowledge of public transport, it should be possible through design elements to recognise the system within the mobility hub. The BRT and other public transport are not

unique elements of Viby Centrum. They support the functions of the mobility hub and enhance accessibility to and from Viby Centrum - and connecting Aarhus Municipality. Thus, Viby Centrum relies on the people to create a 'sense of place' when comparing the place to other places in their network of socio-technical experiences. Nevertheless, it is also necessary for people to develop a 'sense of network', to notice the intermodal mobility opportunities that connect all places within Aarhus Municipality. The individual mobility hubs provide access to a multimodal mobility system within Aarhus. Still, the multimodal mobility system is only possible through a network of mobility hubs supporting travel combinations and intermodal shifts. As clarified, the mobility system relies on high-frequency access to mobility opportunities, whereas the material setting makes this mobility system visible within the mobility hub. Thus, the mobility hubs create a 'sense of place' through their unique activities and urban space that provides the needs of everyday journeys and everyday life within a liveable city. However, the mobility hubs also create a 'sense of network' as they are interconnected and provide a broader understanding of all the mobility systems and opportunities that provide as well as support for the citizens' individual needs within the liveable city.

When designing a mobility hub, the notions of 'sense of place' and 'sense of network' should be considered and supported through recognisable urban elements. Thus, the uniqueness of the individual place and the individual system becomes visible to the user. The elements should consider both site-specific conditions – elevation, coherency, and identity – as well as the intermodal mobility system that enables the network of mobility hubs. The design must be recognisable throughout the network of mobility hubs so that the individual can notice and perceive the connection of the network. Nevertheless, at the same time, the design of the mobility hub must be adapted to the individual context of the place to support the diverse urban spaces.

Ill. 72 A simplified network of mobility hubs

Conclusion

The research topic of this master thesis focuses on how mobility hubs can be designed as a linkage between mobility systems and urban spaces and, thus, be used as a development tool to obtain and sustain Aarhus Municipality as a liveable city. This concluding section focus on the thesis' research question:

How can a mobility hub be designed at Viby Torv to support the development of the liveable city through an interdisciplinary focus on the link between mobility systems and urban spaces?

To answer this research question, it has been necessary to understand the context of Viby Torv in order to develop the area into a mobility hub. The theoretical framework of the analysis focus on how 'mobilities design', as an interdisciplinary field, can be used to develop existing mobility spaces into socio-technic hybrids, which focus on enhancing the individual mobility behaviour as well as sustaining a liveable city. Furthermore, the context of Viby Torv is understood through Agnew's (Cresswell, 2004) threefold definition of 'place', Lynch's (1960) concept of 'mental mapping', Jensen's and Morelli's (2011) approach of 'critical points of contacts' and Osmond's (Jensen, 2013) concept of 'sociofugal and -petal spaces', as this framework includes both the material setting of the urban environment as well as the mobility systems and flows within Viby Torv and the surrounding area.

The main output of the analysis shows that Viby Torv is a result of different eras of development, which has created leftover space between a modern voluminous city and a low-scale and greenery village. This gap between the two districts and identities is an unheeded mobility space filled with parked cars, transit points, and heavy traffic that prioritises the cars. However, there is great potential to incorporate and connect the diverse functions surrounding Viby Torv. As well as support the many daily shifts between buses. Aarhus Municipality and other actors within Viby Torv want a redevelopment of Viby Torv that supports the public transport system in Aarhus Municipality and creates a uniform urban space that connects the two identities of Viby Torv.

Through the approach of 'mobilities design', the design proposal seeks to accommodate the potential of supporting an efficient traffic machine and a uniform and attractive urban space, and thus, include the BRT and other modes of transport through recognisable design elements and create coherency between the diverse functions. The design of Viby Centrum is accessible for the pedestrian, the passenger, and the resident and seeks to attract, direct and distribute the several flows in Viby Centrum. Through a dynamic landscape, the identities of the 'city' and the 'village' become interconnected and become landmarks that define the united mobility hub. Furthermore, the landscape supports the borderless design, which invites the surrounding functions into Viby Centrum and creates visibility of the many opportunities that the area provides. By narrowing Skanderborgvej and closing Grundtvigsvej, the accessibility through Viby Centrum is increased, and the transit point of the mobility hub engages the temporal passenger to engage with the urban space. Viby

Centrum is the link between the mobility systems and the urban spaces, and as a mobility hub, it supports the citizens' individual needs in a vibrant, liveable city.

Not only does this thesis propose a design that needs to include site-specific elements to enhance the potential of Viby Centrum. The design also includes elements that must be recognisable and linked to the multimodal mobility system. Through the discussion, the interpretation of Massey's (1991) 'global sense of place' and Lynch's (1960) concept of 'mental mapping' was reflected upon. Interpretation focuses on how the individual's association between a network of places defines Viby Centrum as a unique place through its material setting and functions. However, a mobility hub consists of both site-specific and generic elements to create the link between the mobility system and urban space. The discussion of the design proposal is based on the 'sense of network', which support the interconnection between Viby Centrum and other mobility hubs within Aarhus Municipality. It is concluded that Viby Centrum should consist of design elements that create associations with other mobility hubs - as a network of mobility systems - as well as design elements that support the uniqueness of the opportunities Viby Centrum provides. This creates the synergy between the mobility systems and urban space as the mobility hub: Viby Centrum.

Further Reflections

The Network of Mobility Hubs

This thesis focuses on developing a specific mobility hub at Viby Torv with a focus on linking the mobility system and urban space. As pointed out in the discussion, it is possible to understand the mobility hub through Massey's (1991) 'global sense of place', but it can also be argued whether it is possible to create a 'sense of network' based on the premise that mobility hubs must be supported as a network, interconnecting the mobility hubs.

Reis via Hub, see Chapter 01 p. 8, consists of a network of mobility hubs that extend across the two provinces of Groningen and Drenthe in the Netherlands. If comparing this thesis with Reis via Hub, there are several differences. One difference is that Reis via Hub's mobility hubs prioritises the traffic machine and efficient shifts between mobility systems. In contrast, Viby Centrum seeks to form an individual mobility hub that creates a synergy between the traffic machine and the attractive urban space. Another difference is that Reis via Hub extends two regions. Within this thesis, the mobility hub is a part of Aarhus Municipality's multimodal mobility system. Therefore, the network of mobility hubs is only considered within Aarhus Municipality.

However, it is interesting to question whether these municipal borders can be blurred. How large can the network of mobility hubs extend? Does the limit exist? In Reis via Hub, one of the prerequisites for a well-functioning network is that there is an interregional collaboration toward common goals (REG LAB, 2021). Meaning, that an expansion of the network of mobility hubs increases the involved actors. Viby Centrum can be considered in an inter-municipal context to support the network of mobility hubs in the region of East Jutland. However, Viby Centrum can also be considered in an interregional context to support a national network of mobility hubs.

There are several potentials and factors that are interesting in both the inter-municipal and interregional collaboration. E.g., there is a difference in how the regional transport companies collaborate with the municipalities. However, there is also a difference in municipalities' and regions' financial means and perquisites to support a network of mobility hubs.

As a further research topic, it could be interesting to investigate the possibilities of developing the network of mobility hubs that Viby Centrum is a part of. This can, e.g., be done by mapping the mobility systems and the many actors. However, there is also an interesting research topic regarding the conflicts that may arise in an intermunicipal or interregional collaboration when developing a network of mobility hubs.

The Balance between Mobility Systems and Urban Spaces

Within this thesis, mobility hubs are defined as a link between the traffic machine and the attractive urban space, see Chapter 01 p. 7. Thus, the mobility hub includes several types of functions and users. One perspective is to reflect upon the scale of the network of mobility hubs that Viby Centrum is a part of, as well as reflect upon the 'sense of network' that arises in a mobility hub. Another perspective is whether the balance between the mobility system and urban space can be transferred and sustained throughout the network of mobility hubs.

This thesis' design proposal describes how Viby Centrum, as a mobility hub, supports recognisable elements and technical functions that support the mobility systems. But the design proposal also describes the site-specific elements and landscape that create an attractive urban space. The mobility hub should support the individuals' 'mental mapping' and 'sense of place' through the material setting and functions, see Chapter 08 p. 91, to create a unique, individual mobility hub.

In this thesis, the mobility systems and urban spaces have been balanced, as the analysis showed that Viby Torv has the needs and potential to be developed in both parameters, see Chapter 05 p. 59. However, with other examples of mobility hubs, see Chapter 01 p. 8, it becomes clear that mobility hubs with a more uneven balance between the mobility system and urban space exist. In Odense, the mobility system is used as a driver for urban development. Whereas in Reis via Hub, the mobility hub supports the individual mobility needs that develop into urban spaces as well due to the increased flow through the mobility hub.

An interesting question is whether the mobility hub always needs to create a balance between the mobility system and urban space? Or whether there is a need for sub-categories of the mobility hub with an uneven balance? Some places require an efficient shift between modes of transportation, and other places require a stronger focus on urban qualities. However, it is important that the development of both the mobility system and the urban space is still enabled. The site-specific analysis is advantageous as the investigation of which needs and potentials the site has is essential in order to design a mobility hub that fits the specific site.

The mobility hub is a concept under development where it is possible to evaluate, adjust, and change the solutions (REG LAB, 2021). Therefore, as a further research topic, it could be interesting to investigate other sub-categories and definitions of mobility hubs and thus seek to understand the interface between the site-specific urban space and the borderless mobility system.

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Ill. 01: clker.com (2011) *Danmarks Kort Clip Art.* (Image). Accessed: 01.05.2022: http://www.clker.com/ clipart-danmarks-kort.html

Ill. 02-05: Own illustrations

Ill. 06: Illustration adapted from Jensen, O. B. (2014) *Designing Mobilities.* Aalborg: Aalborg University Press.

Ill. 07: Own illustration

Ill. 08: Own pictures

Ill. 09-12: Own illustrations

Ill. 13-15: Own pictures

Ill. 16: Aarhus Amtstidende (1960) Viby gør klar til at bygge raadhus. *Aarhus Amtstidende*. 27.08.1960, pp. 6-7.

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Ill. 21: Own illustration based on data from Aarhus Kommune (2021) *Bedre by i Viby – Strategisk helhedsplan for byudvikling langs Skanderborgvej*. Aarhus: Teknik og Miljø. Accessed on 10.03.2022: https://www. aarhus.dk/media/63983/helhedsplan_bedre-by-i-viby. pdf Ill. 22-24: Own illustrations

Ill. 25-28: Own pictures

Ill. 29: Own illustration

Ill. 30-31: Own pictures

Ill. 32: Own illustration based on data from Cappelen, J. & Jørgensen, B. (1999) *Observed Wind Speed and Direction in Denmark – with Climatological Standard Normals, 1961-90.* København: Danish Meteorological Institute. Accessed 10.04.2022: https://www.dmi.dk/ fileadmin/user_upload/Rapporter/TR/1999/tr99-13.pdf

Ill. 33: Own illustration based on data from https:// scalgo.com/live/ (accessed on 15.04.2022)

Ill. 34: Own illustration based on data from https:// miljoegis.mim.dk/spatialmap?profile=noise (accessed on 15.04.2022)

Ill. 35-36: Own pictures

Ill. 37-54: Own illustrations

Ill. 55: Magasinetkbh (n.d.) *Ny Nørreport.* (Image). Accessed 22.05.2022: https://www.magasinetkbh.dk/ projekt/ny-noerreport

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Ill. 57: Lundgaard & Tranberg Arkitekter (n.d.) *SEB Bank & Pension.* (Image). Accessed 10.05.2022: https:// www.ltarkitekter.dk/seb-en-0

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Ill. 59-72: Own illustration

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