In search of softness

Design strategies for improving walkability and soft mobility in between Spånga station and Rinkebydalen

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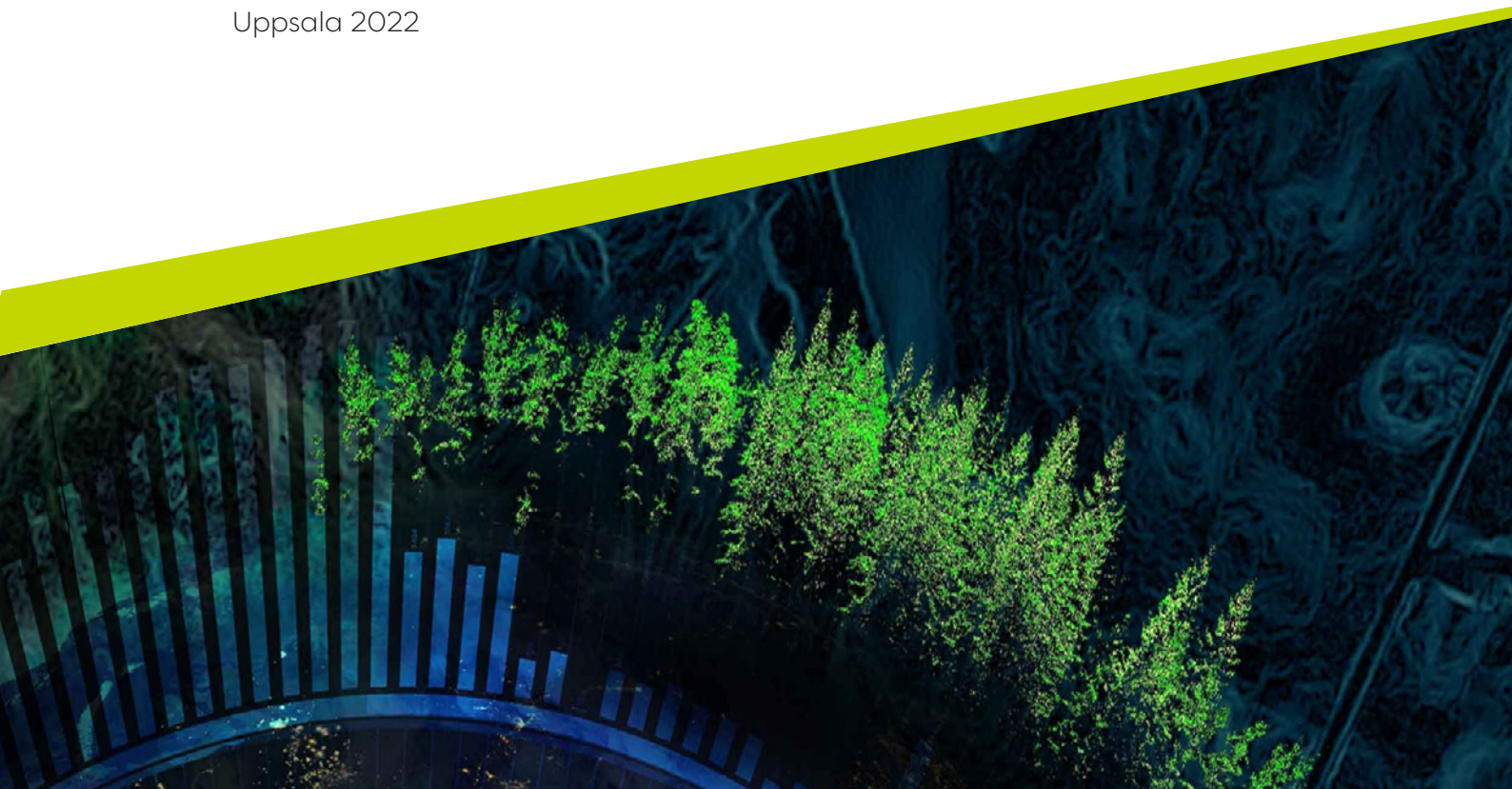

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Abstract

For millions of years humans have been walking to move from one space to another. And even though the landscape has changed significantly throughout history, walking remains an essential mode of transport in all environments across the world. Yet after years of technological development and innovation, other forms of transportation such as cycling, rolling a wheelchair, pushing a stroller or riding an electric scooter have broadened the possibilities for moving throughout the streets and sidewalks of cities. Today, many urban environments around the world are reshaping their street networks to make space for soft mobility and move away from the past notion of prioritising motor-traffic. In doing so, planners and designers must ask what is walkable and how both the physical environment and the services within it affect walkability.

This public life study develops site specific design strategies for strengthening walkability and soft mobility in between Spånga station and Rinkebydalen in Stockholm, Sweden. It does so through point in time public life observations where both human and non-human actors are observed to understand the relational qualities of a space. Moreover, the findings are analysed against an existing set of key dimensions for creating walkability. The result highlights problems and possibilities with walkability on site today and illustrates how walkability could be improved for several forms of soft mobility purposes. Additionally, the study highlights more general strategies for strengthening walkability which could be applied in a broader discussion on walkability and soft mobility.

The study concludes that what is walkable highly depends on the purpose of walking or moving in another form of soft mobility. Furthermore, human senses such as sight, smell, sound and touch all affect soft mobility patterns together with non-human actors such as natural and built objects and micro-climate. Understanding how one actor affects another is essential for designing walkable spaces.

Keywords: walkability, soft mobility, physical and service environment, relational qualities, design strategies, Stockholm.

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ANT	Actor-network theory

1. Introduction

I have always enjoyed walking. I walk to clear my thoughts, to get a breath of fresh air, to move my body and to explore and experience my surroundings. I recently moved to a new city and have since then spent the majority of my spare time seeing new places and discovering hidden gems by foot. My neighbourhood in Stockholm is known for its lush vegetation with old pines and oaks, and not too far from my house is a coastal walk stretching further than I have had the time to explore. I wish everyone had the privilege to live in a neighbourhood where pedestrian and cycling paths were easily accessible, designed along vegetated corridors and connected to the rest of the city.

Stockholm is an intriguing city to focus on through the perspective of walkability as the city's pedestrian and cycling planning ideals between the 20 and 21st century have shifted from traffic separations and prioritising motor-traffic, to incorporating cycle lanes and mixed-use streets to make space for walking, cycling and other forms of soft mobility (Andersson 1998; Stadsbyggnadskontoret 2010b). Soft mobility is described by Chapman & Larsson (2019; 2) as "human-powered, non-motorized ways of getting around, such as walking, cycling, skating, or skiing, that have relatively little impact on the environment and require people to be physically active". Moreover, remains of the old planning ideals are evident in the city's urban form to this day and are bound to collide with today's increasing demand for walkable soft mobility networks.

There are certain neighbourhoods in Stockholm which are highlighted by the City of Stockholm as focus areas for improving soft mobility connectivity (Stadsbyggnadskontoret 2018). The focus area Kista-Järva, situated in the north-western suburbs of Stockholm, is adjacent to the neighbourhoods Rinkeby, Bromsten and Spånga. Focusing this study on two carefully selected routes between Spånga station and Rinkebydalen will allow this study to explore an area facing walkability challenges and examine how the physical and service environment affects walkability on site today. In turn, developing design strategies for improving walkability and soft mobility connections in the area. More on the case and the selection process is found in chapter 2. Case: Spånga station to Rinkebydalen.

1.1 The walkability debate

Studies have shown several personal and societal benefits with walking, but also significant variations in walkability patterns amongst different groups of people. Walkability is a topic of interest for researchers in both the field of health and physical activity, environmental studies, and urban design and planning (Howley et al. 2009; Johansson et al. 2011; Jeffrey et al. 2019; Jennings & Bamkole 2019; Baobeid et al. 2021). Because of this, the scope of knowledge and findings is broad and when seen in a wider context, often intertwined across the different fields of study. When looking at walkability through the lens of landscape architecture, there is no doubt that health and physical activity, environment and sustainability, as well as the urban form and physical environment all affect and are affected by the way we shape pedestrian and cycling paths.

Several theories within urban planning have provided frameworks for planning for the pedestrian. In the United States, Jane Jacobs early on saw the problem of car-dominated planning (Jacobs 1961). The author and activist promoted pedestrian-friendly cities and heavily criticised the modernist urban planning ideologies. In Denmark and with inspiration from Jacobs, Jan Gehl has promoted walkability and the social benefits of soft mobility (Gehl 2011).

In more recent years, and perhaps with a boost from the societal effects on cities due to the covid-19 pandemic, The 15-minute city is being used as a model for making cities more walkable and equitable, ensuring that all residents' daily needs can be met within the distance of a 15 minute walk or bike ride. The model, coined by Carlos Moreno in 2016 was adopted in 2020 by the mayor of Paris, Anne Hidalgo as a vision for the city's urban development strategy (Ville de Paris 2021). Although the 15 minute city has become an internationally widespread term in the field of urban planning, many other terms are used to describe similar principles. This can be seen in Buenos Aires' Ciudad a escala humana (human scale city), Portland, Oregon's Complete neighbourhoods, Bogotá's Barrios Vitales (vital neighbourhoods) and Melbourne's 20-minute neighbourhoods (The Obel Award 2021). The following is a short summary of the current research on walkability and soft mobility.

Walking or other forms of soft mobility are broadly valued in urban planning for its environmental benefits. Prioritising soft mobility both reduces carbon emissions and energy consumption. This in turn improves air quality and creates a more democratic city as more people can afford to move between neighbourhoods throughout the urban fabric (Ureta 2008). Several of the United Nations sustainable development goals include sustainable transportation as a key component in mitigating the effects of climate change and reducing greenhouse gas emissions (United Nations n.d.a). Goal 11, "Make cities and human settlements inclusive, safe, resilient and sustainable", acknowledges the importance of working towards more inclusive and safe forms of transportation, especially directing attention to the needs of women, children, persons with disabilities and old persons (United Nations n.d.b).

Moreover, recent research has identified certain relationships between specific features in the built environment and social cohesion (Mazumdar et al. 2018). More precisely, walkability and access to destinations were shown to increase neighbourhood social cohesion. Yet, societal benefits of improving walkability and soft mobility is under debate, and although the majority of research points to increased social cohesion and social capital there are some calls to nuance the debate worth noting. Researchers in an Australian study state that the term walkability "is more complex than usually defined and that factors influencing neighbourhood sociability extend beyond issues of urban form" (du Toit et al. 2007). Ann Forsyth (2015) is a researcher in urban planning and design who, in her study on the walkability debate in urban design, concluded that what is most walkable differs and depends on the purpose of walking. Designing environments for walking to engage in exercise, enjoy the outdoors or socialise may need different elements than what might be needed for walking to commute, walk the dog or spend time with children. The author suggests that urban planners thus need a better understanding of the multiple dimensions of walking in order to create the most walkable environments.

This verifies the value to further explore how walkability and soft mobility can be strengthened in a site specific context and to develop design strategies which are suited for the site's specific set of soft mobility purposes. Doing so would provide insight into how features in the landscape such as services and physical elements support or hinder certain soft mobility purposes.

1.2 The physical and service environment

The urban landscape consists of buildings, streets, squares, green areas and water sources. Moreover, these all vary in heights, lengths, widths, facades, windows, textures, colours and species diversity. They are also filled with vegetation, seating, shelter, lighting and art. All these elements are part of the physical environment and are situated within, or in connection to, what is known as public space.

Public space is then filled with people, or life if you will. Yet defining public life, or life between buildings as Gehl (2011) puts it, is much harder than defining the more permanent nature of public space. Life is ephemeral, it is constantly changing and thus never the same. Public life, including walkability, is just as Forsyth (2015) noted heavily dependent on the physical characteristics of public space. Another important component to how public life unfolds is the surrounding service environment. The density and variation of services will influence people's movement patterns and the density of social activity a space holds.

When talking about services in relation to humans' everyday needs in cities, Moreno's 15-minute city model highlights six essential urban functions which are needed in a city (The Obel Award 2021). These human needs are living, working, supplying, caring, learning, and enjoying. In turn, they suggest functions or services such as housing, work, food, health, education, and culture and leisure. These essential functions form the physical and service environment, which in turn could affect walkability and soft mobility patterns.

1.3 Aim

The thesis aims to examine how the physical and service environment in between Spånga station and Rinkebydalen influences walkability and soft mobility patterns. In doing so, the thesis aims to develop a nuanced understanding of walkability and soft mobility which could be applied in a wider context. Furthermore, the study aims to provide design strategies for improving walkability and soft mobility within the studied area.

1.4 Research questions

- How is walkability and soft mobility functioning in between Spånga station and Rinkebydalen today, and how does the physical and service environment affect these patterns?

- What design strategies could improve walkability and soft mobility within the studied area?

1.5 Theoretical perspectives and definitions

This part of the chapter presents guiding theoretical perspectives which are used throughout the thesis. Additionally, terms which are especially important for the thesis will be defined in order to clarify their significance within the given context.

1.5.1 Actor-network theory

Actor-network theory (ANT) is a theoretical orientation based on the ontology of relational practices (Jóhannesson & Bærenholdt 2009). The theory was developed by sociologist Bruno Latour and provides a framework for studying and understanding social phenomena. Moreover, it suggests that all which exists does so in continually changing networks of human and non-human actors which all affect and are affected by one another. This implies that what appears more constant is a result of stable networks where involved actors exist in a balance. On the other hand, more flexible situations are a result of networks which collapse or transform into other networks and which are lacking a balanced actor-network.

In the case of this study, ANT coincides with my ontological foundation for the thesis which does not set out to provide an objective truth, but rather to interpret, describe and illustrate a set of subjective truths and perspectives. In turn, collectively forming an understanding of walkability and soft mobility in a site specific context. Public space studies have utilised ANT for approaching the ephemeral and relational qualities of social and material spaces (Kim 2019). The theory allows researchers to see the details in the complexity of public space by observing each human and both physical and non-physical non-human actor, in turn seeing how their relational qualities form ever-changing networks. This allows the researcher to see patterns and develop strategies which affect actor-networks in a desired way, ultimately designing better public spaces.

Furthermore, ANT supports the choice of method which aims to observe how people and the urban form are related and connected. The idea that multiple actors constantly are in play in shaping public space is central to the selection of observations made in this study. As an example, micro-climate, services and natural and built objects are observed just as much as people. The findings are then interpreted and analysed together with the underlying understanding that they are all interconnected and together form several networks, some stronger than others. In other words, ANT informs the choice of method through the study's aim of understanding walkability through human and non-human people and place relations. More in-depth descriptions of the observations are found in the Method and material chapter.

1.5.2 Creating walkability

Walking and biking are often used as umbrella terms for several forms of transportation which occur at a slow pace. Other terms such as slow or soft mobility are also used to describe similar activities. The thesis adopts Chapman & Larsson's (2019; 2) definition of soft mobility as "human-powered, non-motorized ways of getting around, such as walking, cycling, skating, or skiing, that have relatively little impact on the environment and require people to be physically active". Yet this study acknowledges that walking not only is a human-powered activity, but also includes wheeling, rolling and pushing. This is clarified to ensure that walking as a form of soft mobility is used as an inclusive term for all ways of moving at a walking pace.

Walkability is more challenging to define as it covers several research disciplines and is used in a variety of ways. Yet in the field of landscape architecture and urban design, a general definition of walkability is made by Wang and Yang (2019) as “the extent to which the built environment is friendly to people who walk, which benefits the health of residents and increases the liveability of cities”. Although, Forsyth distinguishes between definitions related to creating walkability, the perceived outcomes of walking, and using walkability as a proxy for better design (2015; 3). Forsyth states that creating walkability would involve dimensions of traversable environments, compact places, places of perceived and actual safety as well as physically enticing environments, see figure 1.

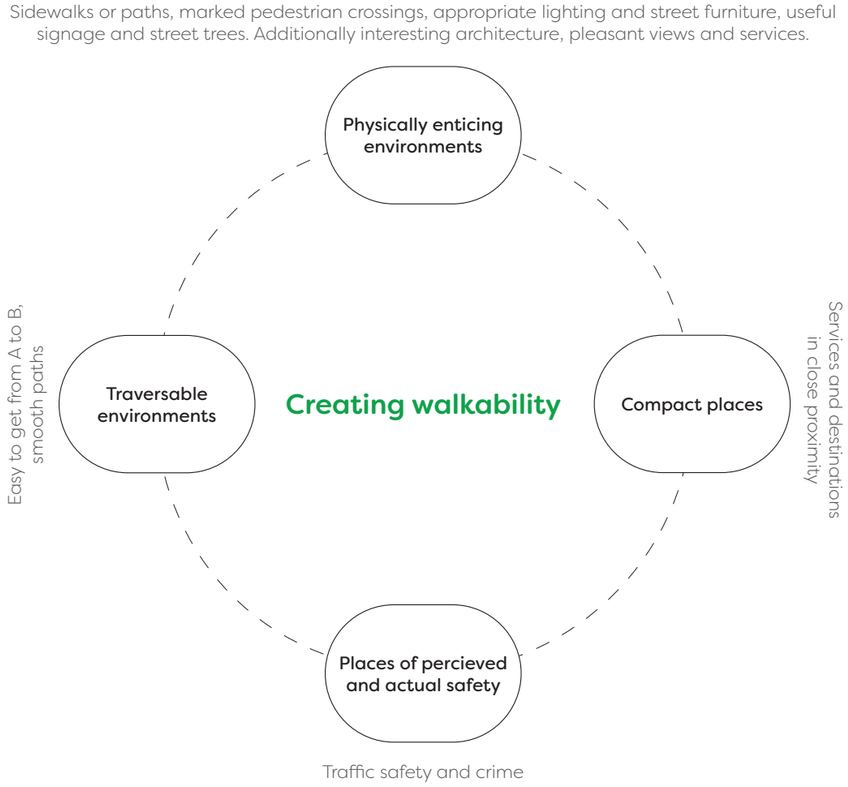


Figure 1. *Forsyth’s dimensions for creating walkability* (Based on Forsyth 2015)

These four dimensions for creating walkability are adopted in the observation analysis as a framework for understanding the degree of walkability on site. More on how they are used is explained under Method and material; Process. In order to analyse the observations against these four dimensions, a thorough understanding of the different themes is needed.

Traversable environments are by definition walkable according to Dictionary.com which describes walkable as “capable of being travelled, crossed, or covered by walking: a walkable road; a walkable distance.” (Dictionary.com 2022). In this definition, the distance is also noted as an element of a walkable place. This factor will be covered in the next dimension. Walkability is, in the perspective of traversable environments, about the physical infrastructure with elements such as the quality and shape of the path in relation to origins and destinations. In other words, traversable environments allow people to move safely between point A to point B. Moreover, Forsyth notes that what is traversable looks differently based on “... age, preferences, level of disability, weather, time of day, the attraction of the destination, perceived safety, other options available, hilliness, and numerous other factors.” (2015; 280).

Compact places are very much related to traversable environments. Yet the definition emphasises a high density or proximity of destinations and people. Moreover, Forsyth refers to the Australian Macquarie Dictionary which defines a walkable neighbourhood as “a neighbourhood designed so that facilities, such as shops, parks, transport, etc., are within walking distance for most residents” (Macquarie Dictionary 2022). Thus, compact places focus on the closeness of functions and services, including other modes of transport. Yet an area with high density in activity or destinations in close proximity is only walkable if the routes in between these areas are easily accessible and traversable. Here, it becomes evident how one dimension overlaps the other. Furthermore, Forsyth refers to (Methorst et al. 2010; Sohn et al. 2012) and elaborates that a walkable distance to destinations varies between “culture, perceptions, the attraction of the destination(s), and the ability to pay for alternative modes of transportation.” (2015; 281).

Places of perceived and actual safety covers both traffic safety and safety from crime. In this sense, safety is very much affected by other features such as sidewalks and safe crossings found in definitions of traversable environments and compact places. Forsyth elaborates that a walkable environment through the lens of traffic safety has some relation to “low traffic volumes or protection for pedestrians such as buffers, signalised crosswalks and traffic calming” (2015; 282). On the other hand, if a walkable environment is viewed through the lense of crime, other features such as lighting, absence of entrapment spots, signs of disarray or people perceived as threatening are in focus. Reported crime rates is also an influencing factor in creating walkable places, yet Forsyth (2015) refers to Lorenc et al. (2012) and draws the conclusion that perceived safety is most important for walkability, although perceptions could vary significantly due to gender and social class.

Traversability, compactness and safety are all related to the purpose of walking to reach a destination. Yet the last dimension, physically enticing environments, focus on the design of the physical environment with features such as street trees, vegetated buffers, benches, wayfinding, lighting and signalised crossings. Again, this dimension overlaps with the others, even though physically enticing environments are not necessarily related to walking for the purpose of reaching a destination. Moreover, Forsyth refers to Gehl (1987) and Speck (2013) and adds that views of diverse buildings and open spaces makes an environment interesting and draws people to the area. However, Forsyth states that Gehl and Speck’s aimed outcome for creating these environments is sociability, meanwhile physically enticing environments through the lense of walkability centres around the actual features in the environment. In other words, a physically enticing environment should encourage people to walk for pleasure and because they want to, not to achieve a certain level of sociability.

1.6 Method and material

This thesis is a public life study which centres around the case of Spånga station to Rinkebydalen. In short, a public life study examines the interaction between public life and space (Gehl 2013; 2). Such a study can cover several forms of data collection such as mapping outdoor furniture, counting pedestrians and observing activities. The primary tool for public life studies described by Gehl (2013) is direct observations.

Gehl's framework for public life studies is designed to help urban planners and designers in grasping the complexity and continuously changing dynamics of public spaces. The tools within this framework are specifically designed to examine people's behaviour and movement patterns in relation to the physical and social environment around them. These relational qualities are central to the thesis and motivates the choice of using Gehl as an influence in the research design.

Yet as mentioned earlier, Forsyth critiqued Gehl's methods for focusing on the outcome of sociability. As this study centres around observing, analysing and creating design strategies for walkability, it is important to clarify that I (the researcher) adopts Gehl's observation methods for studying public life in order to understand people's behaviours in relation to the physical and service environment. Furthermore, incorporating Forsyth dimensions for creating walkability ensures that the observations are analysed through the lense of walkability - not sociability, even though sociability could be an outcome of walkability. As a result, the design strategies are a product of combining the physical elements for creating walkability with the human and non-human actor-networks influencing people's behaviours on site today. Additionally, the study sits within the frame of a design oriented work due to the design strategies developed through observations and analysis described above.

Moreover, the study's theoretical framework, ANT, follows a similar principle as the public life observations, but expands beyond public life and space. Instead, ANT suggests that all which exists does so in constantly changing actor-networks. Direct observations are therefore a tool for approaching the complexity of walkability actor-networks on the selected site. Furthermore, ANT allows a more nuanced analysis of walkability by examining the observations against each other and through the lense of walkability.

This study aims to describe and explain a scenario rather than to strengthen pre-consumptions based on cause and effect. Descriptive studies such as this public life study are usually inductive in their nature, meaning it is impossible to gather all important variables beforehand. The results are therefore presented qualitatively, often using words and images rather than numbers and being out in the field is important as the aim is to observe a phenomenon in its natural setting.

1.6.1 Observations

When conducting studies on people in public space, observations have been proven to be valuable due to the method's ability to provide sufficient amounts of data without disturbing the object(s) being observed. This type of observation study is called passive or systematic and can be conducted both through the medium of a computer software and through the senses of a human observer (Gehl et al. 2013).

Both Jane Jacobs and Jan Gehl have written about human made observations as a key tool for understanding public life. For this study, the book *How to study public life* by authors Jan Gehl and Birgitte Svarre (2013) will serve as a foundation for the design of the observations. In their book, they stress the importance of dividing activities and people into subcategories in order to get specific information out of the complexity of life and public space interactions (2013; 11). The five key general questions to include in an observation study according to the authors are 1) how many? 2) who? 3) where? 4) what? and 5) how long?. What follows are detailed descriptions of how four of these questions will be observed in this study and why.

Question one (how many?) is an effective measurement to include as it gives a general picture of the density in movement a place experiences and could be of great interest to conduct before and after urban development projects. For this question it is of interest to both note the pedestrian flow and the stationary activity, yet after being on site and witnessing the lack of stationary activity, the observations for this first question will be limited to pedestrian flow. Observations on pedestrian flow will be divided into six categories; walking, running/jogging, supported (e.g., wheelchair), carried (e.g., stroller), rolling (e.g., skateboard) and people on bicycles.

Question two (who?) does not aim to examine each person on an individual level, but rather to categorise people into general groups of the public. While the authors admit that some inaccuracy naturally will occur, they suggest to note gender and age to get a basic understanding of the area's demographics. This study will divide gender into three categories; female, male and other/not sure. The age groups will be divided into five categories; toddlers (0-4), kids (5-14), young adults (15-24), adults (25-64) and seniors (65+). Toddlers will not be categorised by gender.

Question three (where?) is useful for understanding where people situate themselves in relation to other people, buildings, outdoor furniture, vegetation and the microclimate. A sunny space with seating might attract many when the sun is out yet be empty on a rainy day. The study will map out services and activities according to Moreno's six essential functions for people in cities (The Obel Award 2021) along with natural and built objects and areas with sun and shade. Observing where people move or stay in relation to these factors will help in developing design strategies further down the study.

Question four (what?) aims to highlight where people are meeting and how public space affects social activities. Gehl et al. (2013) distinguish between necessary and optional activities and suggest that all social activities exist in a gradient between the two. Distinguishing between necessary and optional activities is challenging as a stationary observer as you can not follow people's movement patterns from start to finish. With that said, there are certain indicators one can note. As an example, people sitting down and facing the sun can be interpreted as an optional activity whilst standing at a bus stop can be seen as a necessary activity. This study will place activities within a matrix where walking, standing and sitting is placed in a gradient between optional and necessary activities.

The time and day as well as the current weather conditions could have a significant impact on the results and are therefore essential to consider when observations are compared against each other. The observations were made between 13.00-17.00 on a weekday and is because of this limited to a specific time of day (midday to afternoon) as well as a specific type of day (excluding weekends). To further improve the study's reliability and gather a broader understanding of walkability on site, observations should have been made during the weekends too. Moreover, conducting observations during a longer period of the day would also broaden the understanding. Yet, due to time constraints the observations had to be delimited and adapted to fit within the time frame. Moreover, this delimitation is brought in to the analysis and discussion to ensure that the specific time and day as well as the weather conditions for the observations are considered in the work.

1.6.2 Process

In this study, observations are used for collecting the empirical data. The observations take a structured approach with the aim to examine two routes in between Spånga station and Rinkebydalen. The in-depth observations strive to describe the two routes current reality through the perspective of their level of walkability. More specifically, the observations will be interpreted through a set of categories based on Forsyth's (2015) four key dimensions for creating walkability, seen in figure 2.

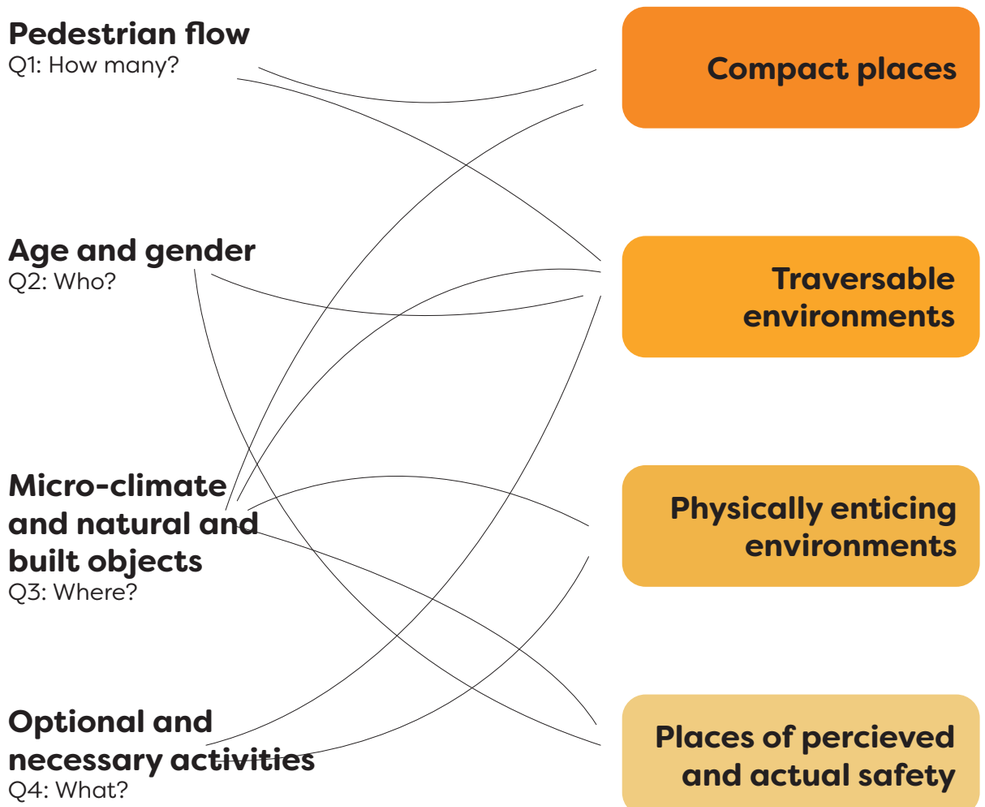


Figure 2. *Structure for observation analysis*

As noted earlier on, defining walkability is challenging as there is no universally accepted understanding of the term. Using Forsyth's dimensions for creating walkability is a way of concretizing the term and distinguishing it from the broader definition of walkability. As previously mentioned, the broader definitions often include outcomes of walking such as certain health benefits and walkability as a proxy for better design such as overall creating more sustainable and healthier cities. These outcomes are indeed important and motivates improving walkability, yet they do not provide any guidance in actually creating walkability. With that said, this study adopts Forsyth's dimensions for creating walkability as they are tangible and transferable into an urban setting.

Forsyth's dimensions are first used for analysing the observations. The analysis is both described in words and through mapping impacted areas. By doing so, the study will highlight, support or question existing assumptions on walkability and soft mobility through the perspective of Forsyth's dimensions. Furthermore, situating the results in the two routes in between Spånga station and Rinkebydalen. The outcome is then translated into a set of design strategies with Forsyth's dimensions as an underlying framework.

In other words, Forsyth's dimensions are both used for analysing the observations, and for developing design strategies. More specifically, the strategies are divided into four categories, all of which depart from one of Forsyth's four dimensions for creating walkability. By doing so, theory on walkability is joined by qualitative site specific understandings of how walking and moving in other forms of soft mobility functions today. The strategies are therefore a continuation and interpretation of Forsyth's dimensions, with more site specific elements and general strategy modifications based on the observation analysis.

Moreover, ANT informs the researcher's assumptions behind the design strategies in the way that the relational qualities between the different locations on site are thought of both as a whole site where one area affects the other, and in a more detailed scale where a specific location on site illustrates how one design intervention affects other interventions. Here, the theory is a tool for explaining and illustrating the relational qualities of the design strategies.

The four design strategies for creating walkability in the study's site specific context is first described in text and through conceptual pictograms. Thereafter, a conceptual plan is made to illustrate how the design strategies are translated into the urban form. To further explain certain key features in the conceptual plan, more in-depth illustrations are made to communicate the increased levels of walkability which could be achieved if the strategies were realised.

1.7.3 Material

In order to get a thorough understanding of the case and its context the researcher has studied primary and secondary sources. The material collected through primary sources are Stockholm City Council's planning documents such as the current masterplan, the sites adjoining planned and existing buildings as well as their functions, the existing green structure as well as walking and cycling routes.

1.7 Disposition

The study begins with a description of the case Spånga station to Rinkebydalen, starting off with an overview of the site in relation to the rest of Stockholm. By gradually zooming in on the site, important information for understanding the case context is presented in words and illustrations, finishing with a site plan which is used for the observations, analysis and results.

The observations and analysis chapter begins by presenting the observations in text and illustrations which all in turn are analysed and summarised to highlight relational qualities of walkability on site today. Moreover, ANT and Forsyth's dimensions for creating walkability are weaved into the analysis.

The following chapter, Design strategies and conceptual plan, presents the results of the observation analysis with four design strategies. The strategies are illustrated through pictograms to explain the conceptual representation of each strategy. Thereafter, a conceptual plan explains how the strategies are translated into the urban form. The chapter ends with more in-depth illustrations to further explain how the site specific alterations could strengthen walkability if implemented.

The discussion chapter reviews chosen theories and methods and examines how they affected the study. Observations and analysis are further examined following a debate on further research and finally, concluding thoughts.

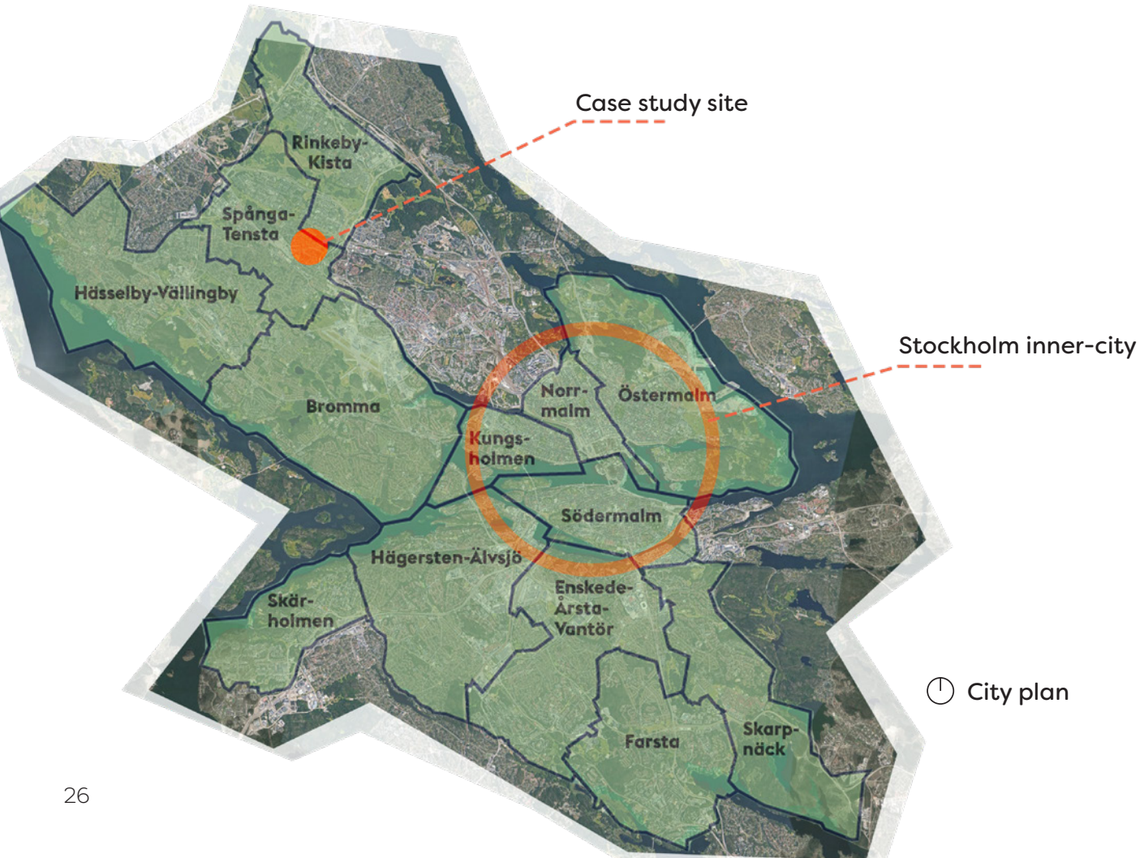
2. Case: Spånga station to Rinkebydalen

The following chapter presents the selected site more in depth, describing its connection to the rest of the city, Bällstaån and the adjoining neighbourhoods.

2.1 Understanding Stockholm's history of walkability

Modernist urban planning, with its precursor The Garden City Movement, came as a response in the 1920s to the polluted and unhealthy living conditions caused by the industrial era. Early influences from architects such as Le Corbusier envisioned large scale, high-rise residential and business blocks as seen in the Plan Voisin in 1925 (Fondation Le Corbusier n.d.). Modernism strived to redevelop the dense inner cities and develop the outskirts by building taller, allowing more sun exposure, open recreation areas and parking lots to fill the ground. This era was also deeply rooted in the belief that the car was the future of cities and that the built environment should be adjusted thereafter (Koglin 2014).

This ideal had a distinct effect on Stockholm's urban development between 1930s and 1970s, with zoning and traffic separations in the Stockholm General Plan in 1952 as an example of how streets gradually moved further away from buildings (Andersson 1998). These influences are especially apparent in Miljonprogrammet (The Million Program, translated by author), a state plan to combat housing shortage by building one million homes in the years between 1965-75. Many of the neighbourhoods built during this time period are characterised by urban sprawl and have been criticised for their lack of connectivity to the rest of the city. Ståhle (2008) describes the outcome as stretches of green areas and traffic in an archipelago of suburban districts. Areas such as Rinkeby in the north-western part of the city is one example, which will be touched upon later on in this study. Worth noting is that far from all residential blocks were built with tall large scale blocks, the most common building typology during this time was in fact the two to three story townhouse.



The years following modernist thinking in Stockholm's town planning constituted a pivotal shift. Urban sprawl was accepted as an unsustainable way forward, instead the city had to be densified. The car as the primary means of transportation was also under debate and soft mobility such as walking and cycling started to gain wider acceptance. The 2010 Stockholm masterplan, Promenadstaden (The walkable city, translated by the City of Stockholm) emphasised the need for mixed-use buildings and neighbourhoods as well as improving neighbourhoods connectivity with one another (Stadsbyggnadskontoret 2010; 5). The masterplan was also a key document for achieving their Vision 2030, with strategies to become "a world-class city" (Stockholm City Council 2010; 4). Within this vision, a specific strategy for the north-western suburbs was developed with the name Vision Järva 2030. The aim was to join up the street networks, focus on central corridors and develop new buildings to strengthen community identity (Stockholm City Council 2010; 65). Since then, projects such as Rinkebystråket have reshaped the separated traffic lanes from the past with the aim to improve mobility for pedestrians and cyclists in Rinkeby and connecting neighbourhoods (Stadsbyggnadskontoret 2010a, 2012).

One of these neighbourhoods is Spånga, and just in between Spånga and Rinkeby a new development called Bromstensstaden is under construction, providing water access through Bällstaån. Here, soft mobility is important for residents' ability to not only access the commuter train at Spånga station and services provided in Spånga centrum. But also to invite residents in Spånga, Bromsten and Rinkeby to the developing vegetated river corridor. Moreover, the emphasis on the issue of disconnected neighbourhoods, as seen in the masterplan from 2010, remains a factor in the city's current plan as they state that "Stockholm has a structure in which many local areas are virtually sealed off, with weak connections to neighbouring areas." and that "One key task for city planning is to make structural changes that counteract the restrictions in the urban structure and pave the way for a more cohesive city." (City Planning Administration 2018, 22). Furthermore, the council states that breaking barriers through increased mobility and open public meeting spaces would strengthen social cohesion which in turn would improve social sustainability (Dahlin 2015). In conclusion, improving soft mobility and connectivity throughout these neighbourhoods is important for weaving together the existing urban form with the new and as the City of Stockholm puts it, build a more socially cohesive city.

2.2 Selecting a case

With the historic perspective on walkability in Stockholm, the current development plans for Bromstenstaden and Bällstaån as a vegetated soft mobility corridor, and the City of Stockholm's existing strategic plan of improving walkability in the Spånga-Tensta and Rinkeby-Kista areas, the neighbourhoods Spånga, Bromsten and Rinkeby were located as areas of interest. To delimit the area and make the observation studies feasible, two routes within this area were selected as the case. More specifically, the site was selected with the following criteria; 1) the site was or could be connected to a wider soft mobility network. 2) the site was situated within or in close proximity to the City of Stockholm's focus area Kista-Järva. 3) the site was or could be connected to the vegetated soft mobility corridor along Bällstaån.

Tensta

Rinkeby

Bromsten

Spånga

Bromstenstaden

Sundby

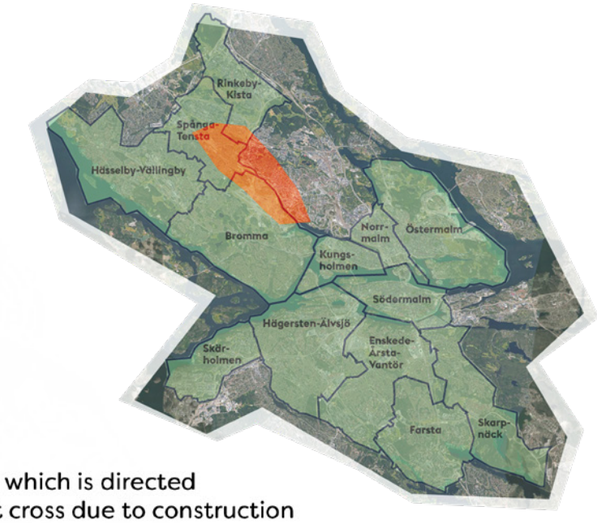
Solvalla

Mariehäll and Annedal

Bromma airport and Johannesfred

Solna and Huvudsta

Bromstensstaden's northern entrance is the endpoint of the Bällstaån, which continues underground into Spångaån further north. This area is of interest due to connections to Bromstensstadens adjoining neighbourhoods Spånga, Bromsten and Rinkeby. But also for the possibility of walking along Bällstaån from the suburbs towards the city centre and vice versa.
The circle marks the area of interest for this study.



The rail tracks act as a barrier both for the river which is directed underground, and for pedestrians which cannot cross due to construction work. A pedestrian bridge is planned by the City of Stockholm.

The highway and horse racing track are strong barriers which disrupts moving between the newly developed area of Annedal and the residential area of Solvalla. Here, an underpath is being built.

A heavily trafficked conjunction which leads pedestrians over a redlight. Noise is a disturbing factor and the river is directed underneath the roads.

The Huvudsta bridge is a breaking point for pedestrians on the western side of the river, taking the path over the bridge and continuing on the eastern side of the river, along Solna strand is the only way forward along the river. The western side is exploited with industrial buildings.

Barriers for movement along Bällstaån

This map shows the most evident barriers for pedestrians wanting to move along Bällstaån.

Figure 3. *City plan of Stockholm showing case study site* (Based on Google earth 2022) (p.26)
Figure 4. *Barriers for movement along Bällstaån*(Based on Google earth 2022)
Figure 5. *Overview map of Bällstaån plan* (Based on Google earth 2022)

2.3 An overview of Spånga station to Rinkebydalen

Spånga station is located about 14 km north-west of Stockholm central station. Driving and catching the commuter train between the two stations equally takes 20 minutes. The heavily trafficked station also runs buses which connect throughout the city. Spånga centrum, just next to the station, is a node in the area with grocery stores, corner shops and a market square selling fruit, flowers and vegetables. There are also offices, health care facilities and schools in the area. On the other side of the tracks, the old industrial neighbourhood is under construction to become a mixed neighbourhood called Bromstenstaden. The river Bällstaån runs through the centre of the development and onward to Annedal, Solna strand and eventually reaching the waters of central Stockholm.

The areas surrounding the construction site in Bromsten consist of villas and apartments, most of them are also home to old trees and lush vegetation. There are not that many services in this area apart from a second hand shop with a community centre, gas station, car repair shop, pre-school and the sports centre Spånga IP. A wide green corridor called Rinkebydalen adjoins the pre-school and sports centre, providing long stretches of paths for walking and other forms of soft mobility. Within this open grass field sits playgrounds, football fields, basketball and tennis courts and barbecue areas. Furthermore, the neighbourhoods Rinkeby and Tensta are found on the other side of the field with more services and access to metro stations.

Site boundaries and main routes for observations

The chosen site is an important transportation link between Spånga station and neighbourhoods Bromsten, Rinkeby and Tensta, both today and in the future with the development of Bromstenstaden. Here, cars, buses, cyclists, joggers and pedestrians will need to share space.

Important connecting routes

The case is connected to existing and proposed walking and cycling networks to ensure that walkability and soft mobility is seen in a wider context. All routes exist except the one through Bromstenstaden.

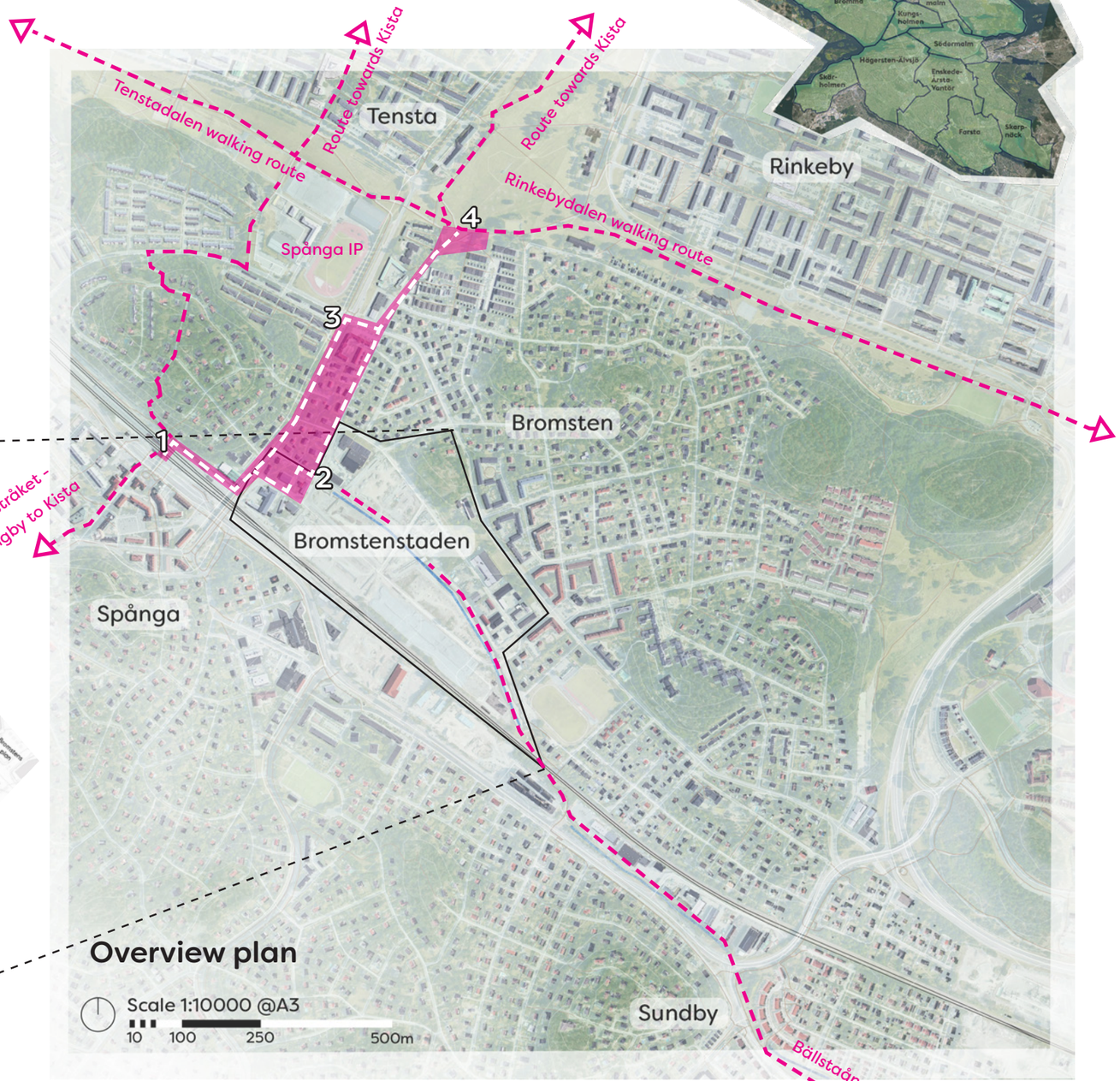
Figure 6. *Site plan of Bromstenstaden by White arkitekter* (Stockholm stad n.d.)

Figure 7. *Overview plan*

Figure 8. *City plan showing location of overview plan* (Based on Google earth 2022)

Key factors for selecting the two routes for observations

1. Spånga station: connecting node to the rest of Stockholm
2. Start and end of Bällstaån walking path: node and destination
3. Spånga kyrkväg: heavily trafficked car dominated street
4. Rinkebydalen: intersection for many pedestrians and cyclists



2.4 Spånga station to Rinkebydalen at eye-level

These images show the character of the area and provide eye-level information to complement the following site plan. To improve readability, each image is named according to the sites pointed out on the site plan.

Figure 9. Spånga station
The photo is taken on the pedestrian and cycling bridge at Spånga station to show the proximity to Spånga viaduct and the bridge connecting to Spånga kyrkväg.

Figure 11. Spånga viaduct
This photo is taken just to the right of Spånga viaduct, viewing the rail tracks. The tree marks the beginning of the pedestrian path up towards Spånga station. The old brick building is an unusual building character in the area.

Figure 10. Path to Spånga station (photo to the left)
This photo is taken near Spånga viaduct, facing Spånga station. The barbed wire fence marks the property for the business in the old brick building.

Figure 12. Spånga viaduct
The community centre and second hand shop is located on the other side of the viaduct. Barbed wire surrounds the buildings.

Figure 13. Spånga kyrkväg (photo to the left)
This street is a the main route connecting Spånga with Tensta and Rinkeby.

Figure 14. Access to Bällstaån
Although this area currently is a construction site, the view of Bällstaån adds character to the area.

Figure 15. Mjölnarstigen
This street is in need of improved physical infrastructure as the asphalt is uneven and the sidewalk is less than one meter wide.

Figure 16. Båtsman Stens väg
Adjecent to the gas station, this street sees a high number of cars in motion and parked along the street as seen in the photo.

Figure 17. Torpstugegränd
This photo faces the entrance to Rinkebydalen. The car parking along the street fills a large part of the street.

Figure 18. Entrance to Rinkebydalen
This photo is taken at the end of Torpstugegränd, facing the entrance to Rinkebydalen. The trees to the right spans around a playground.

2.5 Site plan

Scale 1: 3000 @A3

10 50 100 200m

Main routes for obesrvations

Secondary routes

Bromstenstaden boundaries

Spånga station

Path to Spånga station

Spånga kyrkväg

Spånga IP

Entrance to Rinkebydalen

Spånga center

Spånga viaduct

Access to Bällstaån

Mjölnarstigen

Båtsman Stens väg

Torpstugegränd

Cervins väg

Åkare Engströms väg

Spisbrödsvägen

Fröken Gåhles väg

Wingalists väg

Figure 19. *Site plan*

3. Observations and analysis

The following chapter describes the findings from the observation studies and mappings of the site and how these in turn provide insight into the development of site specific design strategies.

3.1 Observation: pedestrian flow

Table 1. Bench near Spånga station

Date: 19-04-2022
Day: Tuesday 13.20 - 13.50
Weather: Sunny, 15°C, wind 3 m/s

Walking:	28
Running/jogging:	0
Supported:	1
Carried:	3
Rolling:	1
People on bicycles:	2

Table 2. Bus stop Spånga kyrkväg

Date: 19-04-2022
Day: Tuesday 14.16 - 14.46
Weather: Sunny, 15°C, wind 3 m/s

Walking:	28
Running/jogging:	0
Supported:	2
Carried:	1
Rolling:	2
People on bicycles:	15

Table 3. Sand box Torpstugegränd

Date: 19-04-2022
Day: Tuesday 15.07 - 15.37
Weather: Sunny, 14°C, wind 4 m/s

Walking:	29
Running/jogging:	0
Supported:	0
Carried:	9
Rolling:	5
People on bicycles	13

Table 4. Bench Rinkebydalen

Date: 31-03-2022
Day: Thursday 13.08 - 13.38
Weather: Sunny and partly cloudy, 4°C, wind 1 m/s

Walking:	12
Running/jogging:	0
Supported:	0
Carried:	1
Rolling:	0
People on bicycles:	7

Figure 20. *Observation: age and gender + pedestrian flow*

Bench near Spånga station: Sitting on a bench facing the sun and the station. Most people are on their own. Male adults are the dominant demographic group. The pedestrian bridge is closed off so cyclists must take the route to the south on Spånga kykväg instead. This could have affected the results of only two cyclists passing.

Bus stop Spånga kyrkväg: Women often walk in groups of two or three, all men walk alone. Only five people got off the bus. No one got on the bus out of the six buses that stopped. Out of fifteen cyclists only three were women. Pedestrians move fast, although some seniors move slowly with walkers. Very busy street!

Sand box Torpstugegränd: Kids are running around on the car dominated street and people are picking up their kids after preschool on the same road. Significantly more women and toddlers here. The playground in Rinkebydalen was empty at 15.00 but packed at 15.40. A guy came up and wanted my number.

Bench Rinkebydalen: The single person who passed by with a stroller was an adult man. Women are seen more often in groups of two than men. An interesting observation was the frequently occuring 180° turns that people made. It was as if they were missing a circular path and instead had to walk 50% one way, then turn around and head back. These turns happened both to the left and right side of where I sat.

3.2 Observation: age and gender

Table 5. Bench near Spånga station

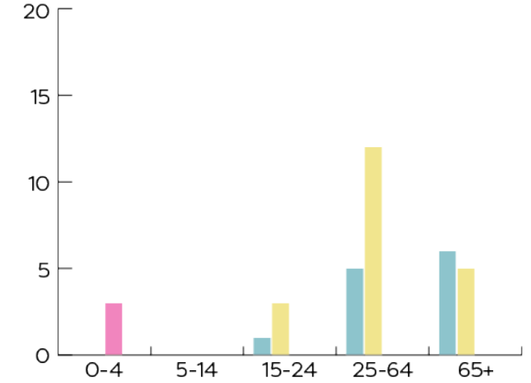


Table 6. Bus stop Spånga kyrkväg

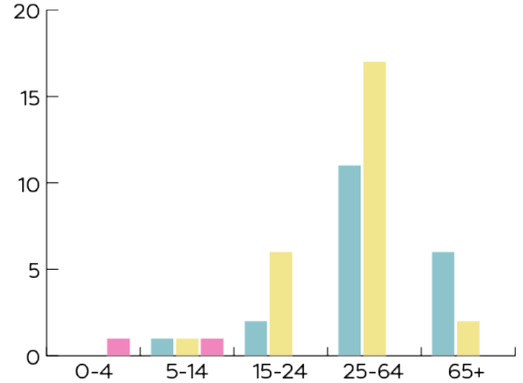


Table 7. Sand box Torpstugegränd

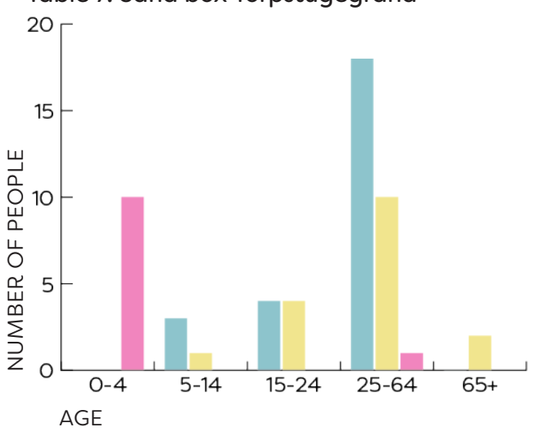
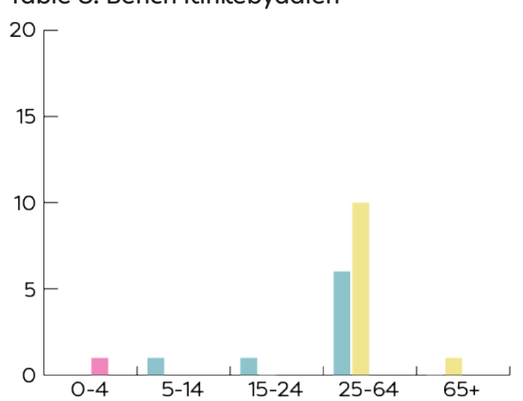


Table 8. Bench Rinkebydalen



3.3 Observation: micro-climate and natural and built objects

Starting off with mapping the functions and services on site is the foundation for continuing to observe people's movement patterns within the physical and service environment. The observation will thereafter look more closely on features such as sun and shade, materials and outdoor furniture.

Functions and services in the built form

Scale 1: 3000 @A3

10 50 100 200m

Figure 21. *Functions and services in the built form*

Photowalk describing micro-climate and natural and built objects

This walk was made to observe where people were situating themselves within the physical and service environment. The notes were made during the walk and highlight how micro-climate and natural and built objects are affecting people's movement patterns. The walk continues on the next page.

1. Spånga station facing Solhöjden, Figure 22
This pedestrian bridge is frequently used both by people travelling by public transport and by pedestrians and cyclists who want to cross over to Spånga centrum. Most people do not stop here but those who do either rest against the wall or the fence.

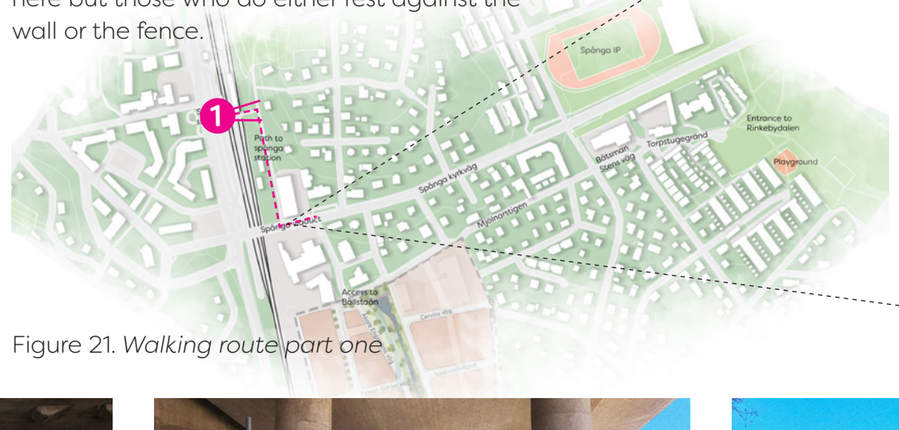
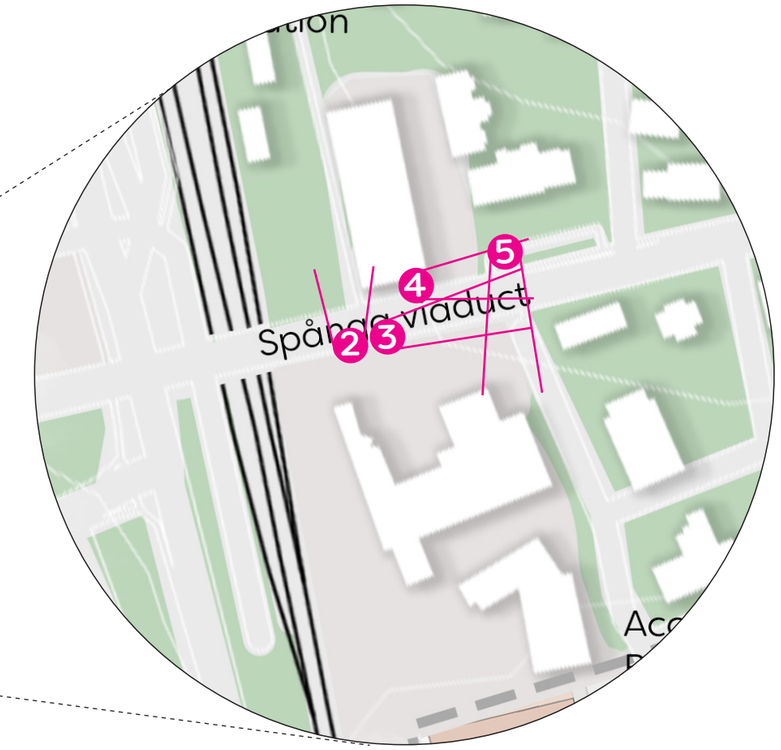


Figure 21. *Walking route part one*



2. Under the bridge facing path to Spånga, Figure 23
The bridge causes an abrupt change in micro-climate as the sharp shadow switches the warm sun to a cold and damp concrete underpass. The old brick building lights up the space but the barbed wire surrounding it makes the area uninviting. No one stops here, pedestrians and cyclists move past.

3. Under the bridge following the dotted path, Figure 24
The dotted lines on the asphalt and the walking and cycling sign directs people around the cars which are parked under the majority of the bridge. There are no lights here. Cars and pillars hide information about what happens after the turn further ahead.

4. Just to the left of the bridge, Figure 25
Pedestrians do not follow the dotted lines. Instead, they take the fastest route which means taking a sharp left at the brick building and joining the dotted path at the end of the bridge as seen in the image. This route is only suitable for able pedestrians as the surface changes in heights and materials with gravel, asphalt and kerbs.

5. To the north of the bridge, Figure 26
This end of the bridge has lighting as seen in the image. Two people are standing at the edge of the shadow talking for quite some time. The shelter caused by the bridge could be good for resting on sunny or rainy days although interventions such as better lighting, seating and removing cars would be needed for making it more enjoyable.

Photowalk describing micro-climate and natural and built objects

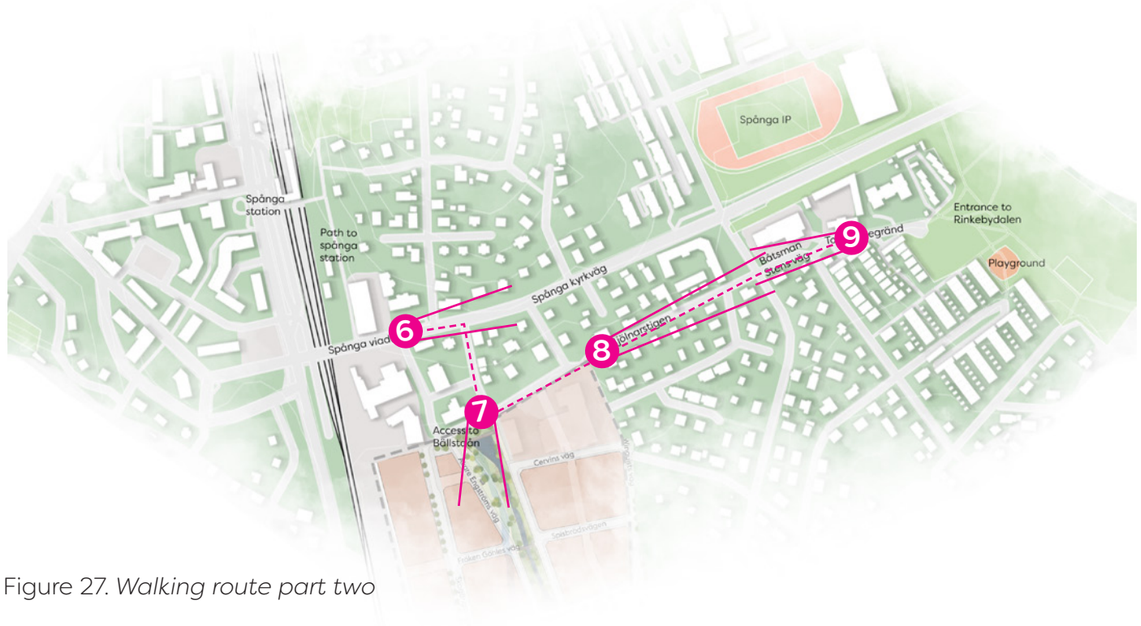


Figure 27. *Walking route part two*

6. Spånga kyrkväg, Figure 28
Good for public transport and motor traffic, less pleasant for walking and other forms of soft mobility. Commuting by bike works okay although the bike lane is about one metre wide. Vegetation creates a soft barrier to the residential houses but could be trimmed to allow pedestrians to walk without disturbance.

7. Bällstaån, Figure 29
The view over Bällstaaån is seen from the top of the road at the intersection with Spånga kyrkväg. The view could be a way to lead people down towards the more calm road on Mjölnarstigen. This area is a construction site at the moment but could be a node with services after Bromstenstadens development.

8. Mjölnarstigen, Figure 30
There are only residential villas and apartments in between Bällstaån and the intersection seen on figure 31. This makes the route less enticing for people to stay. The lack of shelter and seating could also be contributing factors. The sidewalk is less than one metre wide and the asphalt is uneven, making it limited to able pedestrians. Three senior women, one in a wheelchair, discussed taking this road but concluded that they instead had to take the busy Spånga kyrkväg due to the lack of sidewalks and uneven asphalt.

9. Båtsmans Stens väg facing Mjölnarstigen, Figure 31
There is a lack of cycling paths coming from Rinkebydalen and continuing past the intersection toward Mjölnarstigen. The gas station to the right, just outside the frame brings more car traffic to the street. This, along with car parking on the street makes it less traversable for walking and other forms of soft mobility.

Sketches of key physical elements affecting people's movement

These sketches describe the physical elements which notably affected people's behaviours. Most are physical non-human elements such as the benches, the sandbox and the trees. Yet they are interesting because they change purpose or use when combined with non-physical and non-human actors such as the heat from the sun or the noise from traffic.

Path to Spånga station 1
Feeling safe having the hill as my backdrop. I am not in the way or in the centre of the path. Good for people watching as the bench faces the station. Also great for enjoying the sun. People are often using the bench.

Figure 37. Sand box Torpstugegränd
Nice place to rest. Although not intended for seating, it does the job in an area lacking thereof. Facing the sun makes sitting here more enjoyable.

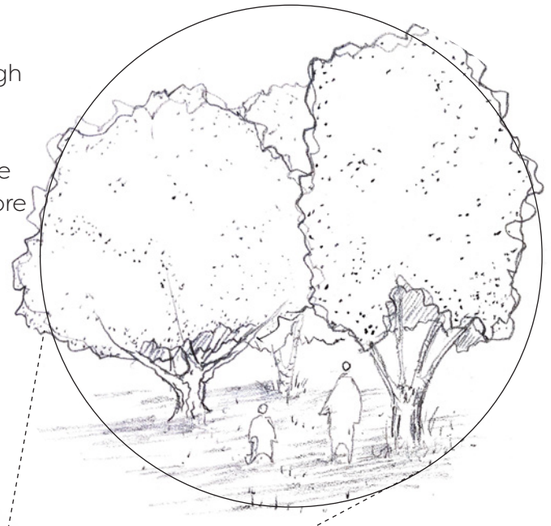
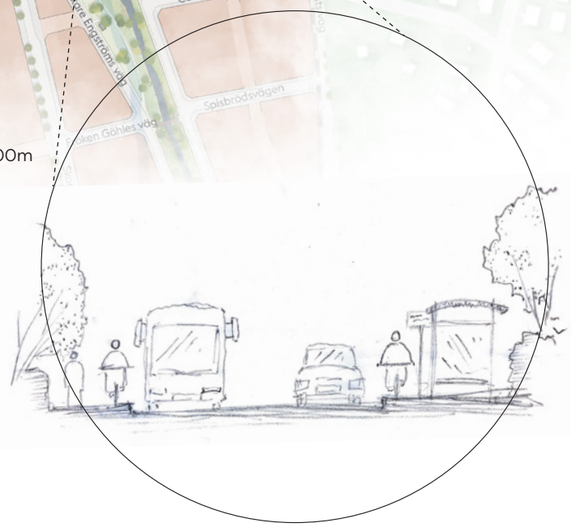


Figure 36. Fordonsparken playground in Rinkebydalen
On a warm and sunny day the trees act as an important shelter, providing shade for people in the park and playground. Kids are more in the sun playing while adults stand in the shade.

Figure 33. Path to Spånga station 2
I have not seen anyone use this bench even though it looks exactly the same as the one closer to the station. The view is not as good as up on the hill toward the station. The back faces a fence with barbed wire which also might influence people's behaviour.

Figure 34. Spånga kyrkväg
This street has good paving and wide enough paths for cyclists and pedestrians to pass by simultaneously. There are no benches here except from the bus stop. Motor traffic makes it noisy and not pleasant for sitting down.



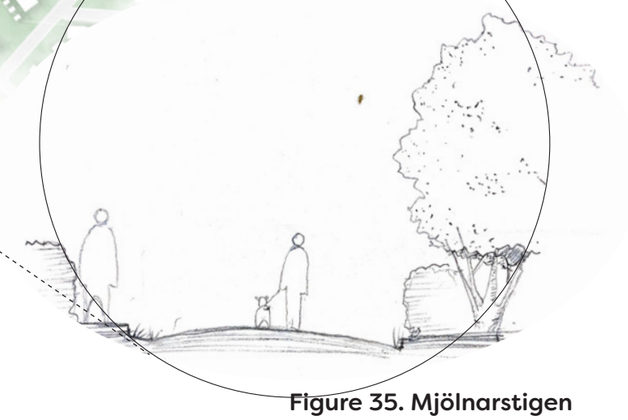


Figure 35. Mjölnarstigen
This street is undermaintained with uneven and cracking pavement. Vegetation is breaking through the asphalt and parts of the street are blocked off due to the construction site at Bromstenstaden. Only able pedestrians can pass through. The street is calm with a mix of villas and apartments. There are no benches here but people walk slower and often in the middle of the street.

3.4 Observation: optional and necessary activities

Figure 38. *Observation: optional and necessary activities*

	Optional		Necessary
Walk	Exercise	Take the commuter train or a bus	
	Socialise in group		Pick up kids
		Walk the dog	Buy groceries
	Playing in the playground		
Stand			
	Socialise in group		
Sit	Enjoy the sun	Rest	Wait for the bus

Table 9. *Optional and necessary activities*

The recorded activities are a result of observations made on foot on March 31 and April 19 in between 13.00 and 17.00. The dotted lines on the map show the walking route. Spånga kyrkväg and Mjölnarstigen are subject to both necessary and optional activities. Moreover, the areas closer to the station are seeing more necessary activities such as using public transport while the area in Rinkebydalen is seeing more optional activities such as socialising and enjoying the sun.

As mentioned in chapter Method and material; Observations, it is difficult to fully grasp what is an optional and what is a necessary activity. Sometimes, they can be both and change during the walk or movement. As an example, someone might take a walk in Rinkebydalen to enjoy nature but buy groceries or pick up kids on the way home. Moreover, exercise could be a necessary activity for someone with health problems with exercise as a prescription for recovery. These nuances are impossible for a stationary observer to understand, yet some general assumptions can be made. Picking up kids from preschool is assumed a necessary activity and becomes evident when seeing guardians walk in and out of the preschool. Taking the commuter train or bus becomes evident when positioned in proximity to public transport, the researcher draws the conclusion that people entering or exiting from Spånga station or a bus are taking one of the forms of public transport. Thus, the observer can not be one hundred percent certain of the activities purpose, yet a general understanding of them can be made which is presented in the table.

3.5 Analysis

To understand what strategies are needed for improving walkability and soft mobility on site, the results from the observations will now be analysed against Forsyths dimensions for creating walkability and with an emphasis on the relational qualities explained through ANT. The photographs are a selection of the sites mentioned in the analysis, all sites noted as walkable within their respective dimensions are illustrated in the maps. The analysis will be made one dimension at a time and conclude with an overall summary of the analysis findings.

Compact places is one dimension for creating walkability. The observation on pedestrian flow, revealed how two sites in particular were more compact in the density of people than the remaining site. The bus stop on Spånga kyrkväg and the sand box on Torpstugegränd both saw high numbers of walking and cycling pedestrians even though the physical environment on these streets are not compact. Yet Spånga kyrkväg is a part of the cycling network providing traversable environments and the ability to access destinations in proximity. This could explain why the high number of cyclists are seen here.

Torpstugegränd is not ideal for cyclists, yet, the entrance to Rinkebydalen could be a reason for the high number of cyclists here. Additionally, the pre-school on Torpstugegränd provides a service to the area which attracts kids and their guardians, in turn resulting in a high density of people in the observation. Less compact places are Rinkebydalen and Spånga station, although the station was subject to many pedestrians on foot. Here, it becomes evident that the site is not compact in the aspect of having a high density in destinations, yet the ability to access destinations in proximity is functioning to the degree that people move in between these areas.

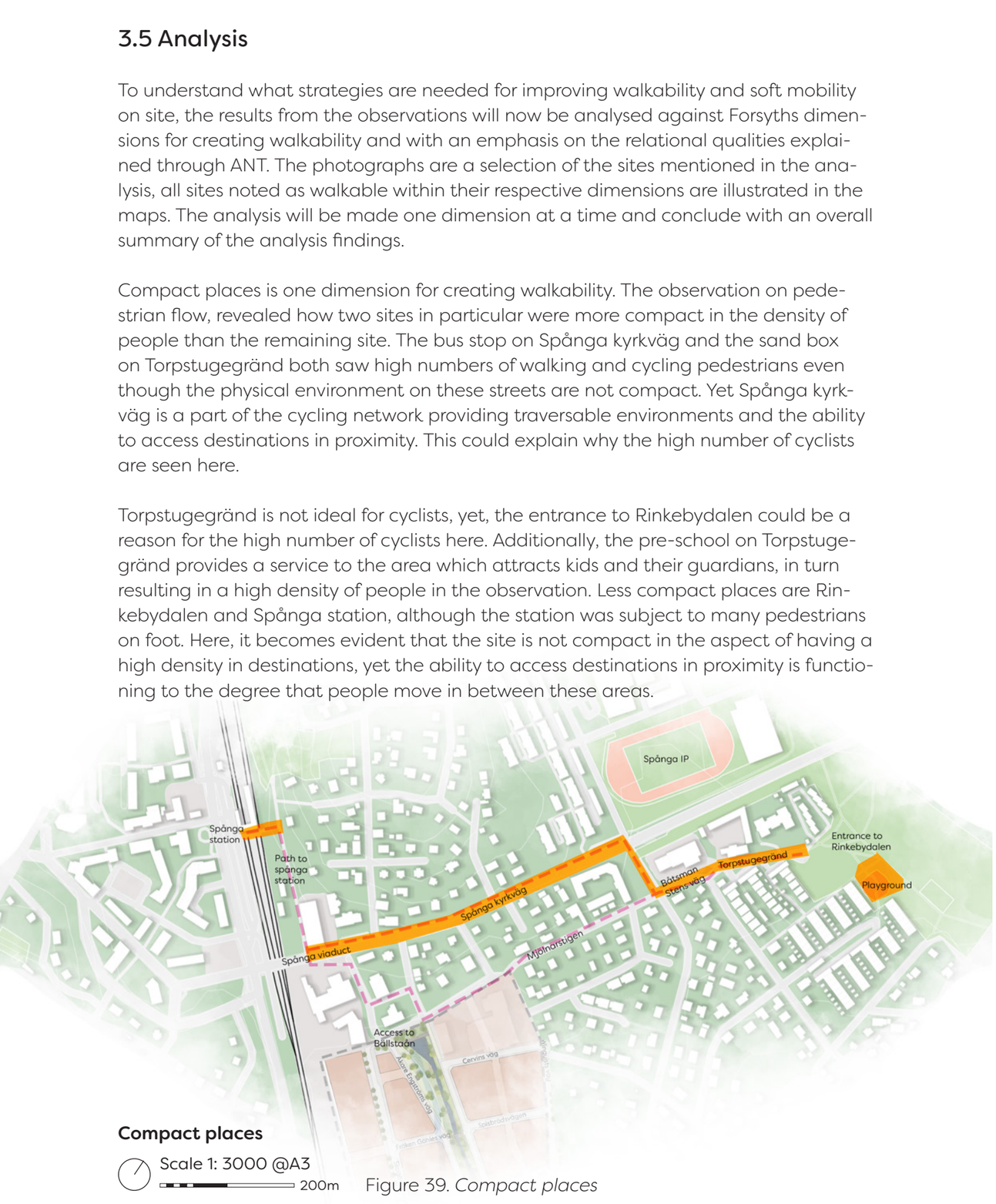


Figure 39. *Compact places*

The observation on micro-climate and natural and built objects found that trees in proximity to the entrance and playground in Rinkebydalen acted as a magnet, providing shade in the sunny weather. Additionally, the path under Spånga viaduct provided too much shade and insufficient places to rest, resulting in a very low density of people. Yet, on a rainy day, this could be a magnet, providing shelter just like the trees in Rinkebydalen did on a sunny day. Here, changes in the actor-networks between non-physical, non-human actors (micro-climate such as the heat from the sun) and physical non-human actors (trees and Spånga viaduct) affect human-actors behaviour within the space. Walkability, through the perspective of compact places is therefore highly relational and affected by both physical and non-physical non-human actors.

Figure 40.
Spånga kyrkväg is compact due to:
- Access to public transport
- Access to destinations
- Safe sidewalks and crossings

Figure 41.
Spånga station is compact due to:
- Access to public transport
- Access to destinations
- Pedestrian and cycling bridge

Figure 42.
Spånga viaduct is less compact due to:
- Sun providing too much shelter
- Car parking
- Lack of destinations

Traversable environments are highlighted both in the observation on micro-climate and natural and built objects, optional and necessary activities, pedestrian flow as well as age and gender. The observations found that traversable environments are perceived differently depending on who is passing through. As an example, able people found shortcuts such as the pedestrian who chose the uneven gravel path instead of the longer, dotted route underneath Spånga viaduct. Yet, rolling or supported pedestrians instead needed to prioritise smooth surfaces as seen when the senior woman in a wheelchair took the longer and heavily trafficked street, Spånga kyrkväg, instead of the calmer Mjölnarstigen due to the condition of the street and sidewalk. Moreover, the station, which sits up on a hill, is traversable due to the benches on the side of the pedestrian and cycling path which provide places to rest along the way. These examples illustrate how combinations of human and non-human actors together form networks, some more stable than others.

Additionally, both Torpstugegränd, Spånga kyrkväg as well as Spånga station sees a high number of people passing through which would suggest that they all are traversable. Yet to nuance this statement it is valuable to look at the age and gender observation in relation to this. Doing so highlights that Torpstugegränd and Spånga station sees a broad mix of ages and genders relative to the other sites. This would imply that these two sites are more inclusive to move through.

On the other hand, the trafficked street along Torpstugegränd and Båtsmans Stens väg is narrow and filled both with parked cars, cars in motion, cyclists and kids and their guardians entering and leaving the pre-school. Cars take up most space which makes the area less traversable for those walking or moving in another form of soft mobility. In this actor-network, it seems that the service environment (the pre-school and residential housing) is a dominant factor, acting as a magnet for people with cars. Even though the physical environment is not ideal for cars here due to limited car parking and kids running out on the street, the access to destinations and lack of traversable environments for reaching the destinations, result in the many cars noted here.

Figure 43. *Traversable environments*

In the optional and necessary activities mapping, optional activities highlight the most traversable environments since these places are areas without a must to pass through. People choose these to pass through because they want to. With that said, the most traversable environments are found in the open and asphalted path around the entrance to Rinkebydalen.

Figure 44. Båtsman Stens väg is less traversable due to:

- Uneven asphalt
- Narrow sidewalks
- Car parking
- Traffic

Figure 45.
Spånga viaduct is less traversable due to:

- Pedestrian gravel path
- No sidewalks
- Car parking
- Lack of signs and lighting
- Dotted lines are not the fastest route

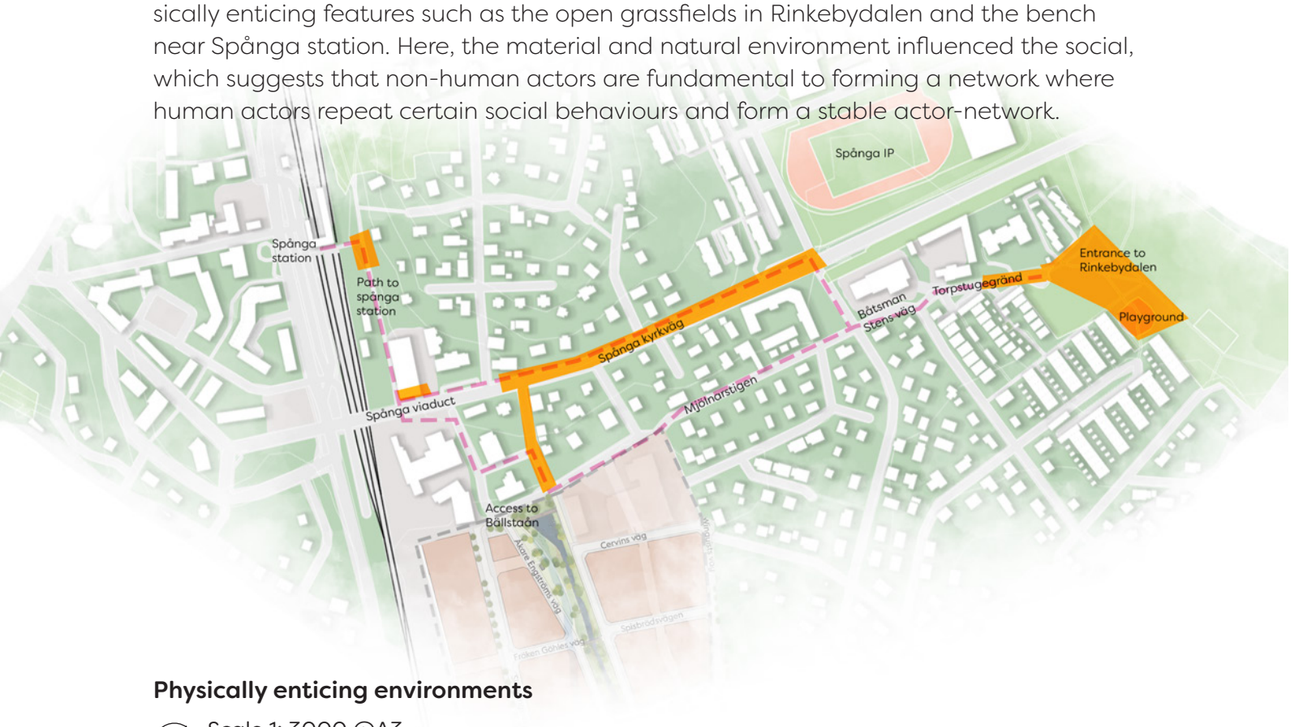
Figure 46.
Spånga kyrkväg is traversable due to:

- Cycle lanes
- Signs and lighting
- Well maintained asphalt
- Safe crossings

Physically enticing environments are found both through the observation on micro-climate and natural and built objects as well as the observation on optional and necessary activities. The observations found that the view over Bällstaån and Rinkebydalen were enticing features along with the street furniture near Spånga station and the trees around the entrance to Rinkebydalen. Although Spånga kyrkväg is equipped with sidewalks, the busy motor traffic makes it less enticing for pedestrians. On the other hand, it could be enticing for cyclists due to the cycle lanes. The old brick building next to the bridge adds character to the area.

The services on site are predominantly related to construction and industry, thus not giving much enticement to the area. The pre-school does however spill out the sound of kids playing which makes Torpstugegränd more inviting. Here, the non-human and non-physical actor of the sound of kids playing is an influential actor in the sense that the sound adds enticement to the area. This could lead to more people being drawn to walk here instead of hearing the sound of motor traffic on Spånga kyrkväg. In this sense, a non-human actor (sound) on one site, could affect human actors' movement patterns in between that site and another. Ultimately linking two actor-networks into each other. This broader relational activity is essential to understand as several sites continuously affect each other, forming actor-networks of varying size and stability.

The optional and necessary activities observations can be analysed by stating that all optional activities occur in physically enticing environments. That said, certain more necessary activities such as walking the dog and resting occured in areas with physically enticing features such as the open grassfields in Rinkebydalen and the bench near Spånga station. Here, the material and natural environment influenced the social, which suggests that non-human actors are fundamental to forming a network where human actors repeat certain social behaviours and form a stable actor-network.



Physically enticing environments

Figure 47. *Physically enticing environments*

Figure 48.
Bällstaån is physically enticing due to:
- Open views
- Access to water
- The fence

Figure 49.
The entrance to Rinkebydalen is physically enticing due to:
- Open views
- Lighting
- Well maintained asphalt
- Benches
- Places to play and socialise
- Cut grass fields
- Waste bins

Figure 50.
Spånga viaduct is partially physically enticing due to:
- The old brick building
- Trees in proximity to the viaduct

Figure 51.
The bench near Spånga station is physically enticing due to:
- Places to rest
- Well maintained asphalt path

Places of perceived and actual safety are located through observing age and gender as well as microclimate and natural and built objects. In areas where there is a wide variety of ages and genders, the analysis draws the conclusion that it is more safe. With that said, looking at reported crime and traffic accidents could significantly improve the understanding of safety in the area. Yet this study is, as noted earlier, solely focused on on-site observations for its empirical information.

The observations highlight that men were noted the most in all places except at the sandbox on Torpstugegränd. The preschool and the playground could be influencing factors as the same place also had the highest number of toddlers and kids. Still, Torpstugegränd has problems with traversability due to poor sidewalks and cars dominating the street. In this perspective, Torpstugegränd is safe for all ages and genders due to including services, yet not very safe in terms of certain features in the physical environment.

Seniors are seen the most in places connected to public transport. Safe places are in this case also Spånga station and the bus stop on Spånga kyrkväg. Physical features such as the parked bikes near Spånga station indicate the level of safety in relation to crime as it supports the idea that it is safe to lock your bike here. This in turn affects closeness and traversability, which together improve walkability. Moreover, the open fields in Rinkebydalen are absent of entrapment spots, again strengthening safety through the perspective of crime.

Places of perceived and actual safety

Scale 1: 3000 @A3

200m

Figure 52. *Places of perceived and actual safety*

Furthermore, lighting, safe crossings and wayfinding could strengthen safety both in terms of traffic accidents and possible crime. Additionally, these observations were conducted during the day and therefore missing the additional perspective of night time activities and how lighting in the area is affecting people's behaviour. Time is in this sense also an actor in the networks forming walkability and it is important to note that all places in the observation study could significantly change in perceived and actual safety as the sun sets or during rush hour.

Figure 53.
Spånga station is perceived a safe place due to:

- Broad age span
- Bicycle stands
- People in movement/ access to public transport

Figure 54.
The bus stop on Spånga kyrkväg is perceived a safe place due to:

- Broad age span
- Informative signs

Figure 55.
Sand box on Torpstugegränd is perceived a safe place due to:

- Broad variety in gender and age
- Kids playing
- Open views

and less safe due to:

- Traffic

3.5.1 Summary of analysis

The analysis shows a lack of compact places in terms of services. This affects people's movement patterns which is evident in the lack of outdoor furniture and places to rest. Moreover, many visited the pre-school by car, suggesting that the distance between the destination (preschool) and each individual's starting point was not within walking distance. With that said, other factors such as lack of time or disabilities could delimit the choice of walking or moving in another form of soft mobility for those people. In other words, understanding the context of human behaviour in relation to walkability is never as easy as observing the physical and service environment. Forsyth (2015) explains that other factors such as the price to drive cars and policies on parking as well as "... income, individual preferences, cultural values and climate" also influence walkability (2015; 279).

Traversable environments are limited to the station, Spånga kyrkväg and Rinkebydalen, meaning that there are connections in between these areas which need improvements to strengthen walkability. Yet as previously noted, changing or disturbing an actor-network on one site might disrupt or affect an actor-network elsewhere. The analysis has made it evident that reinforced infrastructure and other features for improving walkability on Mjölnarstigen is needed. Now, if these features were realised in a redesign of the street, it is likely that many pedestrians would choose that street instead of the trafficked Spånga kyrkväg. This could improve walkability both for cyclists and people moving at a fast pace on Spånga kyrkväg, and pedestrians and people moving at a slower pace on Mjölnarstigen. In turn, both streets could improve in walkability, yet for different purposes.

Physically enticing environments are highly individual and depend on the purpose of walking or moving within the space. In this case, Spånga kyrkväg encourages cyclists, whilst the entrance to Rinkebydalen is more enticing for pedestrians. This highlights the need to strengthen the urban landscape in all areas except for the entrance to Rinkebydalen in order to improve walkability both for those with optional and necessary purposes. Moreover, enticing environments were found to be sensed through more than just sight. Other factors such as the sound of kids playing, the noise from traffic and the smell of grass affected walkability in terms of the level of enticement those experiences created. A physically enticing environment should therefore be rephrased as an enticing environment and designers and planners should aim to include all senses in the enticing experience of a place.

Safe places are difficult to draw any detailed conclusion from as the observations did not take place after the sun had set and is therefore limited to understanding safety through the perspective of daylight. Yet, the analyses reveal that the playground in Rinkebydalen and certain services brought a wider mix in demographics to the site. This would imply that elements inviting to stay, play and socialise could create more safer places for soft mobility activities. Additionally, time is an important non-human actor along with climate and physical non-human actors such as signs for wayfinding, lighting and safe crossings and sidewalks.

Moreover, out of the observations on pedestrian flow and age and gender, three observations were made on the same day and one, the bench in Rinkebydalen, was made earlier. There is a significant difference in the number of people passing by on the two days, with less people noted on the bench in Rinkebydalen. This could partially be explained by the temperature gap, as it was 10 °C colder that day.

Lastly, the analysis highlights how certain material elements experience a wider variety of events than others. As an example, the bench in proximity to Spånga station is solely used for sitting, meanwhile the trees near the entrance and playground in Rinkebydalen are used for avoiding the sun, leaning against and playing with or in connection to. Murdoch (1998) explains this phenomena as spaces of prescription and spaces of negotiation. The space of prescription occurs when an object's intended use aligns with the actor's interactions, in this case the bench intended for sitting is used as such. This process has a stable but narrow variety of spatial interactions. Meanwhile, the space of negotiation does not have a set intended interaction, therefore opening up more, but less stable and frequently compromised opportunities for interaction as seen around the trees in Rinkebydalen. However, both prescribed and negotiated spaces can emerge from the same networks and overlap each other (Kim 2019).

Summary of walkability on site

Scale 1: 3000 @A3

200m

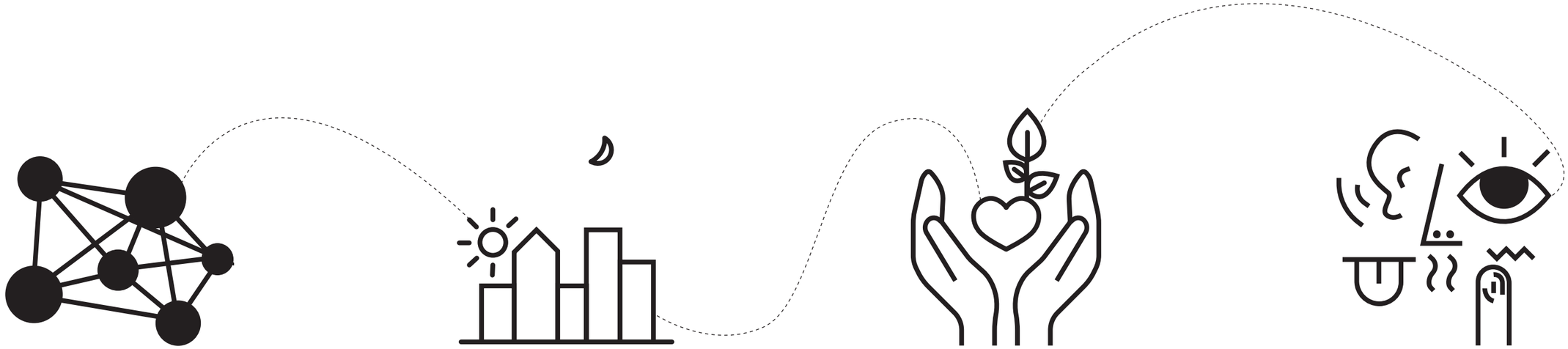
Figure 56. *Summary of walkability on site*

4. Design strategies and conceptual plan

With the insight gathered from the observations and analysis, site specific design strategies are presented along with a conceptual plan and more in-depth illustrations which communicate how walkability and soft mobility is improved.

4.1 Design strategies

These four design strategies are a continuation and an interpretation of Forsyth's four dimensions for creating walkability. Modifications have been made as a response to the findings from the analysis. Additionally, more site specific strategies have been formed to provide guidance for the conceptual plan and allow actor-network details to appear in the illustrations following thereafter. Moreover, the strategies are all connected with one another, forming its own actor-network which collectively produces knowledge about strengthening walkability and soft mobility in between Spånga station and Rinkebydalen.



1. Connect,
Figure 57
Make Mjölnarstigen pedestrian friendly with street trees, places to rest and a safe crossing over the busy intersection toward Rinkebydalen, and create a natural transition from Mjölnarstigen to Bällstaån in Bromstenstaden. Enhance traversability for commuters and fast paced soft mobility on Spånga kyrkväg by improving wayfinding and increasing bicycle stands in proximity to the station.

2. Densify,
Figure 58
Add a variety of services with mixed opening hours in connection to the second hand store and community centre and make them spill out to the street and connect to the bridge underpass. Furthermore, add more services in connection to Bällstaån and the gas station and allow spill out on the pedestrian friendly streets Mjölnarstigen, Båtsman Stens väg and Torpstugegränd.

3. Protect,
Figure 59
Remove car parking from the street on Torpargränd and Båtsman Stens väg and make them pedestrian friendly streets along with Mjölnarstigen. Add rainbeds on Mjölnarstigen to help mitigate flooding in Bällstaån. Improve visibility between the bridge and Bällstaån by removing industrial buildings to form a smaller park.

4. Entice,
Figure 60
Improve lighting and add elements for playing, socialising and walking at various tempos under the bridge and onwards to the station. Remove car parking under the bridge and invite local artists to make art installations on the concrete pillars and walls. Design a fast track to Spånga kyrkväg and a slow track to Bällstaån and Mjölnarstigen.

4.2 Conceptual plan

Scale 1: 2000 @A3

10 50 100 200m

Figure 61. *Conceptual plan*

Bicycle stands and vegetated pedestrian path
Adding these stands will aid cyclists ability to safely park their bikes on this side of the station, improving connectivity. Moreover, the pedestrian path becomes a welcoming entrance toward Bromstenstaden and onwards.

Squares
Both the community centre close to the bridge and Bällstaån act as nodes in the area. Designing squares on these sites will improve wayfinding and provide places to rest and socialise.

Park
Moving industrial buildings and making space for a neighbourhood park will improve visibility between the bridge and Mjölnarstigen. Additionally, opening up views over Bällstaån will create an enticing environment.

Commuting route
Spånga kyrkväg is already a fast paced street with functioning cycle lanes. Improving connectivity under the bridge will help cyclists on the way to Spånga station.

Pedestrian priority street
Mjölnarstigen, Båtsman Stens väg and Torpstugegränd form a vegetated link between Spånga station and Rinkebydalen. This route is suitable for those who walk or move in another form of soft mobility with the purpose of relaxing, socialising and exercising. Yet it can also be the fastest route for moving between, for example, Rinkebydalen and Bällstaån, thus providing space both for optional and necessary activities. By limiting car traffic and reducing speed limits, this vegetated link is a safe alternative in terms of traffic safety. Furthermore, the rain beds reduce the risk of flooding in the area which in turn improves safety and connectivity.

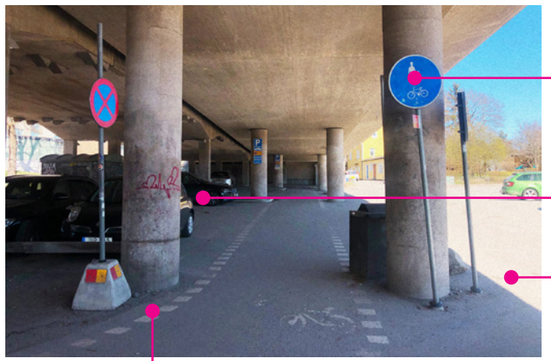
Secondary routes
To improve connectivity, all routes in between Spånga kyrkväg and Mjölnarstigen/Båtsman Stens väg will need to be included in strategies to strenghten elements such as the quality of the physical infrastructure, lighting and wayfinding.

Services
A richer variety and density of services creates compact places which in turn could increase natural surveillance, improving safety in the area. Adding more services in connection to the pedestrian priority streets would therefore contribute to improving walkability and soft mobility on site.

Spånga station
Path to Spånga station
Spånga kyrkväg
Spånga viaduct
Mjölnarstigen
Båtsman Stens väg
Torpstugegränd
Entrance to Rinkebydalen
Access to Bällstaån
Cervins väg
Äkare Engs gata

4.2.1 Spånga viaduct

Figure 62. *Spånga viaduct*



Protect Spånga viaduct by improving wayfinding and lighting

Entice Spånga viaduct by designing spaces for negotiation which can be used for several purposes such as playing, socialising and taking cover from weather

Densify Spånga viaduct by allowing services to spill out on the square

Connect Spånga viaduct by improving pedestrian and cycle routes

Figure 65. Spaces of negotiation

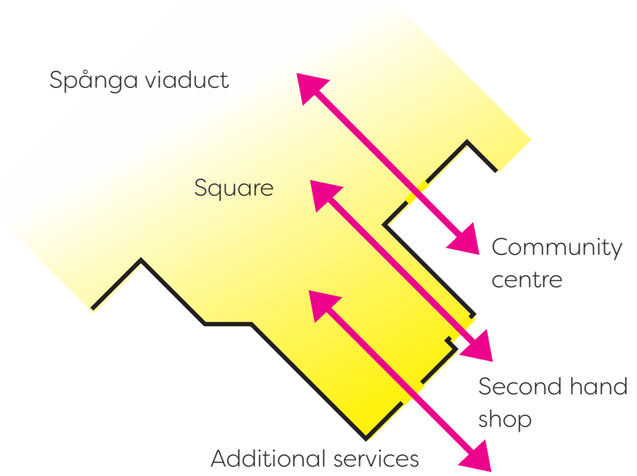


Figure 66. Spill out services creates an active square with natural surveillance towards Spånga viaduct.

Cycle lane/fast pace

Pedestrian path/slow pace

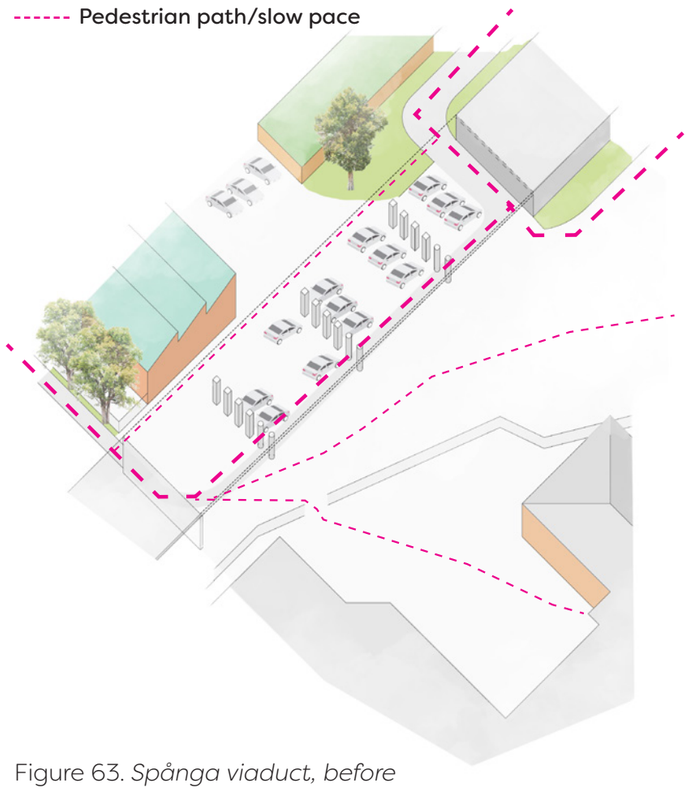
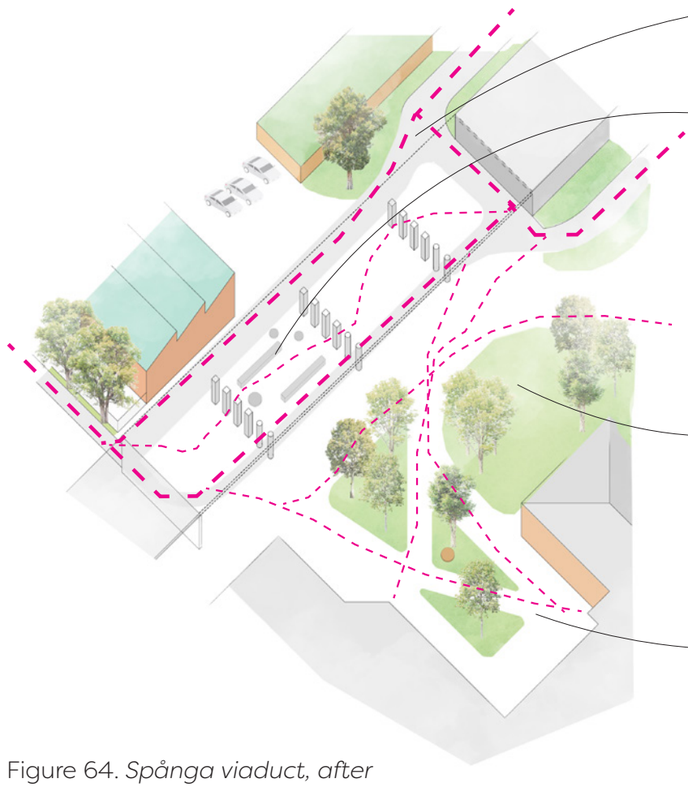


Figure 63. *Spånga viaduct, before*



Concrete blocks welcome skaters and and other forms of play or socialising. This is a space of negotiation as it does not have one specific purpose of intended use.

Fast track for cyclists and pedestrians who want to move between the station to Spånga kyrkväg.

Cut grass and clusters of trees create spaces for people to rest. The community centre could use this space for outdoor activities.

Vegetation directs people towards the entrances of the second hand shop, community centre and additional services.

Figure 64. *Spånga viaduct, after*

4.2.2 Spånga station

Protect Spånga station by improving wayfinding and lighting

Densify Spånga station by protecting, connecting and enticing.

Figure 67. *Spånga station*

Connect Spånga station by increasing and improving bicycle stands

Entice Spånga station by designing plant beds and places to rest near the pedestrian bridge and towards Spånga viaduct.

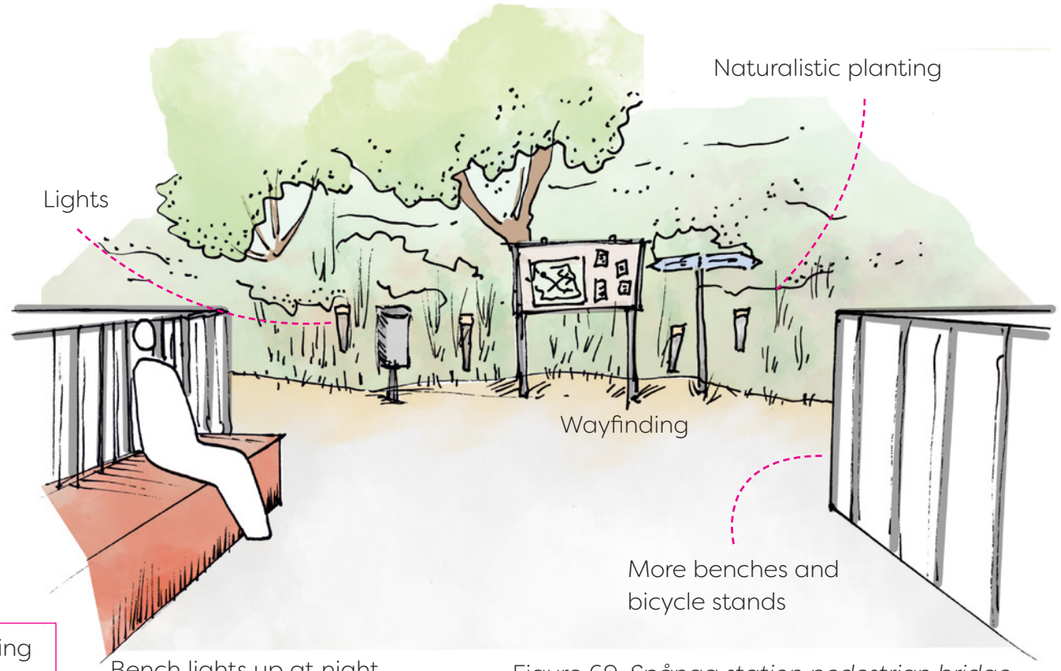


Figure 69. *Spånga station pedestrian bridge*

Figure 68. *Spånga station, before*

Bike stands connect cyclists to the station and provides an essential physical element for strengthening walkability for commuting cyclists.

Figure 70. *Spånga station, after*

Connect Mjölnarstigen by improving the quality of the physical infrastructure

Entice Mjölnarstigen by creating a pedestrian priority street with street trees, a rain bed and places to rest

Densify Mjölnarstigen by connecting, enticing and protecting the street and it's relation to adjecent destinations such as Bällstaån and Bromstenstaden.

Figure 71. *Mjölnarstigen*

Protect Mjölnarstigen by designing a sidewalk for pedestrians who want to move at a slower pace.

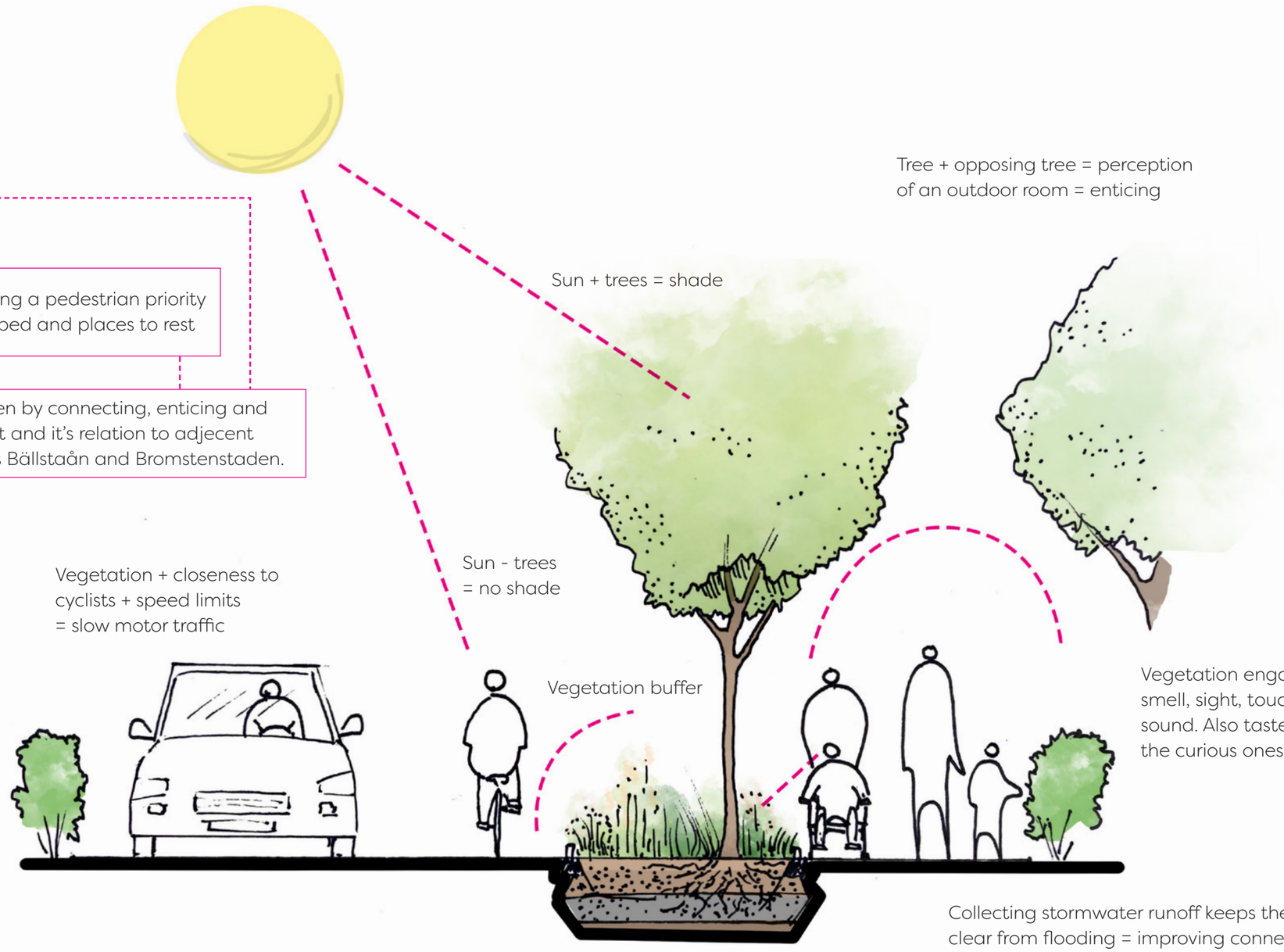


Figure 72. Section of Mjölnarstigen
Scale 1:40 @A3

Pedestrian priority street	Rain bed	Pedestrian sidewalk
4 meters	2 meters	2 meters

4.3 Summary of design strategies and conceptual plan

One principle has remained a red thread throughout the making of the design strategies, namely the idea that one thing affects another. More specifically, one design action such as additional seating near Spånga station affects walkability both in the direct proximity of the specific area and in a wider perspective. In this sense, the design strategies exist in a collective actor-network where each design action, if realised, could affect the other areas within the site. The illustration to the right illustrates how these connections link and overlap other networks. Coming back to the example of seating near Spånga station, this design strategy both connects people and places by allowing spaces to rest and socialise, and entices by inviting people to stay. By designing benches which light up at night or placing lights close to seating, an element of protection is added which could create a perception of safety. In turn, connecting, enticing and protecting affords the space to also densify.

One influential actor which has not been illustrated in depth is the development of Bromstenstaden. This mixed-use neighbourhood will most certainly affect Spånga station with more people accessing public transport. In turn, resulting in an increase in pedestrian flow around Spånga viaduct. Linking these areas together by connecting, enticing and protecting using wayfinding, lighting, seating and places to socialise is essential for creating walkability.

Moreover, additional services within the Bromstenstaden development area will further densify the site. This motivates the strategy to improve walkability from Rinkebydalen to Bromstenstaden with pedestrian priority streets. More seating, safer sidewalks and more enticing environments in terms of rain beds, changes to the micro-climate through street trees and safe crossings could direct people in between these areas. In this sense, the physical and non-physical actors could influence human actors in their soft mobility patterns, ultimately improving walkability.

Lastly, non-physical non-human actors such as noise from traffic, micro-climate and the time of day have been proven to be influential actors in the walkability networks on site. This has been brought into the design strategies by directing fast paced soft mobility activity along the trafficked street Spånga kyrkväg and slow paced activities towards pedestrian priority streets, squares and the park.

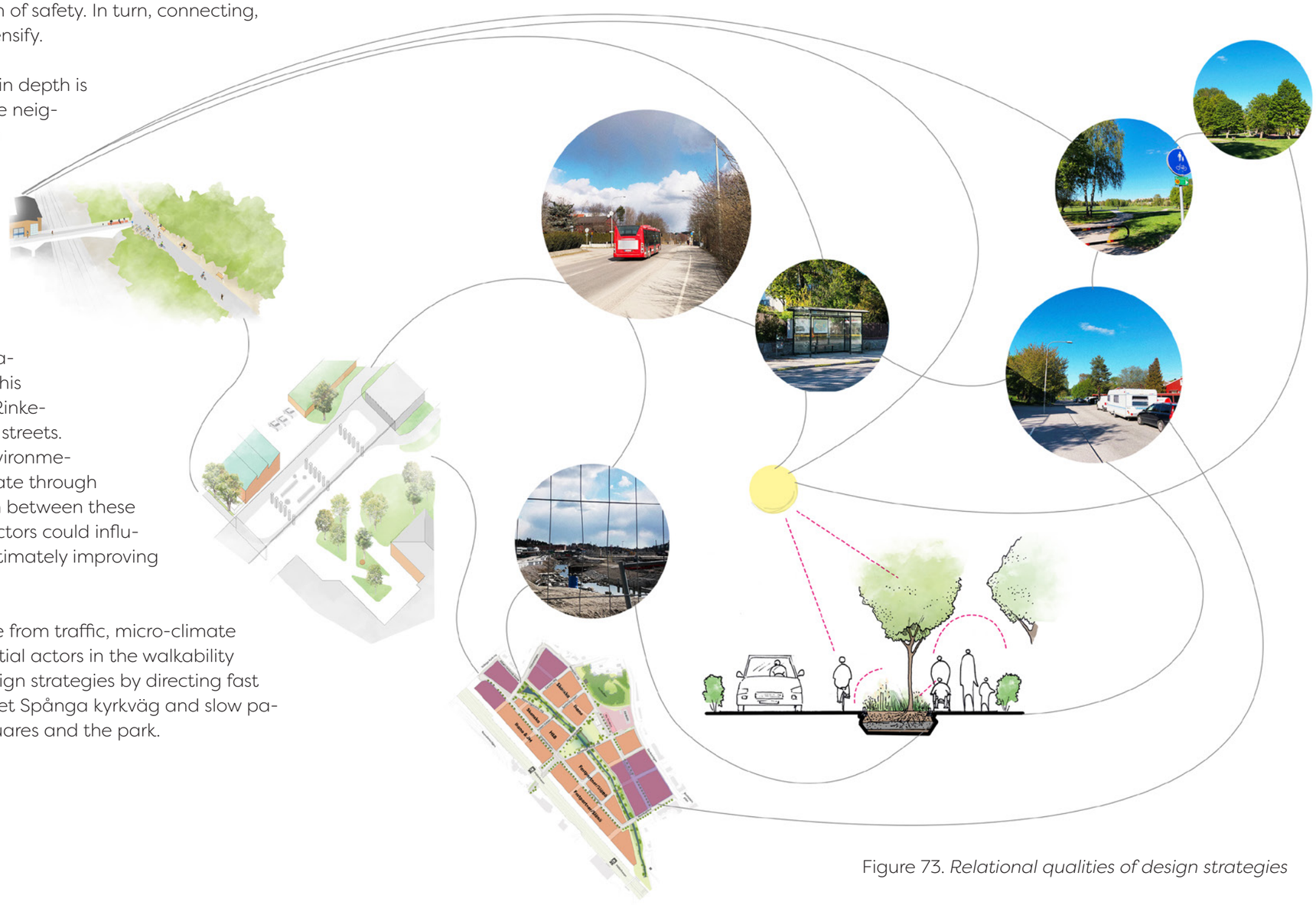


Figure 73. *Relational qualities of design strategies*

5. Discussion

5.1 Theoretical perspectives and definitions

Does strengthening walkability between Spånga station and Rinkebydalen also imply strengthening soft mobility on site? Since the definition of soft mobility includes walking as a means of transport, and walking is the term used both by Forsyth (2015) and Wang and Yang (2019), I would argue that soft mobility most definitely is positively impacted when walkability is strengthened. In fact, one could even argue that robust soft mobility connections per definition is walkable. Yet, as noted in the observations and analysis, the purpose of walking or moving in another form of soft mobility is fundamental in determining to what degree a space is walkable. As an example, walking to relax and cycling to commute are both forms of soft mobility which demand significantly different features from the urban form in order to be perceived as walkable.

This leads me to the theoretical framework of this study, ANT, which has guided the selection of observations in the way that several both human and non-human actors were studied. The relational factors between actors in a network was further analysed when interpreting the empirical data with Forsyth's walkability dimensions. However, the structure of the analytical framework was slightly restricting. As I conducted the observations, I noted that certain features which significantly affected the studied environments were not discovered through sight. Instead, other senses such as smell and sound shaped the observation analysis. As an example, Spånga kyrkväg was often noted as noisy and because of that, prioritised as a commuting street instead of a place for relaxation and socialising. Now, the framework which the observations were analysed against did not include other senses than that of sight. Forsyth describes physically enticing environments with features such as sidewalks, pedestrian crossings, lighting, signage, pleasant views and interesting architecture. None of those features involve other senses than sight. With ANT as a guiding framework, I could acknowledge that both me as the human observer, and the human actors being observed did not only utilise sight in their decision making when moving through the site, but also senses such as smell, sound and touch. In saying that, additional non-human actors to acknowledge and take into account are the smell of exhaust or flowers, or the sound of traffic and kids playing.

5.2 Method and material

Following on the ANT discussion, a more inclusive approach to the analytic framework based on Forsyth's walkability dimensions would be to include more senses. This would open up the door for a more representative definition of walkability as it also seeks to understand how an enticing environment is perceived for visually impared people or those with impared hearing.

On a similar note, the observations were made solely relying on the human observer. This could have affected the results due to the human factor since a human observer is not capable to note all events happening in front of them at the same time. As a result, some information might fall out of the observer's notes. There is also a variation in the outcome of the human observer's study as one might be a beginner, conducting their first ever public life study, meanwhile one might be a practising researcher with years of experience in using observation as a method. In the case of this study, I have some previous experience in using observations as a research method and am knowledgeable in the theme being studied. In saying that, I would argue that possible fall out is acceptable and does not affect the overall outcome of the study.

Many cities in Sweden are using computerised counting software to measure how many cyclists pass a certain area in the city, yet measuring the flow of pedestrians in this way is much less common. Using computerised software for collecting this type of data could be an alternative or complement to the human observer. As an example, Mjölnarstigen appears unused in the observation analysis which has to do with the observer's human error in missing to conduct observations on pedestrian flow and age and gender there. On the other hand, computerised softwares could also be misleading and miss information which only the human senses could discover.

Following on the discussion on methods and gathering empirical data, both observations and interviews are mentioned as broadly accepted and commonly used methods for public life studies. Evidently, this study has only adopted observations and has done so both due to time constraints and due to the standpoint that observations alone provide sufficient amounts of qualitative data. Interviews could give a wider empirical scope to the study yet simultaneously create a more specific and narrow description of the case. Selected individuals would have to be chosen with care to ensure a representative and inclusive understanding of the questions up for discussion. However, I stand by the argument that the observations alone say enough and provide a broad yet site specific and inclusive perspective where all demographic groups and modes of soft mobility have been taken into consideration.

On the other hand, due to the limited number of observations and choice of time and day, the observations alone do not provide a holistic understanding of walkability on site today. They do however inform how walkability functions on site within the timeframe of the conducted observations. Yet to improve the study's reliability, more observations could have been conducted with a broader time span and including weekends. Moreover, other types of methods such as analysing data on the neighbourhood population characteristics, the cultural historic context, and as mentioned above - interviews, could have deepened the understanding of walkability on site by including additional contextual dimensions of people and place relations.

5.3 Observations and analysis

The result show the vast amount of actors which are involved in shaping networks to support walkable places. The relational qualities of a place becomes evident in the most simple physical features such as the sidewalk. On Spånga kyrkväg, the sidewalk was smooth and traversable, yet the sidewalk in combination with heavy traffic resulted in a street for commuting, rather than staying and relaxing. Meanwhile, the sidewalk on Mjölnarstigen was narrow and uneven, not ideal for walking and most definitely not for cycling. Yet the absence of traffic made people walk slower and often socialise in groups in the middle of the street.

The service environment heavily affects the density of people in movement. But the physical environment is the underlying element which affects how people move in between services. As an example, Spånga station is an important service to the area as seen in the high levels of pedestrian flow noted there. Yet the primary street leading to the station, Spånga kyrkväg, sees just as high levels even though there are no services in close proximity to the place of observation. Traversable, safe and physically enticing environments are therefore the prerequisites for creating compact places with high density in social activity.

In turn, compact places need a broad variety of services with a wide span of opening hours to attract pedestrians. As the 15-minute city suggests, services such as housing, work, food, health, education, and culture and leisure should be found within a 15 minute walk or bike ride. Although the route between Spånga station and Rinkebydalen primarily hosts housing, education and culture and leisure, more services such as work, food and health are found in Spånga centrum. The location of these services affect walkability and soft mobility patterns as seen on Torpstugegränd with the often visited preschool and recreational activities seen in Rinkebydalen.

The general goal is not to create places which suit all walking purposes, but to understand what a specific street or space needs and design thereafter. Locating and observing movement patterns to and from services could help in understanding site specific walking purposes. Additionally, understanding what services are missing for accomplishing a 15-minute city, could inform what interventions are needed in the physical environment to strengthen accessibility to the services currently out of reach. When talking about a temporal perspective of soft mobility connections, it is important to acknowledge that not all people are fully able to move at a normal tempo. Furthermore, what is normal varies between age, gender and abilities. The temporal perspective is also important to note due to the study being conducted during daytime. The sun has been shining during all observations and the study is therefore limited to a specific time of day, more precisely midday to afternoon, and a specific time of the year, more specifically March and April.

There are most certainly different forms of walking. The coastal walk mentioned in the introduction is significantly different from the route between Spånga station and Rinkebydalen. Yet, nothing says that one is more walkable than the other. Again, that depends on the walking purpose. By improving the ability to commute through soft mobility on Spånga kyrkväg, walkability is strengthened. Likewise, improving the ability to walk to enjoy the outdoors and socialise on Mjölnarstigen, Båtsman Stens väg and Torpstugegränd, walkability too is strengthened.

5.4 Design strategies and conceptual plan

The design strategies are a continuation and interpretation of Forsyth's dimensions for creating walkability. They are a continuation in the way that the main definitions of the dimensions are transferred into the design strategies developed in this study. Yet the dimension of physically enticing environments has expanded to enticing environments, including all senses and non-human actors which are not physical features in the environment.

Moreover, the design strategies are formulated into verbs to stimulate action. The four design strategies connect, entice, protect and densify are therefore more tangible in the design stages and promote action in creating a proposal for improving walkability. Forsyth's dimensions are on the other hand essential for understanding the general definitions of the strategies and are the foundation for the more general discussion on creating walkability. Meanwhile, the design strategies developed in this study give a more nuanced understanding of walkability in relation to the site, with some insight to the more general discussion.

Although the names of the four strategies (connect, entice, protect and densify) are broad and lack details for action, they are useful as a framework which can be applied for creating or analysing walkability on other sites. Additionally, the more detailed descriptions for each strategy is designed to fit the specific needs of improving walkability in between Spånga station and Rinkebydalen.

Traffic separation is a criticised past planning notion due to the lack of traversability and pedestrian friendly streets. One could say that the conceptual plan separates certain forms of traffic from one another with the commuting street on Spånga kyrkväg and the pedestrian friendly street on Mjölnarstigen, Båtsman Stens väg and Torpstugegränd. Yet there is a difference between a complete separation between different modes of transport and a separation between different purposes of moving. Modernism prioritised the car and built the street networks thereafter, making all pedestrian activity and soft mobility separated from motor traffic. In the case of Spånga station to Rinkebydalen, the streets are instead designed for their type of mobility purpose. As an example, fast paced, often necessary soft mobility activities such as commuting to work or getting groceries are paired together with public transport and cars. Likewise, slower paced, often optional activities such as walking to socialise or enjoying the outdoors is paired with low speed limits for cars and wider sidewalks where pedestrians are prioritised. In other words, strengthening walkability does not require a complete separation from motor traffic, but instead a more purpose oriented division where the pace of motor traffic is paired with pace and purpose of soft mobility activity.

The in-depth illustrations combine images, sketches and text in various scales to communicate everything from the sites changes in soft mobility patterns as seen in the axonometric drawing of Spånga viaduct, to details in the physical and non-physical environment where non-human actors affect walkability in certain ways, as seen in the illustrations for Spånga station and Mjölnarsitgen. Together, they form a holistic view of the different scales of walkability and the complexity of actor-networks involved in creating walkable places.

There are however some gaps between theory, findings from empirical research and assumptions behind the design proposals worth mentioning. First of all, the theoretical framework ANT joined by the four dimensions for creating walkability are two separate ways of approaching walkability. ANT aims to see the relational qualities while Forsyth's dimensions for creating walkability are more descriptive themes on the topic based on previous research. By merging the two, the study departs from a research based

understanding of walkability, and with the perspective that all dimensions for creating walkability are interconnected and form a knowledge actor-network.

When moving on to the findings from empirical research, the method of observations is limiting the study's findings by being conducted during a limited point in time. Moreover, there is no thorough understanding of people's actual intentions with their soft mobility activities noted during the observations. They are assumptions made by the researcher. These assumptions are based on situated knowledge and could be misleading and is a noteworthy issue with passive observations. As previously mentioned, using this method alone to understand relational qualities of walkability might leave out other valuable empirical findings such as population characteristics, the cultural historic context and people's personal opinions.

This is important to state as the findings from the study's empirical research are what informed the design strategies. Due to the fact that other valuable information might be missing to form a holistic understanding of people and place on site, the design strategies are lacking deeper site specific qualities. The assumptions behind the design strategies could therefore be a result of a mix between findings from empirical research and the researcher's situated knowledge. As an example, the rainbed on Mjölnarstigen is part of the design strategy not because it was described by Forsyth as a way of creating walkability, but due to the researcher's previous learnings about the benefits of rainbed's. Forsyth did however mention vegetation as a component to physically enticing environments which then was translated by the researcher into the formation of a rainbed. This gap between empirical research and the assumptions behind the design strategies does affect the study's reliability, yet it also adds layers to the design which sits within the landscape architecture context of this thesis. Such gaps could be further clarified during the development of the design strategies to improve the study's reliability.

5.5 Further research

The thesis has highlighted the importance of specifying purposes of walking if walkability is to be strengthened for the site's specific needs. Therefore, I would argue for a more nuanced walkability discussion when planning and designing walkable places. Research and practice could instead of aiming for 'just' strengthening walkability, aim to specify what purpose of walkability the study or project strives to strengthen. This would make the term more applicable and tangible in the planning and implementation stages, but also in the analysis and discussion of the results and effects of a study or project. Additionally, more research on how the human senses affect walkability depending on our abilities would allow a more inclusive understanding of the term, ultimately broadening walking possibilities for people with disabilities.

5.6 Conclusion

As an observer, I have brought years of situated knowledge formed both through my experiences at university and in my personal life. My subjective perception of the world is shaped by factors such as my gender, abilities, socio-economic status and ethnicity which inevitably affect my findings in this study. The structured and transparent approach to conducting observations and analysing the results is therefore essential for the results significance and in drawing any solid conclusions.

The design strategies are a result of connecting previous research on walkability found in Forsyth's walkability dimension with the theoretical understanding of human and non-human relational qualities found in ANT as well as the site specific realities found in the observations. Together, they form design strategies which not only responds to the case site specific needs, but also provide a general understanding of walkability and soft mobility which could be applied in a wider discussion and context.

That said, the observations are limited to a specific point in time and are therefore not a holistic representation of walkability on site today. Rather, they inform how walkability could be improved within the timeframe of the observations. For a more thorough understanding of the walkability on site, observations on weekends and throughout the whole day could give a better representation. Because of this, the method is limiting the information transferred into the development of the design strategies. To develop more authentic design strategies, other methods such as analysing data on the neighbourhood's population characteristics or conducting interviews with residents could be added to the study.

Walkability and soft mobility connections can be strengthened through connecting, enticing, protecting and densifying. Focusing on strengthening one strategy alone will not result in a holistic improvement for pedestrians and people moving in other forms of soft mobility. The strategies interconnectedness is important to stress as they all relate and often intertwine with each other. As an example, connected places would need to be enticing for people to pleasantly move in between. Furthermore, improving lighting and places to rest or play does not solely improve connectivity, but could also protect pedestrians from traffic accidents and crime, in turn creating safer places. Finally, connected, enticing and protected places improves accessibility to services, ultimately forming denser places.

These general findings can be applied in cases with a similar setting, in other words in an urban environment. In a more rural environment, services might be further apart and connections might therefore be less accessible by foot or even by bike. Yet, the strategies could be interpreted and adjusted to fit the needs of the given environment, just as the study has done with Forsyth's dimensions.

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Figures

Figure 1. Wikström, E. (2022). *Forsyth's dimensions for creating walkability*. Based on: Forsyth, A. (2015). *What is a walkable place? The walkability debate in urban design.* URBAN DESIGN International, 20 (4), 274–292. https://doi.org/10.1057/udi.2015.22

Figure 6. Stockholm stad (n.d.) *Site plan of Bromstenstaden by White arkitekter*. https://vaxer.stockholm/projekt/bromstensstaden-etapp-2/ [2022-05-07]

Other figures: Wikström, E. (2022). [Photography and illustrations]

Popular science summary

For millions of years humans have been walking to move from one space to another. And even though the landscape has changed significantly throughout history, walking remains an essential mode of transport in all environments across the world. Yet after years of technological development, other forms of transportation such as cycling, rolling a wheelchair, pushing a stroller or riding an electric scooter have broadened the possibilities for moving throughout the streets and sidewalks of cities. Today, many cities around the world are designing their streets to make space for walking, cycling and other forms of slow paced movement. In doing so, planners and designers must ask what is walkable and how both physical elements such as buildings, vegetation, streets, squares and parks as well as the services within these areas affect people's walking patterns.

This case study develops site specific design strategies for strengthening walkability and soft mobility in between Spånga station and Rinkebydalen in Stockholm, Sweden. It does so through observing people's behaviour in relation to the site's physical elements. Doing so opens up an understanding of the relational qualities of a space. Moreover, the observations are analysed against an existing set of key dimensions for creating walkability. The result highlights problems and possibilities with walkability on site today and illustrates how walkability could be improved for several forms of walking and soft mobility purposes. Additionally, the study highlights more general strategies for strengthening walkability which could be applied in a more general discussion on walkability and soft mobility.

The study concludes that what is walkable highly depends on the purpose of walking or moving in another form of soft mobility. Furthermore, human senses such as sight, smell, sound and touch all affect soft mobility patterns together with non-human actors such as natural and built objects and micro-climate. Understanding how one actor affects another is essential for designing walkable spaces.

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