Residential Greenery in Kvillebäcken

A comparative case study of how residential greenery is perceived in East and West Kvillebäcken

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Abstract

Urban greenery and its importance for city citizens' wellbeing has already been well established in many studies. However, many studies have focused on larger green spaces, such as parks, during summertime, with fully developed greenery. Residential greenery during other times of the year, and people's perception of it, has not been studied as much. This study intended to fill the research gap by investigating people's perception of residential greenery during spring. This was done through a comparative case study between two areas in Gothenburg, East Kvillebäcken, built according to the Mixed city ideal and West Kvillebäcken, built according to the Nordic functionalism ideal. To make this comparison, a mixed methodology was used, consisting of a face-to-face questionnaire, mental maps and GIS-analysis. The questionnaire asked residents and frequent visitors of each area how they perceived different aspects and photos of the residential greenery, as well as for their favorite green place in their area to create mental maps. The results showed that while the presence of greenery in a residential area was important for the majority, the perception of the residential greenery in each area differed. The residential greenery in the Nordic functionalism typology of West Kvillebäcken was more positively perceived in every aspect regarding amount, accessibility and aesthetics than the Mixed city typology of East Kvillebäcken. Despite this, respondents in both East and West Kvillebäcken still often preferred the nearby parks as their favorite green place, rather than a green place within the residential areas. These findings contribute to the research on subjective evaluation of residential greenery during spring in the two building ideals the Mixed city and the Nordic functionalism.

Keywords: residential greenery, perception, building typology, Nordic functionalism, Mixed city, mental map

Sammanfattning

Urban grönska och dess vikt för välmåendet av invånare i en stad har redan blivit väl etablerad i många studier. Likväl har många studier fokuserat på större grönytor, som parker, under sommartid med fullt utvecklad grönska. Bostadsnära grönska under andra tider om året och människors uppfattning av den har inte blivit lika mycket studerat. Denna studie ämnade att fylla forskningsluckan genom att utvärdera människors uppfattning av bostadsnära grönska under våren. Detta gjordes med en jämförande fallstudie på två områden i Göteborg, Östra Kvillebäcken byggt utefter Blandstads idealet och Västra Kvillebäcken, byggt utefter Nordisk funktionalism idealet. För att göra denna jämförelse användes en blandad metodologi, bestående av en face-to-face enkätundersökning, mentala kartor och GIS-analys. Enkäten frågade boende och regelbundna besökare i varje område vad de tyckte om olika aspekter och bilder av den bostadsnära grönskan, tillsammans med deras gröna favoritplats i sitt område. Resultaten visade att medan det var viktigt med grönska i ett bostadsområde för majoriteten, skiljde sig uppfattningen av den i båda områdena. Den bostadsnära grönskan i Nordisk funktionalismens typologi i Västra Kvillebäcken uppfattades mer positivt i varje aspekt gällande mängd, tillgänglighet och estetik än Blandstades typologi i Östra Kvillebäcken. Trots detta föredrog respondenterna de närliggande parkerna än en grönyta inom bostadsområdet som sin gröna favoritplats. Dessa resultat bidrar till forskningen om subjektiv värdering av bostadsnära grönska under våren i de två byggnads idealen Blandstad och Nordiska funktionalism.

Nyckelord: bostadsnära grönska, uppfattning, byggnadstypologi, Nordisk funktionalism, Blandstad, mentala karta

Preface

Urban greenery and the perception thereof has been a very interesting topic to conduct our bachelor's thesis on. We are happy to now be much more knowledgeable within the field and hope to be able to further investigate the topic in future studies and work. A special thanks goes out to our supervisors Sofia Thorsson and Oskar Bäcklin for helping us with everything we have needed and supplying us with valuable insights and advice. We have enjoyed the work and had the help we have needed thanks to a well-planned course by our kind course leaders Sofia Thorsson and Jonas Lindberg. Thanks also, to our course mates who have read and commented on our text at every stage in the process. And finally, we want to thank the respondents of this study, who were very nice, patient and made it possible to investigate how residents and visitors of Kvillebäcken perceive the residential greenery of the area.

All the photos in this paper are taken by the authors and all the figures and tables in this paper are made by the authors unless stated otherwise.

Table of contents

1. Introduction

Today 7,5 million people in Sweden live in urban areas and the number is rapidly increasing (Dahl et al., 2017). As a result of the increase in people and current urban planning ideals, cities are becoming more densified which puts urban greenery at risk of being overrun. In the process of densifying the city, it is important not to forget the importance of greenery and the positive impacts it has on humans and the urban environment, ranging from better air quality to more recreational areas for inhabitants (Russo & Cirella, 2018). Battisti et al., (2019) especially highlights the importance of greenery near people's homes and how this type of greenery is at a particular risk of being overrun due to the densification of the urban environment.

Certain green spaces mean more to some people than others, and are therefore more important to protect for those individuals. According to Gunnarsson et al., (2017) the more city inhabitants use a green space the more they become attached to it. In practice, this means that people usually create a special bond to greenery near their homes. Much of this vegetation is residential greenery which is defined as mainly small-scale semi-public green space in between or in direct contact with residential buildings (Battisti et al., 2019). Residential greenery has not received the same kind of attention as public greenery such as that in parks and schoolyards. This is pointed out by Battisti et al., which states that “the residential greenery on a door’s step of urban dwellers has rarely been the subject of research” (Battisti et al., 2019 p.4).

Rarely focused on in the context of urban greenery, is also the cognitive response that greenery generates in humans. Cognitive response in this context means the emotions that vegetation evokes, and the resulting perception people have of greenery. The studies that exist about feelings towards urban greenery rather focus on preference than on perception (Sheets & Manzer, 1991). Mittermüller et al., (2021) conducted a comparative case study on the subjective elements, i.e., perception of heat stress, as well as the objective elements, i.e., temperature measurement, in two separate neighborhoods in München. The results from this study highlighted the importance of perception-oriented studies on urban experiences, since perceived heat stress and actual temperature did not correlate. The study concluded by drawing attention to the deficit in studies focusing on the perception of the urban environment and its effects, rather than objective measurements.

A case study conducted in East Kvillebäcken during the spring by Bäck & Uddenäs (2020), which also focused on the subjective elements of the urban environment, found out that people perceived that there was too little greenery and that it was inaccessible, affecting their general wellbeing. The perception of greenery during spring is not well understood because studies on greenery have predominantly been conducted during summer (Brooks et al., 2017), although spaces reserved for greenery are usually maintained all year around. Benefits of greenery during other parts of the year, such as spring, are also of interest due to the importance of greenery all year around on human health and wellbeing (Russo & Cirella, 2018). Thus, studies focusing on the perception of greenery during other seasons than summer are necessary.

1.1 Aim

The aim of this study is to investigate the perception of residential greenery during spring and how it differs between people by comparing the two areas East and West Kvillebäcken, which were built during different times with different building ideals. In order to achieve an understanding of the perception of residential greenery and compare between the two areas as well as between different people, a face-to-face questionnaire and mental mapping was conducted during field observations, paired with digital visualization of the greenery in GIS.

1.2 Research questions

- How is the residential greenery perceived by residents and visitors in East and West Kvillebäcken during spring?
- How does the perception of residential greenery differ between East and West Kvillebäcken as well as between different people?

2. Literary overview

The aim of this chapter is to give a theoretical background to residential greenery and explain the concepts used in this study. For that purpose, previous research will be brought up and explained. At the end of this chapter *Göteborgs Stads miljö- och klimatprogram* (*Environmental and climate program for the city of Gothenburg*) (2020) will be brought up as an example of a governing document for greenery and what may threaten urban greenery.

2.1 Previous research

2.1.1 Residential- and urban greenery

Residential greenery is a part of urban greenery but does not involve parks, instead, it is the small-scale greenery between- and in direct contact with residential buildings. This type of vegetation is usually semi-public and particularly important for children, less mobile people and recreational activities after work (Battisti et al., 2019). Since it is so intertwined with the buildings of an area, residential greenery is included in the characteristic of the building typology. Hence residential greenery is largely determined by the building ideal of the area in question. The definition of a building ideal is the physical design of an area which is based on how the area is intended to be used. The intended usage of an area determines the building ideal which, in turn, determines the building typology (Wing, 2021).

No matter the building typology, the literature is nearly unanimous that urban settings containing vegetation are preferred over those that do not contain vegetation (eg. Russo & Cirella, 2018, Battisti et al., 2019). This is the case both if the environment is unfamiliar or not (Sheets & Manzer, 2019). Vegetated urban areas were consistently rated as “easier places in which to make a living” (Sheetz & Manzer, 1991 p.301). Moreover, the results of Ulrich (1979) strengthen this claim. His study analyzed people viewing scenes of nature and cities and discovered that they felt an increase in positive emotions towards natural scenes, while the contrary was true for people viewing urban scenes. These findings were consistent across the sexes and were applicable to people who had grown up in both urban and rural environments.

Humans require interaction with greenery daily. For many people living in urban environments, urban greenery is the only possibility for nature-based interactions within a reasonable distance

from home (Russo & Cirella, 2018). Greenery in proximity to homes plays a role in a person's sense of place (Knox & Marston, 2010). Gunnarsson (2017) expands on this by stating that the more a person interacts with greenery the more they become attached to it. For this reason and several more, Russo and Cirella (2018) have determined minimums for green space within cities, but when these are exceeded, humans are healthier and happier on a societal level. According to their study, the ideal is 50m² of green space per capita with a bottom limit of 9m² per capita. However, the quality of urban green space must not be forgotten in the planning process of creating large green areas. Urban greenery brings ecosystem services to urban areas, which are more efficient the higher the quality of the green area. Ecosystem services are, amongst others, important to the health and wellbeing of the city's inhabitants as well as the general attractiveness of the city. They are divided into benefits in terms of supportive, regulatory and cultural. In this report, the focus lies primarily on the cultural ecosystem services because this is what residential greenery contributes the most to. Residential greenery also contributes to some extent to the regulating services of urban ecosystems. The cultural ecosystem services that residential greenery supplies include recreational opportunities, aesthetic aspects and a feeling of connection with nature. Examples of regulatory services which residential greenery contributes to are air quality, noise regulation and precipitation management (Dahl et al., 2017).

2.1.2 Theoretical perspectives on the perception of greenery

The reason for urban greenery being appreciated is not completely understood, but a possible evolutionary explanation is that vegetation signifies a richness in resources of a place. A more culturalist approach argues that vegetation is appreciated rather due to our cultural values and the memories we attach to it. Vegetation may be interpreted as representations of the culturally valued aspects of rural life, such as being in harmony with nature (Sheets & Manzer, 1991). However, the evolutionary and culturalist perspective do not have to be mutually exclusive. The reason for vegetation being culturally appreciated may originally come from its historical value to human survival (Bourassa, 1990). Sheets and Manzer (1991) however, argue that there is a difference in the evolutionary and the constructivist view on *how* humans perceive greenery. Evolutionists claim that humans subconsciously perceive and appreciate vegetation whereas constructivists argue that vegetation is consciously perceived and judged. But Bourassa (1990) is once again of a different opinion, he argues that one does not neglect the

other, that these processes could have evolved to cofunction within the human brain and be going on simultaneously.

Orian's savanna hypothesis has been developed in line with the evolutionary perspective. It dictates that humans like trees which are similar in shape to the ones on the African savanna. Research has shown that broad canopies and thick trunks are preferred over trees with the opposite characteristics (Gerstenberg & Hoffman, 2016). This may be a reason why urban residents like to see deciduous trees during summer with thick trunks and thick canopies. Deciduous trees also supply a range of positive ecosystem services such as shade, protection from the rain and air filtration, which, in combination, may be the reason why they are the most common trees in temperate climate urban environments (Erell et al., 2011). However, deciduous trees, which are very beneficial during the summer, lose much of their positive impact during the winter when they have no leaves (Clapp et al., 2014). That they lose their leaves is positive from the point of view that they let through more light during seasons when it is darker (Erell et al., 2011), but negative from the point of view of many other ecosystem services, such as visual aesthetics (Clapp et al., 2014, Gerstenberg & Hoffman, 2016).

2.1.3 Potential threats to urban greenery and documents concerning it

Densification and population increase are identified as two of the main threats to urban greenery, and in turn the health benefits that it supplies to humans. The threat of densification comes to form both in terms of the reduction of urban green areas, as well as in terms of increased exploitation of existing greenery. Since densification and population increase will lead to a higher usage of existing greenery, said greenery will be subjected to a higher level of wear and tear. For this reason, good maintenance and planning of urban greenery is important to maximize the potential benefits of greenery (Göteborgs Stad, 2020).

Main documents that have been decided on by the municipality are what governs the planning and maintaining of greenery in Swedish cities. These are all collectively referred to as governing documents. *Environmental and climate program for the city of Gothenburg* (Göteborgs Stad, 2020) is one of these governing documents which is the framework for greenery and other environmentally related aspects. Several other documents within the municipality, such as planning and strategic documents for greenery, are based on this governing document. In the document, vegetation near people's homes is specifically

mentioned, separate from vegetation in parks and schoolyards. It is mentioned as an important building block of the total greenery of the city and as particularly at risk of being overrun due to densification (Göteborgs Stad, 2020).

3. Study area

The study area is in Kvillebäcken, which lies in northern Gothenburg on the Hisingen peninsula. It is a larger area with several different building typologies. To be able to make a clear comparison and address the research questions of this study, only two building typologies within Kvillebäcken have been selected (figure 1). The reason for choosing these two typologies is that they lie directly next to each other and were built during two different periods when different building ideals were prevalent. The newer of the two areas reflects the current building ideal in which the University of Gothenburg has had several research projects (eg. Bäck & Uddenäs, 2020, Wing, 2021). The comparison with an older building typology and its residential greenery creates an interesting contrast for analyzing differences and similarities. For simplicity, the area to the east will be called East Kvillebäcken and the area to the west will be called West Kvillebäcken (figure 1). Take heed that these are only names that are used in this study, they are not official names.

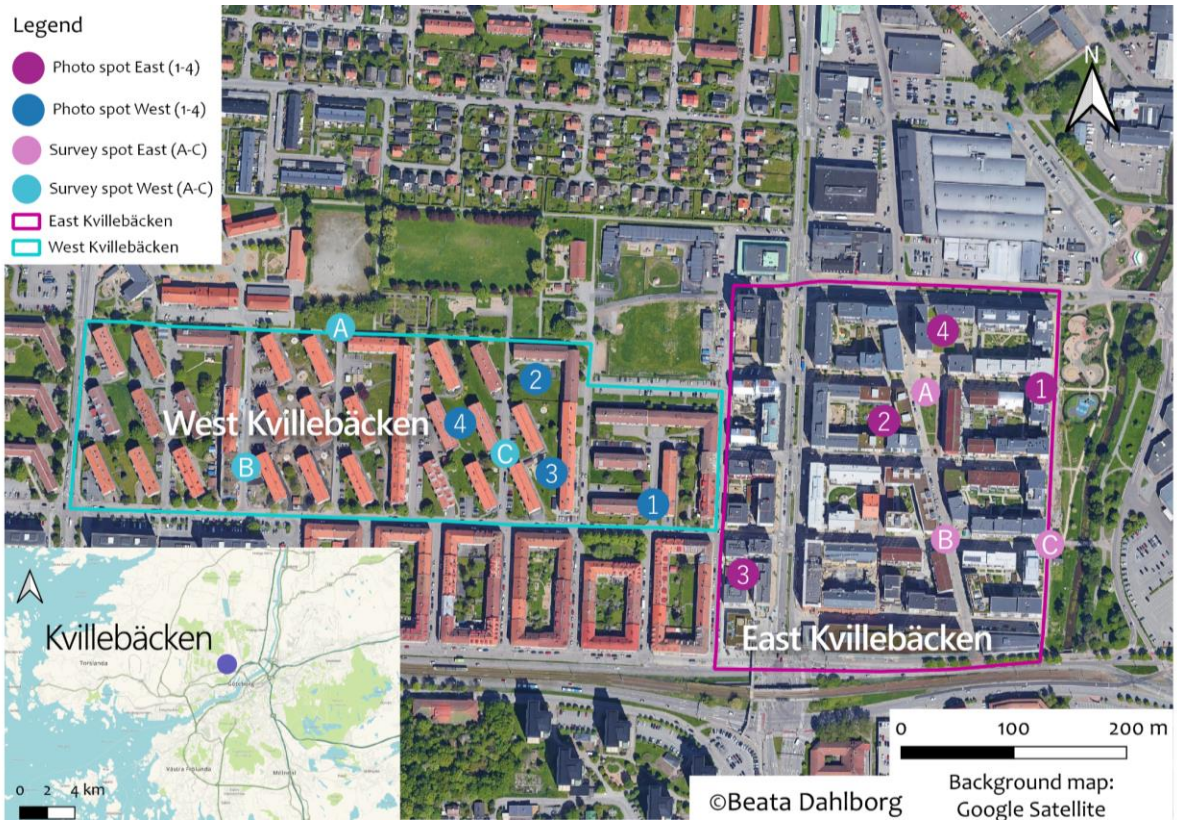


Figure 1. Map showing the study sites East Kvillebäcken, in purple, and West Kvillebäcken in blue. 1-4 represents the places where the photos in the questionnaire, A-C represents the survey spots. The mini map shows the location of the study areas in Gothenburg.

Figur 1. Karta som visar studieområdet Östra Kvillebäcken i lila och Västra Kvillebäcken i blått. 1–4 representerar platserna där fotona är tagna för enkäten. A-C representerar enkätplatserna. Minikartan visar vart i Göteborg studieområdet befinner sig

3.1 East Kvillebäcken

East Kvillebäcken is also called New Kvillebäcken. The name *New Kvillebäcken* suits the area because its construction was finished as recently as 2020 (Bäck & Uddenäs, 2020). According to a classification done by Wing (2021) this building typology is planned after the Mixed city ideal. This is a frequently used building ideal within the contemporary central urban area, said to be a more sustainable way of city planning. Albeit having no specific definition, unifying for the Mixed city typology is a dense building structure that aims to create a diverse and lively inner-city area (Bellander, 2005).

East Kvillebäcken is 10 hectares large with buildings 4 to 16 stories high that are arranged in rectangular shapes, encircling courtyards which contain different sorts of landscaping. The building complexes are owned by several different property owners, such as Wallenstam and Bostadsbolaget (Bostadsbolaget, n.d., Wallenstam, n.d.). Each courtyard is unique, with a special array of plants, bushes and trees (figure 2). However, the majority of the land coverage consists of paved ground and buildings, more so than in West Kvillebäcken. The remaining greenery makes up 14% of the land coverage (figure 3). The pie chart in figure 3 summarizes all types of greenery mentioned in the map to ‘grass’ and ‘trees’. Within the residential area of East Kvillebäcken, the trees are young and small, which is because the greenery of the area was planted during the same time as the construction (Göteborg Stad, 2008). The distribution of the greenery inside and outside the courtyards can be seen in figure 3. Green roofs, sedge and rain gardens exist as part of the landscape which cannot be seen in West Kvillebäcken (figure 3 & 5). Outside of the study area, an oblong park by the name Kvillebäcksparken frames the area to the east. It is close and many people visit the park to experience greenery, therefore it is mentioned here. Within the park, older deciduous trees reside with a small river, the namesake of the area, running through.

Figure 2. Courtyards in East Kvillebäcken.
Figur 2. Innergårdar i Östra Kvillebäcken.

Figure 3. Map over vegetation types with circle diagram over land cover types in East Kvillebäcken. Vegetation data: Wing (2021). The vegetation types are counted as either trees or grass, except for green roofs which are included in the buildings land cover type.

Figur 3. Karta över vegetationstyper med cirkeldiagram över marktäckestyper i Östra Kvillebäcken. Vegetationsdata: Wing (2021). Vegetationstyperna räknas som antingen träd eller gräs, förutom gröna tak som inkluderas i marktäckningstypen byggnader.

3.2 West Kvillebäcken

West Kvillebäcken is an older area than East Kvillebäcken with buildings originating from the 1950s (Ottosson & Thuvander, 2013). The building typology of West Kvillebäcken is defined by Wing (2021) as the Nordic functionalism ideal. This ideal was developed during the 1930s and used until the 1950s. The thought behind this type of building typology was that it should feel natural, and the buildings should blend into the landscaping of the location. This past decade, West Kvillebäcken has been renovated, giving the facades a fresher look paired with updated or added functions in the landscaping, such as flower beds and sitting areas. The property owner for the majority of the buildings in the area is Familjebostäder, coupled with a few others including Wallenstam (Ottosson & Thuvander, 2013).

West Kvillebäcken is 9 hectares large with rectangular buildings, where nearly all are surrounded by green lawns and are 3 to 4 stories high. Buildings are arranged following a grid structure with space in between them, allowing for a courtyard which, unlike East

Kvillebäcken, are not enclosed, but encourage passing through. These courtyards house lawns, and trees amongst other types of greenery (figure 4). The map in figure 5 shows the distribution of this type of vegetation within the area. The pie chart, visualizing land coverage, summarizes the different types of vegetation (trees, grass surfaces, flower beds, bushes and hedges) found in the map into 'grass' and 'trees' (figure 5). Combined, the greenery coverage is 34%, which is 20% more than in East Kvillebäcken, even though there are some types of vegetation in East Kvillebäcken which are not seen in West Kvillebäcken. Located north of West Kvillebäcken, outside the study area, is a park by the name Fjärdingsparken. It was built in 2019 during the same period as East Kvillebäcken (Stadsutveckling Göteborg, 2020). The park is worth mentioning because it is the closest large green area.

Figure 4. Trees, bushes, lawn, playground and designated sitting area in a courtyard in West Kvillebäcken.
Figur 4. Träd, buskar, gräsmattor och lekplatser och utsedda sittplatser i en bostadsgård i Västra Kvillebäcken

Figure 5. Map showing the distribution of vegetation types with a circle diagram of land cover types in West Kvillebäcken. Vegetation data: Wing (2021).
Figur 5. Karta som visar distributionen av vegetation med diagram på marktäckenstyper i Västra Kvillebäcken. Vegetationsdata: Wing (2021).

4. Data and method

This chapter consists of a description of how this study was conducted and what data was used. Choice of methods and potential weaknesses are then discussed in the method discussion.

4.1 Research design

This study has utilized a mixed method approach including a questionnaire and mental maps that make use of both qualitative and quantitative methods. GIS calculations, mapping and visualizations have also been done on the amount of greenery in each area which adds another quantitative element. Geography is an interdisciplinary subject and to be able to answer complex questions, regarding both natural geography and human geography, an interdisciplinary approach can give the best answers (Elwood, 2018). By incorporating several research methods, different qualitative and quantitative aspects concerning the perception of residential greenery can be analyzed.

4.2 Face-to-face questionnaires

A questionnaire based on the one used for Mittermüller et al., (2021) was created for this study (appendix). The questionnaire had two variants, one for East Kvillebäcken and one for West Kvillebäcken. Both variants contained the same questions, the only difference was the photos included in them. Respondents were asked about their perception of the greenery within the residential areas of East and West Kvillebäcken. Through conducting the questionnaire face-to-face, the reasoning behind the answers of the respondents could better be understood. This process contributed valuable field knowledge aiding in the analysis of the data.

In order to achieve a more representative evaluation for people's perception of residential greenery during "one kind of weather", data collection in the field was conducted when it was sunny. This was to attempt to maintain weather as an independent variable. It was also estimated that people would be more likely to stop to respond if it was sunny. In order to remain as consistent as possible with the study group and to avoid possible differences between the week and the weekend, data collection in the field was conducted on weekdays. It was determined that data would be collected between 10 AM to 12 PM and 1 PM to 3 PM on weekdays in order to avoid the morning and lunch rush and be able to make contact with a

coherent group of people that were not in a hurry. The data collection for the study was conducted during spring in order to better understand the perception of greenery during this time of the year. The photos used in the questionnaires were taken when the greenery had yet to begin to sprout and bloom. A few weeks later when the questionnaire was conducted, the greenery had started to bloom. By using pictures from early spring (March) and conducting the questionnaire during late spring (April & May), the full spectrum of the season could better be taken into account, as there is a drastic change in vegetation during spring which should not be ignored.

4.2.1 Selection of respondents

Three locations where many people pass by were selected in East and West Kvillebäcken respectively (figure 1). Because of the size and population of the area it was not possible to include all residents and visitors of the given areas in a total selection. Therefore, a partial selection of study subjects was deemed to be the best. The hope was that this selection would give a representative image (Esaiasson et al., 2007) of residents and visitors of East and West Kvillebäcken *during weekdays with a specific weather and time of the day*. People were asked at random in these locations to take part in the questionnaire which took roughly 10 minutes to answer. The questionnaire was conducted in Swedish, with the possibility for communication in English, in order to include the greatest number of people.

The population for this study was defined as all adults living within East and West Kvillebäcken, as well as the area's frequent visitors. Frequent visitors were defined as people who at least visit the area a few times a month. Only people that were over 18 years old were asked to take part in the questionnaire in order to assure legal consent. If a respondent answered that they do not live in the area and visit it less often than a few times a month, the interview was concluded without continuing to the next part. These answers were not registered. This measure was taken to avoid people who do not have a comprehensive overview of the area to take part. The reason for including frequent visitors of East and West Kvillebäcken in the study is that they too perceive residential greenery while spending time in the area and this was interesting to the study.

4.2.2 Contents of the questionnaire

The face-to-face questionnaire consisted of five parts. The list below is an overview of what the questionnaire contains:

- Date, time, weather and location.
- If the person lives in the study areas or is a frequent/non frequent visitor.
- Feelings towards residential greenery in East and West Kvillebäcken.
- Photos of greenery in Kvillebäcken.
- Selection of favorite green places for mental maps.
- Information about the respondent.

The first part of the questionnaire includes the specific date and time of the day, as well as the weather at that specific moment, in order to be able to take these variables into account later. The documented weather included if the temperature was above 10 degrees, if it was windy and if it was cloudy. What spot the questionnaire was conducted in out of the 3 available areas was also documented. This was all filled out by the interviewer before the start of an interview.

The second part of the questionnaire concerned respondents' general perception of residential greenery in the area. They were asked to rate statements regarding the residential greenery of the area on a scale from 1-5, where 1 is more negatively inclined and 5 more positively inclined. The questions concerned amount, beauty, safety and accessibility as well as the importance of greenery. These aspects were chosen because they were deemed relevant for the understanding of the perception of residential greenery in an area, similar to how aspects of greenery were treated in Mittermüller et al., (2021).

The third part asked what the respondents thought of four photos, taken in the respective area by the authors during sunny days in the month of March. The photos portrayed places with residential greenery in the corresponding area where the interview took place. The purpose of this part was to investigate if and how people's perception of residential greenery changes when viewing different kinds of it. The variant of the questionnaire used in East Kvillebäcken contained photos from East Kvillebäcken, and the other way around for West Kvillebäcken. The places were chosen cohesively with the type of area in consideration, in order for the responses to be comparable. In East and West Kvillebäcken respectively, there is one photo portraying a road scape. The other three photos portray differently landscaped courtyards. The

respondents were asked to describe the greenery in each photo with 1-4 words. This was done in order to understand how respondents would describe specific residential greenery in their own words.

The fourth part of the questionnaire consisted of a method called mental mapping, inspired by how it was used in the study by Mittermüller et al., (2021). The data collection for the mental maps was done by showing respondents an aerial photograph of either East or West Kvillebäcken depending on the area in which the interview was conducted. The respondent was then asked to place a sticky dot in their favorite green place in the area. The person was then asked why the place was chosen in order to understand what it is about that specific green place that they like.

The final part of the questionnaire contained a few questions concerning personal information. These questions included the age and gender of the respondent, if they have children, if they have a dog, as well as where the person grew up in terms of the size of the city. These questions were asked in order to be able to draw conclusions of the population and compare the results (Esaiasson et al., 2007) from East Kvillebäcken with the results from West Kvillebäcken. However, the respondents remained anonymous in the study. Careful wording and consideration for each question was made in order to avoid offending.

4.2.3 Analysis of the questionnaire

The way people perceived residential greenery was analyzed separately for each area using a descriptive analysis (Harris & Jarvis, 2014). A total of 71 responses to the total questionnaire were collected for East and West Kvillebäcken. Of these, 31 were from East Kvillebäcken and 35 from West Kvillebäcken. As a part of this, a total of 620 words and phrases describing and commenting on the photos were collected during the survey. These were divided into the categories positive, negative and neutral by appreciating the general meaning and intention, with consideration to the context of this study. The next step was for the words and phrases with similar meanings to be grouped together, because of the large number of different words with similar meanings. One word or phrase represented a group of similar responses. Broader words, such as ‘nice’ or ‘boring’, were used to summarize responses of a similar kind in order to encompass the main intentions and meanings. This created major categories in which the descriptive words and phrases were collected, counted, analyzed and most frequent answers

were identified. With the help of a descriptive analysis, simplified comparisons and conclusions could be made about the respondents' perception of the photos.

The questions from the questionnaire were read to respondents and their answers were noted by the interviewers in Google Form. The software easily allowed for collecting answers digitally and later compiling the data in Google Sheet and Excel. The person behind the response was considered using the personal information gathered. This made it possible to analyze if there were any trends in the perception of residential greenery and the person answering. The dots representing people's favorite green place for the mental maps were digitized and geocoded in QGIS.

4.3 Mapping and Data

To aid in visualization of the study area and mental maps, the software QGIS 3.22.5 Bialowieza was used. Most of the information was digitized and visualized directly in QGIS using satellite images. The map of the study area (figure 1) was made by drawing polygons of the study sites using the satellite images of the background map by Google Satellite via the QuickMapServices plugin. The extents of the two study sites were determined by building typologies and surrounding roads. Both of the study sites' areas were then calculated. The mini map in the bottom left corner used a background map by Waze via the same plugin as well. The locations of the photos in the questionnaire were marked on the map as points 1 to 4, while the selected interview locations were marked on the map as points A to C.

For the two maps of the residential greenery in the study areas (figures 3 and 5), vegetation data from Wing (2021) was used. Some complementation was made for the green roofs in East Kvillebäcken by drawing polygons using Google Satellite, as that vegetation type was not present in the data set. The data was then visualized in the maps. For the circle diagrams, the raster analysis tool 'zonal histogram' was used to calculate the total area of each respective vegetation type, using land cover data in raster form. The results from the analysis were then converted to percentages and summarized in the diagrams.

The digitizing of the mental maps was done by manually digitizing and geocoding points. The points were then categorized and visualized using the heatmap function in order to represent the location and number of placements in the same area that were made by the respondents.

Table 1. *Data used in this study.*
Tabell 1. *Data använd för den här studien.*

Dataset	Year	Source	Usage
Vegetation data as polygons in a vector layer.	2022	Wing, 2021, University of Gothenburg.	To show the distribution of different vegetation in the study areas.
Land cover data.	2018, corrected 2020	From National ground cover data (Nationella marktäckedata) from the Swedish Environmental Protection Agency (Naturvårdsverket).	Calculating fractions of different types of land cover in the two respective study areas.
Satellite Images		Google Satellite	Creating a polygon layer for the study areas, mapping green roofs, and as background for the mental maps.
Background map Waze (World)		Waze	As background for the maps of vegetation types.

4.4 Method discussion

4.4.1 Population

The method of collecting research material has meant that several groups that live and spend time in Kvillebäcken have been excluded. The time of 10 AM to 12 PM and 1 PM to 3 PM on weekdays, during which field observations were conducted, excludes many people who do not reside outdoors during these hours. That includes for example people working in offices during these hours. On top of this, to fill out questionnaires, the study has been dependent on answers from people choosing to participate in the study. This in itself has also risked excluding the many people who have not wanted to stop and respond. The exclusion of groups who cannot, or do not want to take part in the study might have affected the results. This is a consequence of using an interview-based method, however, to better understand the perception of people, the selected method was deemed the most suited for the purpose of this study. Furthermore, children and youths are also an important part of the population living in Kvillebäcken and they were also not included in the study. It was deemed that there was not enough time to gain the legal consent to interview them.

When describing the photos, respondents were asked for 1-4 words. Because a few respondents described a photo with only 1 word and others with 4, some respondents were overrepresented, and some were underrepresented in that part of the questionnaire. However, this was deemed

to be the best alternative, as the goal was to collect the greatest number of describing words and respondents could not be forced to produce 4 words for every photo if they could not come up with more after naming 1.

An encountered problem during the analysis was a lack of data in order to make comparisons between different groups. The questionnaire asked for a number of variables (age, gender, place of upbringing, current residence, dog owning and number of children under 18). However, problems arose when analyzing the data using these variables. With so many different variables treated in the questionnaire, the analysis became too wide and made it difficult to focus on one specific variable. Additionally, there were too few respondents for a representative analysis of the different groups in each respective area, which led to difficulties when making correlations and comparisons.

4.4.2 Variables

One independent variable that had to be considered was weather. Although field studies were only conducted during sunny days it was difficult to get the exact same weather conditions regarding wind and temperature. Collecting information on approximates of wind and temperature and taking it into account helped create an understanding of how interview responses may have been affected by these weather conditions. In the end, as the weather during the period when the questionnaire was conducted was relatively consistent, responses were not noticeably affected.

Another variable that should be mentioned is that the choice of photographs affected the responses to that part of the questionnaire. As each study area required different photos (table 2 & 3) it was unavoidable that they affected the responses differently. To be able to compare East to West Kvillebäcken as accurately as possible, the photos used for each study area were chosen with the purpose of resembling similar types of places with residential greenery in the respective area.

Interview locations may also have impacted the responses. If the respondent stood in a green place or a non-green place, he or she may have been affected by the surroundings and therefore answered differently to the questions about rating greenery in the area. For this reason, three

interview locations in each study area were chosen to interview respondents with different amounts of surrounding greenery in different settings (figure 1).

Vegetation states varied throughout the study period, which was something that was difficult to avoid. This was because the time of the year that this study could be conducted was limited to spring, a period where vegetation undergoes extensive and rapid change. Affected by this, are the periods in which the photos were taken, and the questionnaire was conducted. These were done during two different times and represented different states of greenery, before and during bloom. Which might have affected the prevailing impression of greenery in the area, and therefore the way respondents perceived residential greenery.

5. Results

In the following chapter the results from the face-to-face questionnaires and the collection of mental maps are presented. First the ratings of residential greenery are presented, followed by a display of the results from the mental maps. Lastly, tables are presented visualizing a collection of words and phrases describing the photos showing residential greenery in the area.

5.1 Ratings of residential greenery

Generally residential greenery was perceived more negatively in East Kvillebäcken. This is indicated by East Kvillebäcken receiving between 0.5 to 1 units less than West Kvillebäcken regarding the residential greenery in eight out of nine questions; influence on security, if it leads to encounters with other people, if it offers children space to play, accessibility, variation, naturalness, attractiveness, amount (figure 6).

The only question in which both areas had the same score was 'How important is greenery *in general* for a residential area?' (figure 6). This question was the only one in which respondents did not have to consider the reality of the area they were living in. It was clear to see how respondents value greenery highly and see it as an important aspect of an urban environment. This was the question which received the most 5's and that the respondents agreed the most on. In East Kvillebäcken 25 respondents said it was very important to them, and in West Kvillebäcken 24 respondents, both averaging 4.6 units.

How much respondents valued greenery in their neighborhood stood in contrast to the actual amount of vegetation they perceived in both areas, especially in East Kvillebäcken. In West Kvillebäcken, respondents perceived more residential greenery than respondents from East Kvillebäcken (figure 6). Considering the gap between the importance of residential greenery (4.6 in both East and West) and perceived amount of greenery (2.7 in East and 3.7 in West), there is dissatisfaction among residents and visitors in both areas, particularly in East Kvillebäcken. People living and visiting East Kvillebäcken value greenery as highly as people living and visiting West Kvillebäcken, however the example for the Mixed city typology used in this study is perceived as less green, with less attractive, less natural, less varied and less accessible greenery than its Nordic functionalism counterpart. No correlations of statistical

significance could be found between how different groups of people perceived the residential greenery.

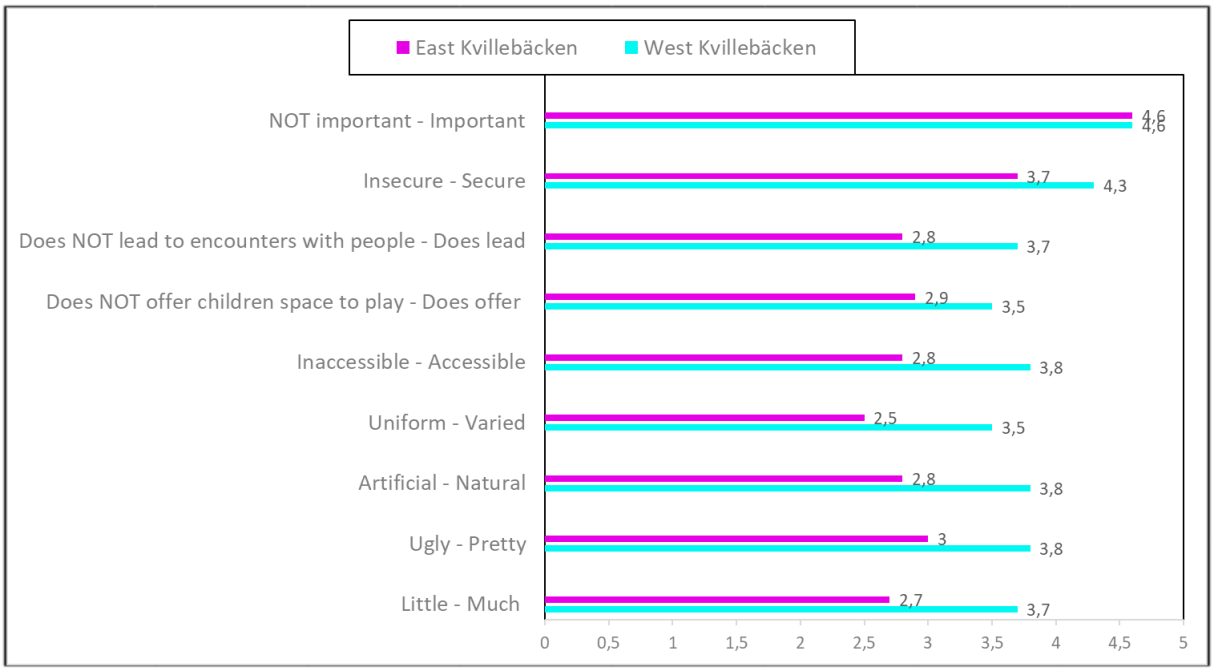


Figure 6. Mean ratings of how greenery is perceived in Kvillebäcken. Each statement relates to the greenery. Scale from left to right corresponds to the statements from left to right.
Figur 6. Hur grönska upplevs i Kvillebäcken. Varje påstående relaterar till grönskan. Skala från vänster till höger motsvarar påståendet från höger till vänster.

Evident from the results of the questionnaire was the fact that people perceived the residential greenery in West Kvillebäcken as more accessible. The responses to the question 'Does the greenery feel accessible?' (figure 7) and questions relating to the accessibility of greenery, such as 'Does it offer children space to play?' and 'Does it lead to encounters with other people?' (figure 8), also received higher scores in West Kvillebäcken than in East Kvillebäcken. People without children in both areas had a similar attitude as people with children, towards the space residential greenery offered children to play. Dog owners, however, felt differently about the accessibility of greenery in East Kvillebäcken. Several respondents who owned dogs complained that they were not allowed in, or did not feel welcome, into the courtyards of the area. Although, the two parks outside the study areas were often mentioned as places for people to walk their dogs and for children to play. But this was ruled out as it was outside of the study area.

Overall, answers from East Kvillebäcken were varied. The scores given by respondents were in several cases relatively evenly spread from 1-5, which indicates that different people

perceived the residential greenery differently. This is exemplified by the responses in figure 8 (right) where there is almost an even spread in the number of responses per scale unit. Comparatively, answers from West Kvillebäcken were more weighted in a positive direction, indicating that respondents felt similarly about the topic in question (figure 7 & 8).

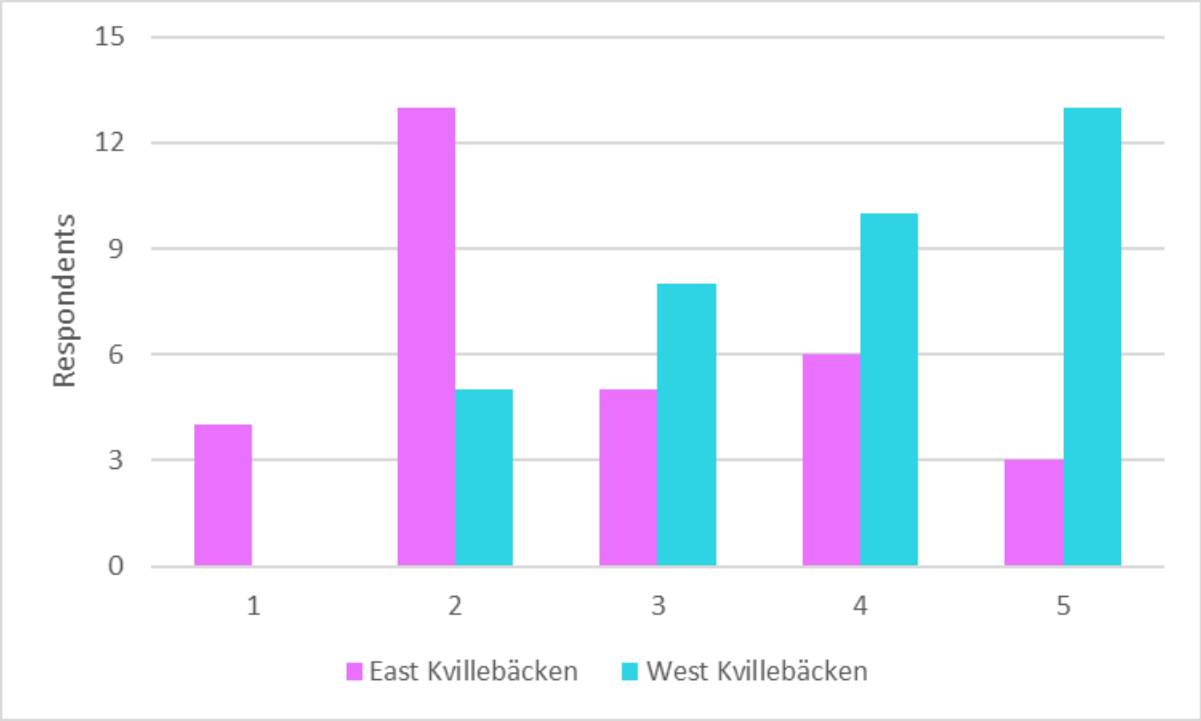


Figure 7. Answers from West and East Kvillebäcken to the question 'Does the greenery feel accessible?'.
Figur 7. Svar från Västra (vänster) och Östra (höger) Kvillebäcken på frågan 'Känns grönskan tillgänglig?'.

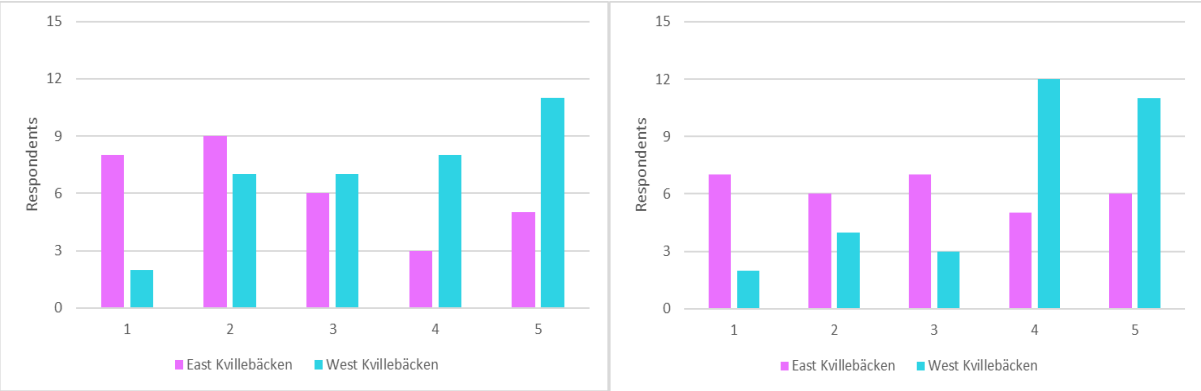


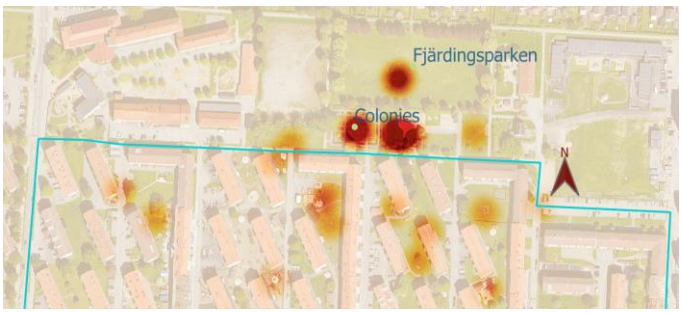
Figure 8. Answers from West and East Kvillebäcken to the question 'Does the greenery offer children space to play?'(Left). Answers from West and East Kvillebäcken to the question 'Does the greenery enable encounters between people?' (Right).
Figur 8. Svar från Västra och Östra Kvillebäcken på frågan 'Erbjuder grönskan barn utrymmen att leka?' (Vänster). Svar från Västra och Östra Kvillebäcken på frågan 'Möjliggör grönskan för möten mellan människor?'(Höger).

5.2 Respondents favorite green place

Figure 9 shows the respondents favorite green places in the respective study areas. The highest concentration of favorite spots was in, or near, the larger parks which are located outside of the study areas. Despite encouragement for pointing out favorite locations within both the study areas, many respondents simply preferred the parks above all else. Second favorite were the courtyards near where the respondents lived.

In East Kvillebäcken, the most mentioned green places were the parks Kvillebäcksparken and Tuveparken, while the second most mentioned were different courtyards. Green roofs were mentioned on two occasions, as well as a rain garden. Restaurants, cafés and the Saluhall, which are places for eating, were also mentioned as favorite places in the area because the respondent could not come up with a favorite *green* place. All these except for Kvillebäcksparken can be found inside the study area.

For West Kvillebäcken, Fjärdingsparken was mentioned the most, but also the nearby colonies and rose gardens, all outside of the study area. Inside the study area, the open courtyards between the buildings with larger open grass areas, flower beds, trees and seating areas were appreciated. In general, the reasoning for the chosen favorite green places could be divided into three categories, one being that the greenery that was in the location was nice, another was that the respondent lived close by, while the third was that the nearby park was the greenest and was therefore the most preferred. The only noticeable difference between the way different groups of people answered was that residents more often chose their own courtyards whereas visitors more often chose the parks.



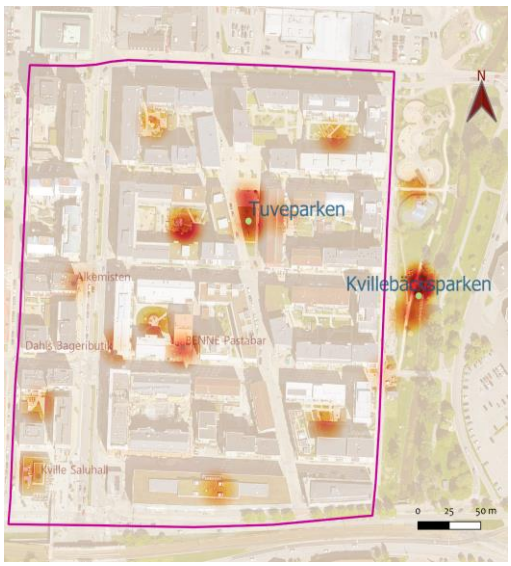


Figure 9. Heatmaps showing the respondents' favorite green places in West Kvillebäcken (left) and East Kvillebäcken (right) respectively. Darker color represents more placements of favorite places. Background map: Google Satellite.
Figur 9. Värmekartor som visar respondenternas favoritplatser i Västra Kvillebäcken (vänster) respektive Östra Kvillebäcken (höger). Mörkare färg representerar fler placeringar av favoritplats. Bakgrundskarta: Google Satellite.

5.3 Respondents description of the photos of green spaces

5.3.1 East Kvillebäcken

East Kvillebäcken, built according to the Mixed city ideal, received overall more negative words than positive (table 2). The only photo to have more positive words than negative was the second, *Evergreen courtyard*, with 53 positive words to 33 negative words. The first and third photos, *Roadscape East,* and *Westcoast courtyard*, on the other hand, had both over 50 negative words and around 25 positive words. Uniquely, the fourth photo, *Modern courtyard*, almost had the same amount of positive and negative words; 33 to 34.

Qualitatively, the words by the respondents gave an idea of what the main positive and negative impressions were of each respective place and residential greenery. On the positive side, the word ‘nice’ was mentioned for all four photos. *Evergreen courtyard* was described as ‘nice’ the most times. The phrase ‘nice in summer’ was mentioned the most in *Roadscape east*. While some appreciated how it looked at the time the photo was taken in spring before sprouting, some said it would be even nicer in summer with more developed greenery.

Regarding the negative words, the most frequently mentioned word differed between each photo. ‘Boring’ was mentioned several times for all four photos, but it was mentioned the most for *Modern courtyard*. Another word that was mentioned in all photos besides the second, *Evergreen courtyard,* was ‘artificial’. Moreover, ‘undeveloped greenery’ was also often mentioned, especially in *Roadscape East*. The reason often being the young trees and seemingly empty flower beds. ‘Autumn’ may also refer to the undeveloped greenery. The usage of the greenery in the areas was also noticed in a negative sense, some respondents found the greenery ‘inaccessible’, while others found it ‘not child friendly’ or that it had ‘no actual use’.

In some cases, ‘boring’ and ‘nice’ were mentioned for the same photo by the same respondent. There were further contradictions between the positive and negative words between separate respondents. For example, in *Roadscape East*, respondents said both ‘clean’ and ‘unkempt’ or 'inviting’ and ‘uninviting’ for *Westcoast courtyard*. It may have been that respondents were in disagreement about the greenery seen in the photos.

Other parts of the landscaping were also acknowledged, such as the two phrases ’nice details’ for *Westcoast courtyard* and ‘nice design elements’ for *Modern courtyard*. The neutral phrase ‘modern’ referred to both buildings and landscaping and could together with the two previously mentioned positive phrases be connected to the design that comes with the Mixed city typology. Another neutral term often brought up was ‘okay’, or ‘neutral’, indicating that respondents did not feel strongly about the photos. In addition, some respondents made a connection with the property owners to the landscaping and cleanliness of the yards, as the property owners are responsible for their own courtyard.

Table 2. *A summary of the 2-6 most common positive, negative and neutral words by the respondents describing the greener in each photo in East Kvillebäcken. The first cursive word was mentioned the most, then the following words are ranged in order from.*

Tabell 2. *En sammanfattning av de 2–6 mest förekommande positiva, negativa eller neutrala ord från respondenterna som beskriver grönskan i vardera fotonen i Östra Kvillebäcken. Det första kursiva ordet var nämnt flest gånger, sedan är följande ord rangordnade från mest till minst nämnt.*

East Kvillebäcken				
Photo	**Positive**	**Negative**	**Neutral**	**Total**
Roadscape East (1) 	*Nice in summer, (6)*, Nice, Clean, Nice greenery	*Underdeveloped greenery (13),* Boring, Unkempt, Plain, Artificial, Inaccessible	*Modern (6),* Autumn, Kjellbergs*	
	Total: 21 positive words	**Total: 55 negative words**	**Total: 9 neutral words**	**83 words**
Evergreen courtyard (2) 	*Nice (20),* Better than the previous one, Inviting, Nice in summer, Well maintained, Lot of green	*No place to sit (6),* Inaccessible, Predictable, Not child friendly, Only for summer, Plain, Boring	Okay, Kjellbergs*	
	Total: 53 positive words	**Total: 33 negative words**	**Total: 2 neutral words**	**88 words**
Westcoast courtyard (3) 	*Nice (7),* Nice details, Inviting, Has potential, Greenery	*Artificial (10),* Uninviting, Boring, Rocky, Failed planning, No/undeveloped greenery, Not nice	Okay, Neutral, Autumn, Adapted for some	
	Total: 24 positive words	**Total: 59 negative words**	**Total: 4 neutral words**	**87 words**
Modern courtyard (4) 	*Nice (11),* Nice design elements, Space for different activities and needs, Nice lighting, Inviting	*Boring (7),* Not child friendly, Artificial, No actual use, Not enough greenery	*Okay (3),* Grassy, Garden, Neutral	
	Total: 33 positive words	**Total: 34 negative words**	**Total: 7 neutral words**	**74 words**

*Kjellbergs is one of the property owners in East Kvillebäcken.

5.3.2 West Kvillebäcken

In West Kvillebäcken with the Nordic functionalism ideal, a majority of positive words were mentioned (table 3). The exception was the first photo *Roadscape West,* which had the most negative words (39) and the least positive (24). Oppositely, the third photo, *Fika seating area*, was the most positively regarded at 55 to 13 negative words. The remaining two photos received a similar evaluation, with a majority of positive words, 45 (*Flagpole lawn*) and 51 (*Lawn courtyard*), and less negative words, 26 (Flagpole *lawn*) and 23 (*Lawn courtyard*).

On the positive side, 'nice' was the most mentioned word overall. An exception was found for the *Fika seating area*, where the phrase 'fika' exceeded the word 'nice'. Similarly to East Kvillebäcken, 'nice in summer' was mentioned in all but the third photo. The word 'open' and 'well maintained' also came up in all photo descriptions but *Roadscape West*. Although, in *Roadscape West* and *Lawn courtyard,* the existence of greenery was appreciated. Likewise, the greenery in *Flagpole lawn* and *Fika seating area* was complemented for looking nice, with the words 'nice flower beds' and 'nice greenery'.

Regarding the more negatively connotated words, 'boring' could be found as the most mentioned word for both *Roadscape West* and *Flagpole lawn.* Words with the theme of absence adjoined these photos in the form of words such as 'sparse' and 'nothing'. On the other hand, *Fika seating area*'s main negative word was 'concrete', followed by words such as 'unused potential'. Meanwhile, respondents voiced the desire for more greenery in the other three photos. This can be found contradictory to their positive counterparts, complimenting the greenery found in these photos. Additionally, as in East Kvillebäcken, there were some respondents that did not feel strongly about the greenery in the photos and therefore answered with the neutral terms 'okay', 'normal' and 'nothing wrong'. Contradictory to East Kvillebäcken, other elements of the landscaping were not specifically mentioned.

Table 3. *A summary of the 3-6 most common positive, negative or neutral words by the respondents describing the greenery in each photo in West Kvillebäcken. The first cursive word was mentioned the most, then the following words are ranged in order from.*

Tabell 3. *En sammanfattning av de 3–6 mest förekommande positiva, negativa eller neutrala ord från respondenterna som beskriver grönskan i vardera fotonen i Västra Kvillebäcken. Det första kursiva ordet var nämnt flest gånger, sedan är följande ord rangordnade från mest till minst nämnt.*

West Kvillebäcken				
Photo	**Positive**	**Negative**	**Neutral**	**Total**
Roadscape West (1) 	*Nice (10)*, Good that there is greenery, Adapted for the seasons, Nice in summer	*Boring (11),* Uncreative, Badly planned, Sparse, Not much greenery	*Normal (2)*, Bushes, Small town	
	Total: 24 positive words	**Total: 39 negative words**	**Total: 4 neutral words**	**68 words**
Flagpole lawn (2) 	*Nice (12),* Open, Nice in summer, Good for children and pets, Well maintained, Nice flower beds	*Boring (8),* Needs more greenery, Grass needs work, Sparse	Autumn, Normal, Okay	
	Total: 45 positive words	**Total: 26 negative words**	**Total: 4 neutral words**	**75 words**
Fika seating area (3) 	*Fika (10),* Nice, Well maintained, Nice greenery, Cozy	*Concrete (3),* Unused potential, Ugly, No bin, Large shadowy bushes	Wallenstam*, Stone, Only adapted for some	
	Total: 55 positive words	**Total: 13 negative words**	**Total: 4 neutral words**	**72 words**
Lawn courtyard (4) 	*Nice (9),* Open, Well maintained, Nice in summer, Good, Green	*Could be prettier with more greenery (7),* Nothing, Boring, No place to sit	*Okay (2),* Nothing wrong, As expected	
	Total: 51 positive words	**Total: 23 negative words**	**Total: 8 neutral words**	**72 words**

*Wallenstam is one of the property owners in West Kvillebäcken

6. Discussion

Residential greenery was considered very important in both areas (figure 6), which became clear from the responses to the questionnaire. The presence of greenery was rated very highly in the question about the importance of greenery in a residential area, and when responding to the photos respondents often appreciated the greenery or said that there was not enough (table 2 & 3). These results further confirm that greenery is important for the welfare of humans in urban environments which is consistent with previous research (e.g., Sheets & Manzer, 1991, Russo & Cirella, 2018). However, due to the limits of the questionnaire, it was difficult to understand *how* respondents would want more residential greenery to be implemented. Interesting for further studies is how to best implement greenery according to residents and visitors of an area in the limited space of the urban environment.

Considering that it has been established that it is important with greenery in a residential area for the greater majority of the respondents (figure 6), the result from the mental mapping is an interesting contradictory result. In the maps, the highest concentration of the placements of favorite green places were outside of the study areas, in the parks. When considering why this was the case, three potential reasons come to mind. First, the greenery that exists in the residential area is not consciously perceived but still constitutes an important aspect of the evaluation of an area, as evolutionists would argue (Sheets & Manzer, 1991). Second, when thinking about a place, it is possible that the respondent has an ideal image, such as a place in harmony with nature, as culturalists would argue (Sheets & Manzer, 1991), setting high expectations for their favorite green place and the amount of greenery there should be. When the respondent then considers the residential greenery present in either East or West Kvillebäcken, it may be that none of the areas were not up to par with these ideals. The third potential reason was that respondents simply chose what they presumed was the most green place in close proximity, which often were the parks. The only satisfaction with the residential greenery in the study areas was found in a few cases with placements made near a respondent’s homes. Despite valuing residential greenery as important, it did apparently not make enough of a conscious impression in many respondents' perception for them to be able to name what their favorite part of it was. Considering the way people valued parks and sought out the green characteristics of them, the relation between residential greenery and public greenery is an important aspect in the planning process of greenery of the urban landscape.

Between the two study areas, the responses from the questionnaire differed noticeably. In West Kvillebäcken, a general positive agreement could be found, while in East Kvillebäcken, the answers often varied across the whole 1-5 scale (e.g., figure 8). The varied answers in East Kvillebäcken indicate that people feel very different about the residential greenery. Answers were so varied, that no particular trends between groups could be found. However, one great difference between two groups was encountered, which was the discrepancy between the two study areas. This may be because of the different building typologies which create structures that affect the perception of residential greenery in each area. To conduct a refined study, a larger population is advised on the perception of greenery between different groups, for the sake of proper representation.

Evaluating the responses from the two areas, West Kvillebäcken was perceived more positively than East. This could be found in both the ratings 1-5 and in the words describing the photos, where West scored higher in all categories and received more positive feedback. The reason for residential greenery being more appreciated in West Kvillebäcken could have to do with a higher percentage of vegetated land coverage, as seen in the pie charts of land cover types (figure 3 & 5). Residential greenery in West Kvillebäcken was also perceived as prettier, which could have to do with it also being perceived as more natural (figure 6), which according to Ulrich (1979) is something desirable. The result that the greenery in West Kvillebäcken was perceived as prettier was entirely based on the perspective of the respondent. Greenery preferences are cognitively mediated (Sheets & Manzer, 1991) and cannot be cross referenced with any computer analysis. The reasons for the attractiveness of greenery are still only theories and could be researched further in future studies.

According to the inventory of greenery made by Wing (2021), the types of greenery in the Mixed city typology of East Kvillebäcken are more varied in comparison to West (map in figure 3 & 5). However, respondents perceived it as less varied when asked (figure 6). The reason behind this could have to do with the interaction with greenery, or lack thereof. To exemplify, each courtyard in East Kvillebäcken contains a unique set of plants. However, many respondents, especially visitors, mentioned that they did not feel allowed into the courtyards of other buildings because they felt as if they were trespassing on someone else's property. It is of little significance to a visitor or a resident of East Kvillebäcken that the greenery of a courtyard is unique if they do not enter it. Yet, the courtyard may be important to a resident in the particular building which it belongs to, illustrated by some respondents choosing their own

courtyard as their favorite spot (figure 9). This is in line with the findings of Gunnarsson et al., (2017) stating that people become more attached to greenery that they often interact with. However, residential greenery which is only accessible to the residents of the immediate surrounding buildings is a more selective form of greenery that is not welcoming to visitors. Nor is it welcoming to dog owners because dogs are not allowed into the courtyards. Due to the lack of accessibility respondents may have perceived the residential greenery as less varied in East Kvillebäcken. This is probably also the reason why questions on accessibility received lower scores in East Kvillebäcken than in West (figure 8). In contrast, the courtyards of West Kvillebäcken, encompassing the Nordic functionalism typology, are not encircled by buildings. Instead, paths run through the courtyards as an alternative to get from point A to point B, encouraging people to pass by and feel welcome to experience the residential greenery. This may have allowed them to see all of the greenery in the area and perceive it as more varied.

Considering the responses to the photos, the cultural ecosystem services were the most important to respondents. Of these, aesthetic aspects, such as ‘clean’ and ‘inviting’, seemed to be highly valued, followed by recreational possibilities such as ‘good for children and pets’ and ‘fika’. This study did not focus much on the regulatory ecosystem services of the vegetation, the only service which came up by the respondents themselves was shadowing. However, the method of this study asked about greenery in a location using the ocular impression of a photo, which most likely encouraged respondents to focus predominantly on that sense. To improve the scope of the research on residential greenery, further studies should strive to implement methods that incorporate more senses than only the ocular.

Landscaping design aspects of the modern Mixed city typology were mentioned with both negative and positive connotations, such as ‘nice design’ and ‘artificial’. Sometimes regarding the same objects. The landscaping in West Kvillebäcken had in the past decade been newly redone and received a fresh look, which was apparently appreciated by respondents in that area. Although *new* was not only a good thing in the case of East Kvillebäcken (figure 6, table 2 & 3). There the residential greenery was planted more recently but received a worse score. The age and the resulting size of the trees came up in several of the interviews. The statements ‘has potential’ and ‘undeveloped greenery’ came up five, respectively six times regarding East Kvillebäcken (table 2 & 3). Both statements often had to do with the facts that the vegetation was undeveloped, and the trees were young or not in bloom. According to the savanna hypothesis (Gerstenberg & Hoffman, 2016) it makes sense that people do not appreciate

undeveloped trees with small canopies. Even if the flower beds and bushes of West Kvillebäcken were new, the trees were old and well developed. This may have contributed to why greenery was more appreciated in West Kvillebäcken than in East Kvillebäcken. It would be interesting to further analyze the role of trees in relation to other greenery on the overall perception of vegetation.

The difference between the seasons spring and summer was mentioned 22 times during the interviews, summarized in the phrase 'nice in summer' (tables 2 & 3). 'Nice in summer' indicates an understanding and expectation that greenery will be nicer when the summer comes and when the vegetation has developed more. The comments to the photos indicate that the season and state of the greenery affects respondents' perception of residential greenery. The different perceptions of greenery depending on the season is an important aspect of urban greenery rarely mentioned in the literature because many studies are conducted during the summer with fully developed greenery (Brooks et al., 2017). Variations in greenery following the seasons are further reinforced in urban environments in northern latitudes because most trees planted are deciduous and lose their leaves for roughly half the year (Erell et al., 2011, Clapp et al., 2014). To implement residential greenery which provides ecosystem services more evenly during the entire year, urban planners could account for the variations in seasons. One possibility is to plant greenery that does not lose its "green qualities" during the winter months while at the same time remaining aesthetically pleasing. The impact on perception of urban and residential greenery during different seasons would be an interesting topic to conduct further research on. One way to gain a better understanding of the seasonal differences of greenery and its effects on the urban environment would be to conduct an inventory of the greenery in both summer and winter, when the greenery is the most, respectively the least developed.

Some respondents expressed a feeling of disinvolvement in the projects regarding greenery during the interviews. It is important for the urban environment and its inhabitants that planners identify *what* greenery is needed and for *whom*. This has been identified by the city of Gothenburg in the *Environmental and climate program for the City of Gothenburg* which states that "new planning processes are necessary to cater for the demands on urban greenery" (Göteborgs Stad, 2020, own translation). Another result from this study that is important to involve in the planning process is that people seek the greenery in parks. Involving residents of the given area in the planning process may help planners accommodate the needs of the people using the greenery. Maintaining a dialogue with residents is a point brought up in

previous research (Dahl et al., 2017, Battisti et al., 2019) as a form to improve the planning process of urban greenery. To succeed in creating a green urban environment, residential greenery must be prioritized, and the needs of inhabitants clarified. The role of residential greenery in the urban environment must be precisely formulated and communicated to the municipality.

7. Conclusion

East Kvillebäcken received a lower score on the evaluation scale from 1 to 5, and a larger amount of negatively connotated words regarding the residential greenery compared to West Kvillebäcken. There were no apparent differences between answers from groups of people within the areas. However, the answers differed significantly between the East and West Kvillebäcken, which further strengthens the validity of the results showing the difference between the areas rather than groups. There seemed to be a connection between building typology and how people perceived the residential greenery which could be a result of the planning structure resulting from the building ideal. Although the ratings of the greenery in the areas differed, the presence of greenery in a residential area was valued equally high in East and West Kvillebäcken. Yet, in regard to the mental maps, it became clear that residents of both areas often preferred parks rather than locations with residential greenery. This finding is important for the planning of the urban environment and its associated greenery because it shows how people prioritize their interaction with greenery.

The fact that this study took place during spring was noticed when analyzing the perception of residential greenery. Season and development of vegetation seems to matter for people's perception of greenery. Newer greenery, especially trees which have not had time to develop, were not appreciated as much and perceived as less green by respondents. So was greenery that was not in bloom. The amount and accessibility of residential greenery also played a large role in the ratings and may have affected other aspects such as the perception of variability, which West Kvillebäcken scored higher in even though having less varied greenery.

Based on the results from this study, it would be beneficial to plan residential greenery which supplies ecosystem services throughout the whole year. In particular, cultural services from the perspectives of residents and visitors of an area. To better plan the residential greenery of the urban landscape, planners would benefit from involving its users in the planning process. Planning of greenery considering objective elements is important, but to the individual experiencing the greenery, it is the perception of it that matters the most.

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Appendix

Questions in the Face-to-face questionnaire

Part 1. External factors.
Date.
Time.
Survey spot.
Weather.
Does the respondent live in the area?
How often does the respondent visit the area?

Part 2. How the greenery in the area is experienced.

1. There is… little greenery (1) ... much greenery (5)
2. The greenery is… ugly (1) ... pretty (5)
3. The greenery feels…. artificial (1) ... natural (5)
4. The greenery is… uniform (1) ... varied (5)
5. The greenery is... inaccessible (1) ... accessible (5)
6. The greenery… does NOT offer children space to play (1) ... does offer children space to play (5)
7. The greenery does… NOT lead to encounters with people (1) ... lead to encounters with people (5)
8. The greenery makes one feel… insecure (1) ... secure (5)
9. The existence of greenery in a residential area is… NOT important (1) ... important (5)

Part 3. Photos of greenery in each area.
Photos found in table 2 and 3.

Part 4. Mental maps.
Respondents place sticky dots in their favorite green place on a map of the study area.

Part 5. Information about the respondent.

1. Where did you grow up? (Large, medium or small city, suburb, countryside)
2. Age?
3. Gender?
4. Do you have any children under 18?
5. Do you have a dog?
6. Anything to add?