

# Reimagining Academic Greenspaces with Restorative Practices

A Design Proposal for Betonggården, Chalmers

Elna Boklund & Kittima Ritthichot

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Swedish University of Agricultural Sciences, SLU  
Faculty of Natural Resources and Agricultural Sciences  
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# Reimagining Academic Greenspaces with Restorative Practices

## A Design Proposal for Betonggården, Chalmers

Elna Boklund & Kittima Ritthichot

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**Swedish University of Agricultural Sciences**  
Faculty of Natural Resources and Agricultural Sciences  
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# Abstract

The aim of this thesis is to investigate how an environment with restorative qualities can be designed to support users in an academic setting, specifically Betonggården, at Johanneberg campus in Gothenburg. Designing environment to support the users need was initiated in the 19th century when the first public parks emerged. It has been established that greenspaces can have a beneficial impact on physical and mental health. However, academic greenspace is commonly disregarded as a greenspace – although they existing in a highly competitive, stressful and taxing environment for staff and students. Therefore, this thesis will elaborate on how to implicate restorative qualities through evidence-based design. A meta-analysis with the following theories was conducted in the pre-study: Healthy Academic Greenspace Framework (HAGF), The Triangle of Supportive Environments, the Quality Evaluation Tool (QET). The meta-analysis was conducted at five academic greenspaces and three reference locations. While the results at five academic greenspaces at Johanneberg campus portrayed existing and absent qualities, the results of the meta-analysis at the reference locations provided the practicalities of designs through the perspective of environmental psychology. Hence, both results provided a the fundamentals for the design at Betonggården.

The thesis emphasises the importance of designing supportive environments in an academic setting, whence is akin to a working environment. Therefore, the design should be adapted to existing site conditions to create a purposeful design that enhances existing qualities. For Betonggården, creating smaller rooms and enclosure with vegetation enhanced the experience of entering

an undisturbed world. Thus, allowing users to recover their mental fatigue. As landscape architects, it is vital to recognise the users need as commonplaces are designed for the public. Hence, the academic greenspaces should be reconsidered to create supportive environment. A competitive environment is susceptible to strain, thus, the improvement of these environments should be prioritised. On the broader scale, it could also be a part of vicinity's the green infrastructure – further enhancing the opportunity to be near nature.

**Keywords:** *restorative academic greenspace, restorative environment, academic greenspace, restorative campus, university greenspace, betonggården, johanneberg campus, chalmers technical university.*

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# Sammanfattning

Syftet med det här examensarbete är att undersöka hur en miljö med återhämtande egenskaper kan utformas för att stödja användare i en akademisk miljö, närmare bestämt Betonggården, vid Johannebergs campus i Chalmers tekniska högskola i Göteborg.

## Bakgrund

Den gröna infrastrukturen har en stor påverkan i våra städer, ofta talar man om dess klimatreglerande egenskaper och inverkan för biodiversitet. Grönytor inhyser även en annan viktig roll; de har en stor påverkan för att främja människors psykiska och fysiska välmående. Det finns en korrelation mellan välmående och närheten till grönytor samt hur mycket tid man spenderar i dem. Enligt Grahn & Stigsdotter (2003) och Grahn & Stoltz (2021) rekommenderas ett maxavståndet på 300 meter till grönytor, vilket motsvarar ungefär 5 minuters promenad, för vardagsanvändning. Att designa ytor för att främja välmående är ingen ny idé, utan var något som fanns i åtanke redan under 1800-talet när de första offentliga parkerna kom till. Kaplan & Kaplans (1989) *Attention restoration theory* (ART) talar om att den *direkta uppmärksamheten (directed attention)* kan tröttnas ut om den inte ges möjlighet att vila. Den direkta uppmärksamhet kräver koncentration och är energikrävande. Får man inte återhämta den direkta uppmärksamheten kan det i längden leda till psykisk trötthet. Den direkta uppmärksamheten får vila när den *indirekta uppmärksamheten (involuntary attention)* används. Den indirekta uppmärksamheten kräver ingen energi för att upprätthållas och kan till exempelvis triggas av att befinna sig i grönytor. Det är etablerat att grönytor har fördelaktiga egenskaper för

välmående. Däremot, bortses ofta vikten av *akademiska grönytor* (see begreppsförklaring s. 10) trots att detta är en mycket konkurrenskraftig, stressig och belastande miljö för personal och studenter. Därav kommer den här uppsatsen att undersöka hur man kan använda teorier inom miljöpsykologi för att skapa en evidensbaserad design som skapar en återhämtande grönyta i en akademisk miljö. Uppsatsen har i avsikt att omgestalta en urban campusgrönyta ur ett miljöpsykologiskt perspektiv. *Betonggården*, på Chalmers tekniska högskola, anvisades för oss av en vän som studerar på Chalmers på Johanneberg campus i Göteborg; Platsen ansågs lämplig då det var en yta som vi ansåg ha potential för att utvecklas till en återhämtande grönyta på grund av dess skyddade läge som bakgård.

## Syfte & Frågeställning

Syftet med det här examensarbete är att ta fram ett designförslag som undersöker hur en miljö med återhämtande egenskaper kan utformas för att stödja studenter och universitets personal i en akademisk miljö, närmare bestämt Betonggården, vid Johannebergs campus i Chalmers tekniska högskola i Göteborg. Designens huvuduppgift är att skapa en återhämtande akademisk grönyta för studenter och akademisk personal då den akademiska miljön kan vara psykiskt utmattande. Utformningen av platsen strävar efter att ta en form som stämmer i den redan existerande kontexten av det omkringliggande campuset. I den större skalan, strävar uppsatsen till att informera och inspirerar kring hur det är möjligt att integrera det miljöpsykologiska tankesättet för att skapa och designa återhämtande miljöer.

Följande frågeställning eftersträvas att besvaras:

***Hur kan Betonggården utformas för att främja välmående och återhämtning för studenter och akademisk personal med varierande behov?***

## Metod

Metoden består av tre huvuddelar: *Förstudien*, *design* och *diskussion*. Arbetsprocessen var iterativ även om det fanns tre huvuddelar. Designprocessen som helhet genomfördes genom den evidensbaserad modellen *Den intuitiva modellen - "Forskning inspirera design"*. Grundprincipen i modellen är att låta intuitionen vara den främsta vägledningen för designen och forskningen används för att inspirera och informera om koncept och design. Det är en modell där den instinktiva responsen och känslorna får styra designens gång. Förstudien innefattar en litteraturöversikt, intervjuer, dokumentöversikt, samt framtagandet och genomförandet av meta-analysen. Designdelen inbegriper designprinciperna som härletts från förstudien och designförslaget för Betonggården. I diskussion tas olika aspekter upp om designens utformning och arbetsprocessen.

## Förstudien

Förstudien inleddes med en litteraturöversikt som genomfördes för att hitta etablerad forskning inom miljöpsykologi angående välmående kopplat till grönytor och akademiska grönytor samt om hur man utformar återhämtande miljöer. Litteraturöversikten lade grunden för grundförståelse för miljöpsykologi kopplat till grönytor och återhämtande miljöer samt metaanalysen. En semi-strukturerad intervju hölls med Anna Zahlbruckner, Campusutvecklingsansvarig från Chalmersfastigheter. Intervjun gav bland annat insikt kring vilka grönytor som är välanvända på Johanneberg campus, hur Betonggården nyttjas idag och vi fick tillgång till campusindex (en enkätundersökning). Campusindex gav ett utförligt

underlag av vad studenter från Chalmers ansåg kan utvecklas inom de akademiska grönytor. De åsikterna sammanvägdes senare med resultaten från meta-analysen. Meta-analysen är en kombination av tre olika analysmetoder. Fördelen med en meta-analys är att risken för felaktiga slutsatser reduceras. Meta-analysen innefattar teorierna, *Quality Evaluation Tool (QET)*, *Pyramiden av stödjande miljöer (Pyramidmodellen)*, samt *Hälsofrämjande akademiska grönytor (HAGF)*. QET utvärderar olika kvaliteter i miljöer utifrån tre huvudkategorier: *behagliga*, *låg* och *hög stimulerande* kvaliteter. Pyramiden av stödjande miljöer är en grafisk illustration av miljöer för välmående som innefattar fyra nivåer: *inåtriktat engagemang*, *emotionellt deltagande*, *aktivt deltagande* och *utåtriktat engagemang*. HAGF tar upp vikten av akademiskt grönytor som hälsoresurs, dess potential att återställa direkt uppmärksamhet, forma identiteter och sociala möten. Det finns redan en koppling mellan QET och Pyramidmodellen, medan HAGF ger en inblick i vilka kvaliteter som behövs specifikt i en akademisk grönyta. Meta-analysen inleds med QET där alla kvaliteter analyserades och

dokumenterades (anteckningar och foton). Därefter utvärderades kvaliteterna med den pyramidmodellen och HAGF. Även om egenskaperna hos den pyramidmodellen och HAGF överlappar, utesluter den ena inte den andra. Pyramidmodellen används för att bedöma användarnas behov engagemang i miljön medan HAGF användes för att bedöma det fysiska utrymmet, det vill säga aktivt engagemang skulle kräva ett socialt utrymme som stöder sociala relationer, delade ritualer eller aktiviteter.

Meta-analysen genomfördes på fem grönytor inom Johanneberg campus, inklusive Betonggården, för att få en förståelse för vilka kvaliteter som campuset redan inhyser och vilka det finns ett behov av att utveckla. Meta-analysen genomfördes även på de tre referensprojekten för att ge praktisk inspiration till hur designförslaget för Betonggården kan utformas. Slutligen genomfördes meta-analysen en sista gång på det presenterade designförslaget för Betonggården för att visa på och skapa förståelse för vilka kvaliteter platsen inhyser efter omgestaltning.

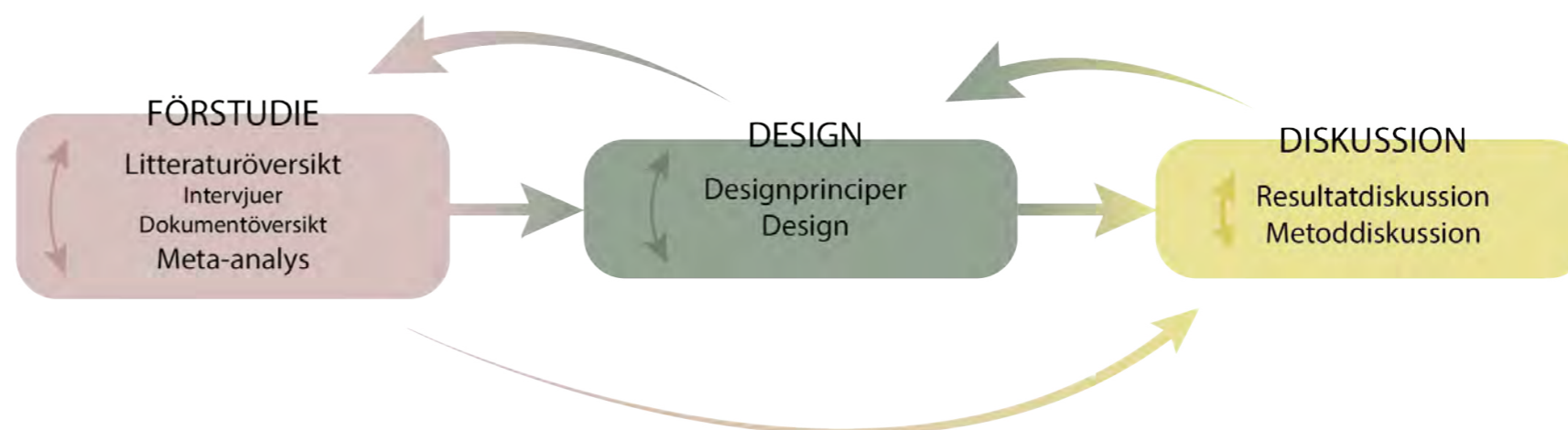


Figure 1: Beskrivning av arbetsprocessen - en iterativ process.

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## Design

Resultaten från meta-analysen, som genomfördes på Johanneberg campus, framgick det att majoriteten av grönytorna fokuserade på att skapa sociala ytor och att det fanns en brista av återhämtande grönytor. Baserat på resultaten från förstudien sammanställdes grundprinciper för designen för att skapa en återhämtande grönyta för Betonggården som sedan lade grunden för den fortsatta gestaltningen. Konceptet för Betonggården, *Genom Gläntan*, är inspirerat av hur en glänta ser ut – en glänta definieras som "ett öppet utrymme i en skog". Konceptet inspirerades från närliggande natur och möjligheterna att införa liknande inslag för att skapa en återhämtande plats för studenter och personal på campus. Genom Gläntan ska bidra med en grönyta som användarna kan nå på en kort färdsträcka eller kunna ses från de angränsande byggnaderna genom fönsterna, för att återhämta den direkta uppmärksamheten. Designen är uppdelad i två huvuddelar, vegetationen och rummen. De många säregna träden i Betonggården står i ett oregelbundet mönster för att ge känslan av en naturlig karaktär. Tillsammans med träden finns ett lägre lager som består av perenner och buskar med inslag av högre växter; detta skapar en enkel överblick över platsen med tillägg av dolda skrymslen och vrår där man kan befinna sig i en privat sfär. De fyra rummen i olika storlekar skapar fyra gläntor, där träden skingras och låter ljuset komma in. Mellan rummen finns gångvägar som leder besökaren genom platsen och tar dem från ett rum till ett annat med utsikt genom växtligheten. Inte på något sätt försöker designen återskapa en naturlig glänta, men konceptet har hämtat inspiration till hur rummen gentemot vegetation är

uppdelade, där träden i vissa områden kan skingras och låta ljuset sippra in för att skapa en mer dynamisk plats. Genom den föreslagna designen kommer Chalmers elever och personal att kunna röra sig genom gläntan, ifrån den omgivande betongdjungeln och omfamna sig själv i lugnet i det nya och förbättrade Betonggården.

Eftersom designen i stora drag omfattar vegetation som förändras och bildar rum krävdes en djupgående studie av växternas karaktär, tillväxt, blomning, samt utveckling. Därmed utnyttjades tryckta exemplar som *Stadsträddlexikon* av Sjöman och Slagstedt (2015), *Perenner och Lökar & Knölar* av Hansson och Hansson (2022), *Gräs & Bambu* av Hansson och Hansson (2021). Elektroniska källor exempelvis som växtkataloger från svenska plant skolor och The Royal Horticultural Society (RHS) nyttjades även i detta sammanhang.

## Diskussion

Det är relevant att ha grönytor i nära koppling till campusbyggnaderna då det möjliggör mer frekvent användning av grönyta och därmed ökar chansen för dess fördelaktiga effekter. Att spendera tid i grönytor har återhämtande effekter för den direkta uppmärksamheten och minskar risken för psykisk trötthet. Att ha grönytan i nära anslutning till campusbyggnaderna möjliggör att studenter och universitetspersonal kan spendera mer tid i grönytan då sträckan blir kortare att färdas, vilket är viktigt då ledig tid är en bristvara under arbetstimmar..

De förutbestämda platskvaliteterna fick stå i samspel med de designprinciper som tagits fram. Betonggården är en bakgård, vilket innebär att det är en mer avskild plats av campus. Men där är fortfarande entréer in till universitetsbyggnaderna som används frekvent vilket innebär att där ett flöde av människor som passerar platsen dagligen. Med detta i åtanke sågs det inte rimligt eller möjligt att skapa en plats för inåtriktad engagemang (Pyramiden av stödjande miljöer) då det är svårt att skapa en plats som är tillräckligt avskild på en plats där så många människor kommer att passera. I stället arbetade designen med de förutbestämda platskvaliteterna och fokuset hamnade på att skapa en återhämtande grönyta som fokuserade på emotionellt och aktivt deltagande (Pyramiden av stödjande miljöer). Vegetation i designen är en den huvudsakliga faktorn som triggar indirekt uppmärksamhet och skapar möjlighet för återhämtning, därav lades stor vikt på vegetationens utformning.

Huvudgruppen för designen är studenter och universitetspersonal men Betonggården är fortfarande en offentlig plats vilket innebär att allmänhet kan ta del av platsen. Detta är både en positiv och negativ aspekt. Det negativa är att det kan innebära mer människor befinner sig på platsen och det kan bli en för social yta och motverkar effekten för återhämtning. Medan den positiva aspekten är att Betonggården ökar möjligheten till närhet av grönytor för fler människor i Göteborg.

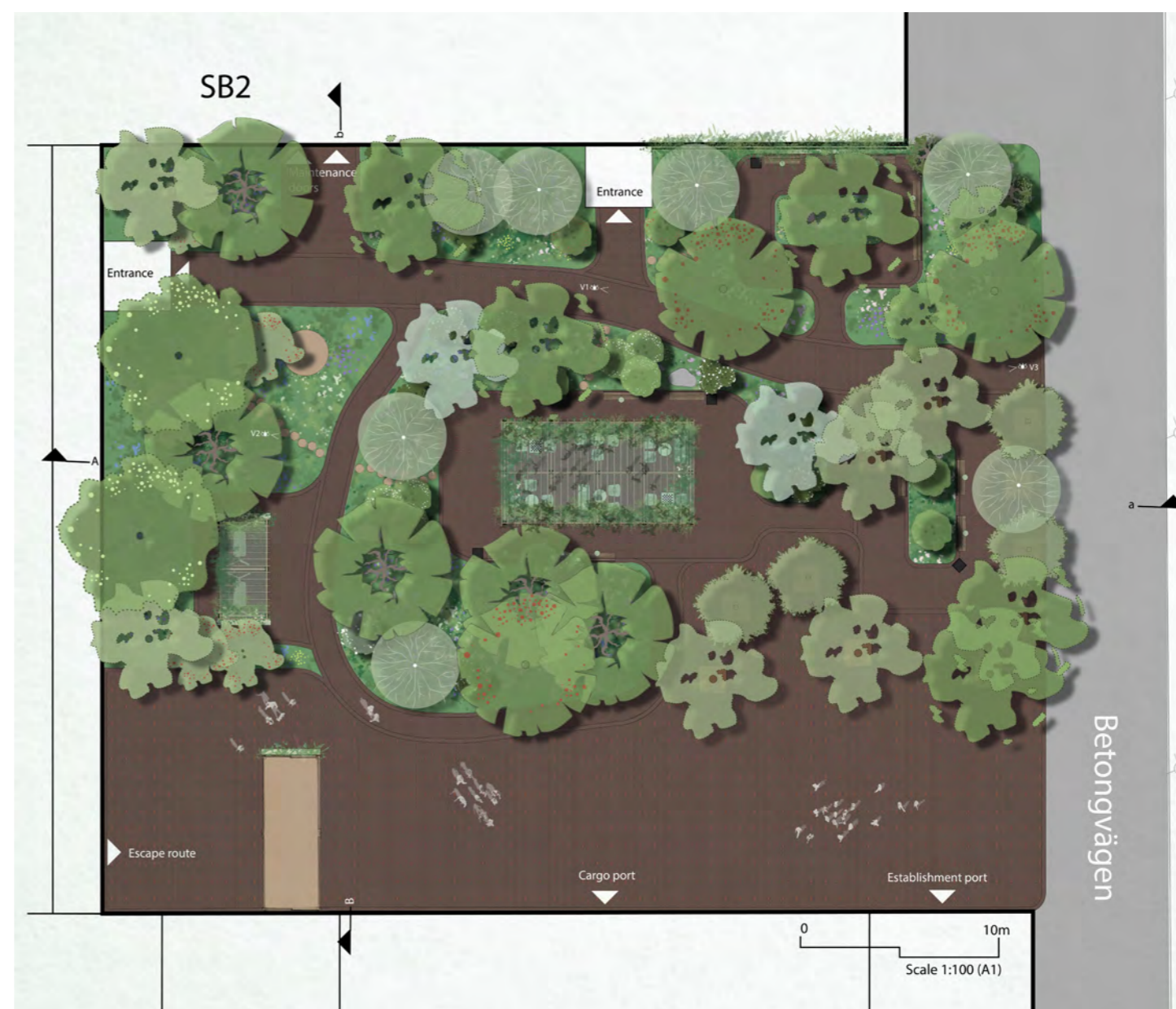


Figure 2: Det slutgiltiga designförslaget för Betonggården.

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# Glossary

**Academic greenspace:** greenspaces on campus

**Being away:** derived from ART, an aspect that triggers restorativeness by allowing users to experience the feeling of getting away cognitively (p. 24).

**Compatibility:** derived from ART, an aspect that triggers restorativeness with the environment's characteristics to reciprocates the desires and goals of the individuals (p. 24).

**Directed attention:** derived from ART, involves the type of attention that is cognitively controlled. Direct attention requires a large amount of effort and is susceptible to fatigue (p. 24).

**Extent:** derived from ART and the interrelationship of the individual and their perception and experience of the vastness in the environment (p. 24).

**Fascination:** derived from ART and entails stimulation of curiosity of fascinating occurrences, related to involuntary attention. It enables the recovery of by finding stimuli, therefore also replenishing directed attention (p. 24).

**Green infrastructure:** A system of tactically planned natural and semi-natural areas with various environmental features that are designed and managed to deliver ecosystem services. Likewise, enhancing biodiversity (EU Commission environment policy. n.d.).

**Involuntary attention:** derived from ART, involves the type of attention that does not require effort, i.e., intrinsically fascinating occurrences or stimuli and is self-sustaining (p.24).

**Indirect experience of nature:** experiencing/perceiving nature through windows

**Wild characteristics:** Used to describe characteristics of vegetation that is allowed to grow freely, akin to those in nature.

## Abbreviations

**ART** = Attention restoration theory (p. 24)

**QET** = The Quality Evaluation Tool (p. 25 )

**HAGF** = Healthy Academic Greenspace Framework (p. 31)

**UGS** = Urban greenspace

**PSD** = Perceived Sensory Dimensions

# INTRODUCTION

## **SUMMARY**

This chapter will provide a brief introduction to the current topic of restorative benefits linked to greenspaces. Based on this, the aim, purpose and the research questions of the essay are then presented. Finally, the method and approach used during the essay to answer the research questions are described.

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# Background

In this thesis, the connection between academic greenspaces and well-being is investigated to create an understanding from a perspective of environmental psychology that can be used as a basis for developing an evidence-based design proposal for Betonggården in Gothenburg.

The global goals intend to establish increased greenery, equitability, and an improved world by the year 2030 (Global goals n.d.a). Goal 3 and 11 can be achieved partly through the development of our cities; Goal 3 aims to create better health among the population whilst goal 11 aims to create sustainable cities and societies – both goals can be achieved partly through the green infrastructure as greenspaces have an impact on improving people's well-being, both physically and psychologically (Grahm & Stoltz 202; Kaplan & Kaplan 1989). Urban greenspaces [UGS] could positively contribute to many aspects of the cities, namely regulating the climate, enhancing biodiversity, and improving the well-being of the population. There is a correlation between greenspaces, physical and psychological well-being (Grahm & Stigsdotter 2003; Hyvönen et al. 2018). Spending time in green environments can lower blood pressure, heart rate and salivary cortisol, as well as reduce muscle tension. Concurrently, it encourages the opportunity for social interactions (ibid). Frequent visits and longer stays in natural environments, increases the likelihood of the beneficial effects (Grahm & Nilsson 2024; Sun et al 2018). Furthermore, visiting natural environment is not exclusive to those in need of restorative environments, likewise is it beneficial for healthy

individuals as a preventative practice (ibid). Therefore, it is crucial to improve the quality of UGS as the majority of the population lives in urban areas and some have limited access to nature – therefore, the immediate nature is incredibly valuable.

There has been a clear decline in mental health of the Swedish population in recent years, due to increased stress in everyday life and insufficient working environments (The Public Health Agency of Sweden 2023). According to

the global goal 8.8 the working environment should offer and promote healthy working environments (Global goals 2022a; Global goals 2022b). By creating more accessible greenspaces with qualities to aid mental recovery, it can alleviate this problem.

The role of a landscape architect entails a great responsibility in the creation of public environments as the creation develops to a commonplace. The positive impacts of UGS in correlation to people's mental and physical well-



Figure 3: Priorn, an example of evidence based design in Malmö. © Elna Boklund (2024).

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# Aim and Purpose

The objective of this thesis is to investigate how an environment with restorative qualities can be designed to support users in an academic setting. In the greater context, the purpose is to encourage the usage of environmental psychology in design, specifically in an academic setting. The academic environment, whence is akin to a working environment, is competitive and taxing. Thus, implementing restorative qualities would greatly support users in their academic endeavours. Likewise, enable the opportunity to be near nature.

## Research question

The essay intends to answer the following research question:

**How can Betonggården, as an academic greenspace, promote well-being and varying degrees of restorative qualities for students and academic staff?**



Figure 4: Linnéplatsen, a popular UGS in the centre of Malmö, Sweden © Kittima Ritthichot (2022).

being are frequently discussed. Likewise, the importance of having a proximity to greenspaces in the vicinity of the residence, see *fig 4*. However, workplaces and campus environments are areas where many people spend a large amount of time - hence, the work commenced in an in-depth exploration on previous research in this subject. The existing literature established that there is a greater amount of research material on restorative work environments compared to restorative campus environments. Therefore, this thesis aims to further elaborate on the subject. Campus greenspaces, hereafter *academic greenspace*, are commonplaces where many spend their time whether it be students, academic staff, or passersby (Emmerton et al 2024; Felsten 2009; Foellmer et al 2021). Academic greenspaces is often an UGS as many campuses are located near city centres.

The chosen location was suggested by a friend that studies at Chalmers University of Technology in Gothenburg, hereinafter *Chalmers*. Betonggården, is a courtyard at Chalmers campus which is used frequently due to the entrances in the space. However, it has potential for improvement as the space is primarily catered toward practical use and not users. In addition, there is an absence of outdoor spaces aimed at relaxation and recovery of mental fatigue. The choice of Betonggården was further strengthened when we found various projects that are developed with consideration to cognitive recovery in Malmö (Priorn), Lund (Medicum) and Stockholm (Various parts of Stockholm University), see *fig. 3*. However, we could not find any reference projects in Gothenburg.

To work evidence-based felt like a natural choice as we both have been doing this instinctively in previous work. Additionally, we also have a great interest in how vegetation can be used to promote well-being.

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# Demarcation

The perception of an environment is an individual experience. Hence, there is a risk of subjectivity influencing the decisions and creating incorrect analysis results. To mitigate this problem the analyses have been carried out from a transdisciplinary point of view, namely landscape architecture and environmental psychology, to prevent subjectivity. Landscape architecture provides information related to site context and the technicality, whilst environmental psychology entails perceived qualities and aspects on supportive design.

Noise pollution on reference locations and adjacent greenspace at Johanneberg campus has been taken into consideration during the analysis; however, it is not quintessential in the design. Safety and light will be considered similarly due to the limitations of the purpose of the study and surrounding infrastructure. Therefore, light will not be included in the design proposal as it is focused on daytime usage. This also applies to benefits of various plants (e.g. climate regulation and biodiversity). Although, it has been taken into consideration, the vegetation is primarily adapted to the microclimate and the perspective of environmental psychological.

The existing parking spaces within the project area will be removed. It is necessary to study further whether the parking spaces are needed within the project area or placed elsewhere. However, this issue will not be processed in this work.

The nearby establishment requires space for material tests, likewise is the space used for fraternity activities. Additionally, there is an escape route, two maintenance doors, and a cylinder near the entrance (assumed for a technical practicality). Thus, these limitations will be taken into consideration.

The reference sites were limited to similar size and site context to Betonggården for applicability and to create a reasonable comparison in the meta-analysis.



Figure 5: Part of Betonggården in Gothenburg © Elna Boklund (2024).

# Material and method

The chapter on materials and methods is divided into three main parts: *Pre-study*, *Design* and *Discussion*. Each part describes in what manner the work was carried out, see *fig. 6* for an overview. The arrows in the model indicates that the work process has been a iterative process. The design process, altogether, was carried out through an evidence-based work process using the evidenced based design model *The intuitive model - "Research inspires Design"* (Jansson et al. 2019; Milburn & Brown 2003). The basic principle of the model is to let intuition be the main guidance of the design and the research is used to inspire and inform the concept and design. It is a model in which the instinctive response and emotions are allowed to dictate the course of the design (Milburn & Brown 2003). Milburn & Brown (2003) describe the intuitive model as follows: "The concept is not a reflection of the research, but rather a transformation which involves a dialogue of idea and site." The intuitive model was considered appropriate as many of the environmental psychology theories are

based on the experience of the place and the qualities it contains.

## Pre-study

The pre-study contains four parts. First, a literature overview was carried out on various environmental psychological and design theories. Second, how the semi-structured interviews were conducted. Third, revision of numerous documents containing general and location specific information about Betonggården and its vicinity. The interview and document review were processed and included as a part of the literature overview and are therefore not presented as separate chapters in the essay. The fourth part, entailed the meta-analysis where site analysis of chosen locations at Johanneberg campus and reference locations was conducted. Finally, a synthesis of the conducted meta-analysis was formed to derive relevant information. The work has not been carried out linearly, but as an iterative process.

## Literature overview

A literature overview was conducted to find established research in environmental psychology regarding well-being and attention recovery linked to the general outdoor environment – specifically academic greenspaces, as well on how to design restorative environments. Three environmental psychology theories were used in the meta-analysis for site analysis and two theories were used for the spatial design together with the remaining literature to create an evidence-based design.

Both printed and electronic sources were utilised. The databases used for the literature search were *APA Psyche info*, *Google scholar*, *Primo Science Direct* and *Web of Science*. The following English, Swedish and Danish keywords were used in the search: *benefits nature, campus parks, health benefits nature, pocket park, restorative campus, restorative urban greenspace, restorative pocket park, restorative workplace, university entrance, university greenspace, university pocket park, urban greenspace, well-being therapy*

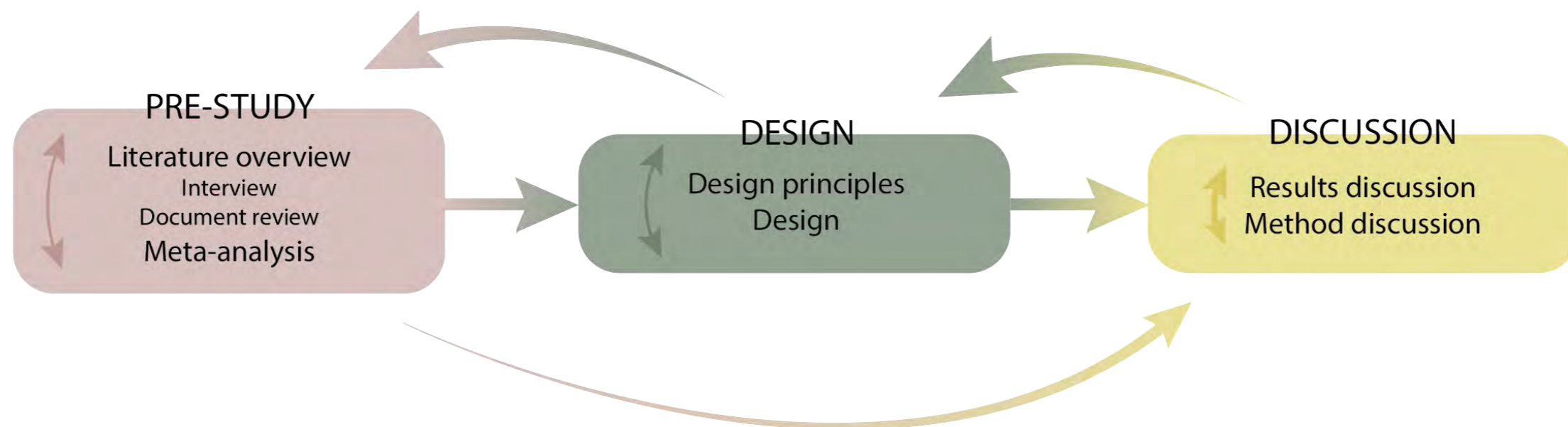


Figure 6: The figure presents the general structure of the thesis. The work approach is an iterative process

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*garden, well-being green areas.* Relevant literature was also obtained from our supervisor, assistant supervisor, and personal contact at Chalmersfastigheter and Akademiska hus. Example of literature is *Green and Healthy Nordic Cities* by Bengtsson et al. (2024), *Naturalistic Planting Design* by Dunnet (2019), *The Experience of Nature* by Kaplan and Kaplan (1989) and *The planting design handbook* by Robinson (2016), and Swedish plant nursery catalogues. The selection of the literature was based on established and recurring researchers in environmental psychology research and landscape design from the 20th century onward, for example Kaplan and Kaplan (1989) and Kaplan (1995), whilst others were related to restorative academic greenspaces or landscape architecture. Although part of Kaplan & Kaplan's work dates to the mid-20th century, it is considered significant as Kaplan & Kaplan's *Attention Restoration Theory* continues to be used in the present research.

## Interviews

One semi-structured interview were conducted; It took place 240130 with our personal contact at Chalmersfastigheter over Microsoft Teams. Questions were compiled and sent to our personal contact two days prior to when the interview took place. The interview was recorded with consent. During the interview the work was divided: One was responsible for asking the predetermined questions and the other responsible for transcribing. Both added any follow-up questions that arose during the conversation. After the interview, the notes were transcribed, as well as parts of the audio recording as an addition to the notes.

## Document review

A document review was conducted to gain insight into the past and present of Betonggården, Johanneberg campus and Chalmers University of Technology. Following the interview with Chalmersfastigheter, materials were provided; pictures, an analysis of the outdoor environment at Johanneberg campus, campus index (a survey), and materials from a student workshop held in the fall of 2022 (see fig. 7). Thus, a compilation of plans and information was conducted. Parts of the material was later used as premise for the design.



Figure 7: A collage made by students during the workshop at Chalmers portraying the qualities they desired at the campus, a part of the document review © Kittima Ritthichot (2024).

## Meta-analysis

Based on the knowledge from the literature overview a meta-analysis was conducted and interpreted through the perception of landscape architecture. A meta-analysis is the combined result from several different scientific studies (The National Encyclopedia [NE] 2023b). The meta-analysis is based on three different theories: *Healthy Academic Greenspace Framework (HAGF)*, *The Triangle of Supportive Environment* and *The Quality Evaluation Tool (QET)*. The meta-analysis was conducted at Betonggården, the four other locations on Chalmers campus - Geniknölen, Kemigården, the Library hill and the SB3 entrance – and three reference projects. Additionally, site visits at all locations were executed to obtain a basis for existing conditions.

The result of the meta-analysis of Betonggården and the four other locations on Chalmers campus were compared to evaluate the present and absent qualities at the campus area. Whereas the reference locations served as inspiration on how to design a restorative greenspace and gave practical design solutions.



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## Design

The final design proposal derived from the evidence-based method - *The intuitive model - "Research inspires Design"* (Jansson et al. 2019; Milburn & Brown 2003), the preliminary study and meta-analysis are processed, and the design principles are derived from that knowledge. The design principles and Betonggården's predetermined site conditions are used as a basis that guides the design. Thereafter, the sketching process commenced. The sketching was carried out through the website *Magma*, which allowed sketching together. The concept, Into the Glade was inspired by nearby nature and the possibilities of introducing similar elements to create a restorative space for students and staff on campus.

The design utilises an extensive amount of vegetation and their characteristics to achieve a restorative design. Hence, an in-depth exploration on the vegetation was conducted. The information on the vegetation were primarily derived from printed sources i.e., *Stadsträddlexikon* by Sjöman and Slagstedt (2015), *Perenner and Lökar & Knölar* by Hansson and Hansson (2022), *Gräs & Bambu* by Hansson and Hansson (2021). In addition, electronic sources were also used e.g., plant nursery catalogues and The Royal Horticultural Society (RHS), was also used to explore hardiness zones and flowering seasons, and fall foliage. The design proposal comprises a diverse plant list, thus, an in-depth study regarding the species was conducted to achieve the distinctive character.

## Discussion

The final part of the thesis is the discussion, where different parts of the work are discussed - from the method, the literature overview, the meta-analysis and the design proposal. This was executed to reflect on the final design proposal and to find the strengths and weaknesses of the proposed design.

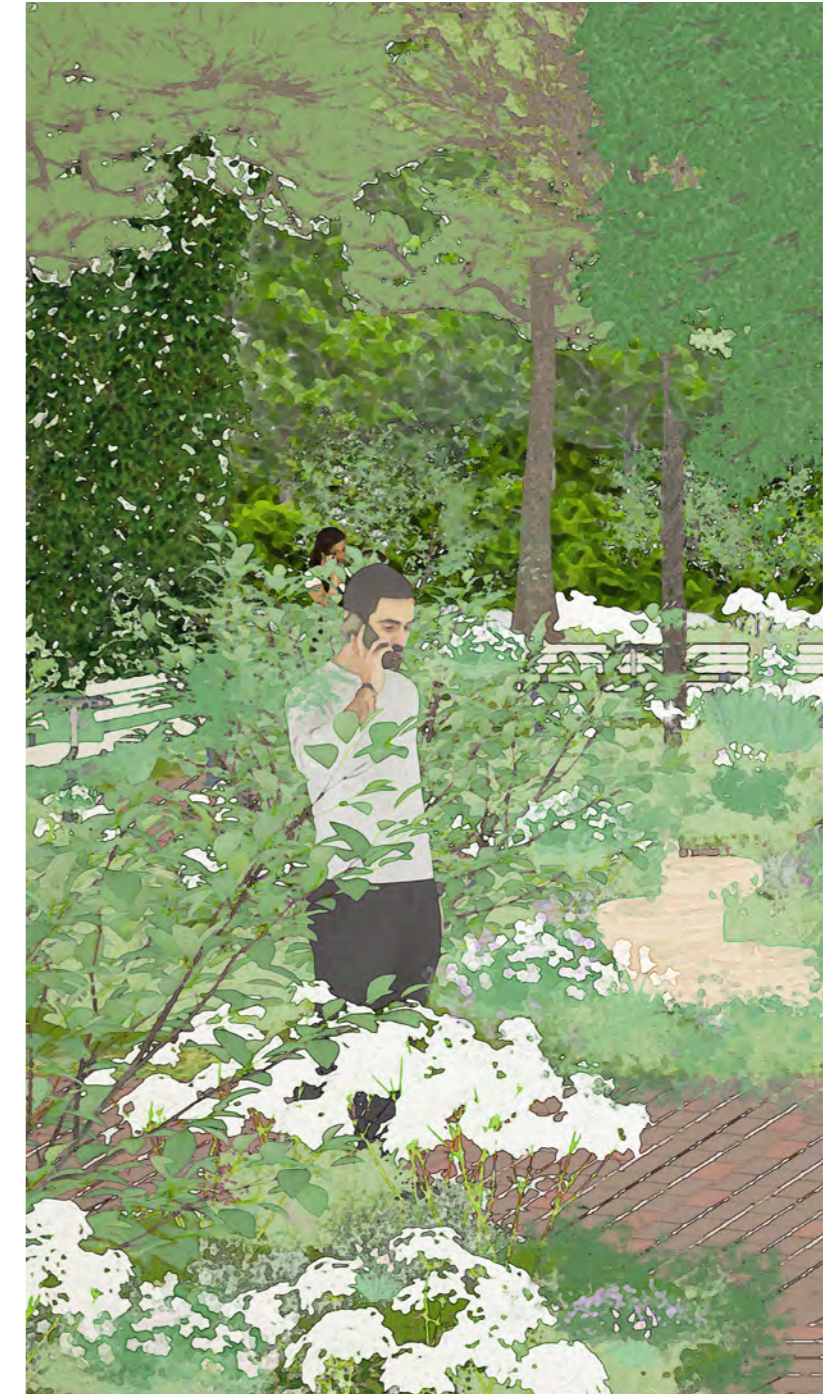


Figure 8: Vegetation seen from one of the main paths unfolding as users travels through the space.

# LITERATURE OVERVIEW

## **SUMMARY**

This chapter aims to provide an insight on the linkage between greenspaces and well-being, academic environments and mental health. Subsequently, environmental psychology theories will be presented to create a general understanding for recovery of mental fatigue. In addition, preferences, perceptions and elements of the landscape will be discussed to comprehend and derive design solutions. The design solutions will reciprocate to the preceding theory.

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# Greenspaces Interlinking to Well-being

In 2015, the 17 global goals were admitted with the intention of establishing increased greenery, equitability, and an improved world by the year 2030 (Global goals n.d.a). Goals 3 and 11 are affected by how cities are planned. Goal 3 states to assure healthy lives and elevate well-being for all ages (ibid), thus greenspaces have an impact on this as they improve people's well-being, both physically and psychologically. Consequently, making greenspaces available to the population can have a beneficial impact on health long-term (Grahn & Stoltz 2021; Kaplan & Kaplan 1989). Goal 11 entails creating sustainable cities and communities, with the intentions to "Make cities and human settlements inclusive, safe, resilient and sustainable." (Global goals n.d.c), several sub-goals also include UGS. Goal 11.6 covers the reduction of the environmental impact of cities (ibid). UGS contribute positively to many aspects in cities, i.e. regulation of the climate, stormwater management, increased biodiversity, protection against weather, purification of air. Hence, making UGS an important part of the city to promote biodiversity and create sustainable cities (Statistics Sweden 2015). Sub-goal 11.7 addresses that everyone should have access to green and public spaces that are inclusive, safe, and accessible (Global goals n.d.c).

As discussed above, UGS are beneficial for both physical and mental health. Historically, this perspective can be seen in the 19th century when the first public parks were initiated. The idea of improving public health emerged after the industrialisation as congestion and diseases became widespread (Grahn & Nilsson 2024). Among the leading proponents of this was the landscape architect Frederick Olmsted. Olmsted acknowledged the value in natural

scenery as an important component for restoration of the mind. This mentality can be seen in Olmsted's landscape designs, e.g. Central Park in NY, USA (Architect of the capitol n.d.; Kaplan 1995).

## Mental health

The Public Health Agency of Sweden (2023) conducted a survey in 2022 that estimated about 10% of women and 5% of men experienced signs of mental health problem in Sweden. Stress can affect mental health negatively (Largo-Wight et al., 2011). The World health organization [WHO] (2023b) defines stress as a perturbed state or mental strain caused by predicaments – a natural human response that invokes individuals to manage challenging and threatening situations. Stress to a certain degree can be good and helps us to perform daily tasks. However, when a person experiences an excessive amount stress, it consequently leads to both physical and psychological complications (ibid). In a status report by the Social Insurance Agency (2023), stated that the sick leaves in correlation to stress have increased in an unprecedented manner in Sweden. Between June 2019 and June 2023, there was an increase in sickness absence due to stress-related ailments from 32,700 to 42,000 – thus, generating an increase of 29% over four years. Women account for most of these cases, 79%, which corresponds to roughly 33,200 cases.

According to the Social Insurance Agency (2023), this askew distribution is deemed to have arisen by two causes. The first cause, namely the insufficient working environment

with high level of sickness absence in the welfare contact profession. The second cause is the inadequacy of equality in private. Principally, to alleviate stress and to create equality in the work environment and the balance between work and private life, preventive work environment solutions and increased equality between men and women are required (ibid).

Aforementioned, contact with nature is also beneficial to psychological well-being (Grahn & Nilsson 2024; Hyvönen et al. 2018; Kaplan 1995). Nature can have restorative qualities that enables the recovery of mental fatigue (Kaplan & Kaplan, 1989; Kaplan, 1995). The benefits of contact with nature are enjoyment, relaxation and lowered stress levels, see *fig. 9* (Kaplan & Kaplan 1989).



Figure 9: Couple enjoying the warm weather near water in Aarhus, Denmark  
© Kittima Ritthichot (2022)

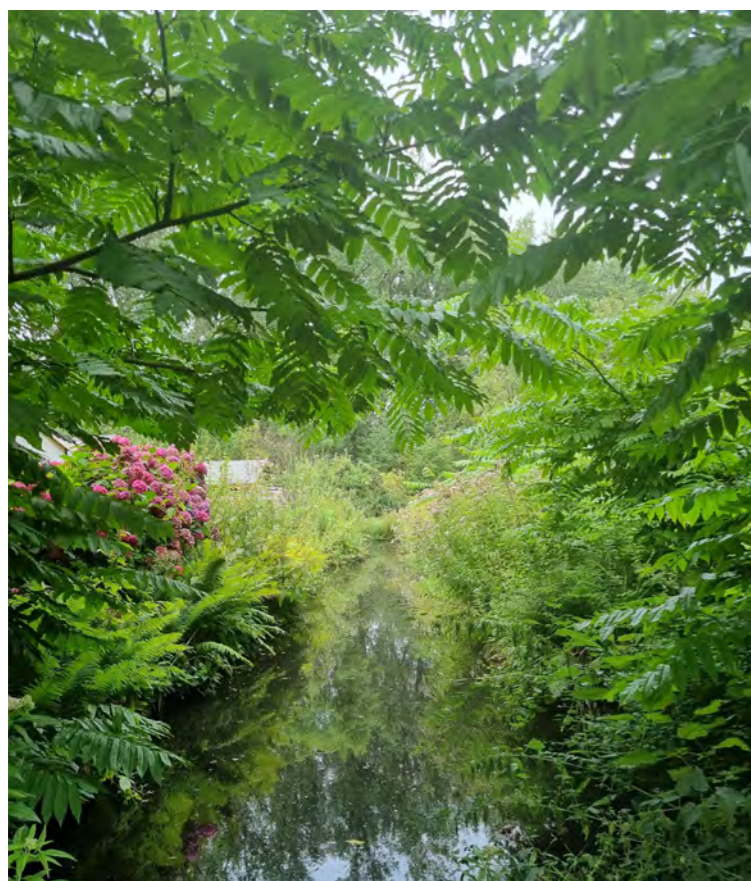


Figure 10: A brook running through the Tuinpark Sloterdijkmeer in Amsterdam, The Netherlands © Elna Boklund (2023)

Urban environments are less restorative than natural environment as they accommodate an increased amount of dramatic stimuli that require attention, e.g. avoiding traffic or ignoring traffic (Berman et al., 2008). Presently, more than half of the world's population lives in urban areas (Our World in Data 2024); in Europe, 72% of the population lives in cities and urban areas (European Investment Bank et al. 2018); in Sweden, 88% of the population lives in urban settlements, i.e. a settlement area with the minimum of 200

inhabitants (Statistics Sweden 2022). With more than half of the world's population in urban environments, prolonged stress and mental strain caused by dramatic stimuli could negatively impact society altogether. Thus, nature's role in urban environments is crucial to recover mental fatigue.

## Size and proximity

The question arises as to how it is possible to alleviate stress and improve well-being during the day, both at work and in our spare time. It is evident that the connection between the proximity and contact to greenspaces have a positive impact on health and well-being for people who experience mental fatigue or strain (Grahn & Stoltz 2021b; Sonntag-Öström et al. 2014). For everyday use of greenspaces, the main parameters are distance and time for the frequency of visitations to greenspaces (Grahn & Stigsdotter 2003). 300 meter is considered to be the average threshold value for everyday use of greenspaces, conforming to a 5-minute walk (Grahn & Stigsdotter 2003; Grahn & Stoltz 2021b). Henceforth the threshold value, the frequency and duration of frequency per week decreases. For children, the elderly and those with disabilities, a closer distance than 300 meters is required to encourage daily use (Grahn & Stigsdotter 2003). During rest days, the threshold value is higher, about 1500-1600 meters distance, corresponding to a 25-minute walk (Grahn & Stoltz 2021b). Although there is no lower limit for the size of green areas linked to its impact on health, the size can affect the content of the space and thus its effects (ibid). Therefore,

there is a gradient of needs for recovery that depend on whether the individual experience temporary or long-term stress. Smaller greenspaces can reduce temporary stress peaks, *short-term stress*. While larger green areas with natural vegetation seem to offer thorough physical activity, stress and fatigue recovery (ibid). Larger areas can contain a greater variety in the elements included in the greenspace, e.g. space for physical activity, the feeling of leaving the urban environment and being enclosed by greenery (Grahn & Nilsson 2024; Grahn & Stoltz 2021b).

Grahn and Stoltz (2021b) divides greenspaces into six categories based on their size and proximity; in direct contact to buildings or visible from windows are urban greenery (stadsgrönska) and pocket parks (fickpark) – with an area up to 1 hectare. Urban greenery and pocket parks close proximity promotes outdoor activity, i.e., to get fresh air, move around or social interactions. Thereafter are neighbourhood parks (grannskapspark) – ranging from 1-2 hectares, within 300 meters – particularly important for everyday use as they allow physical movement and the feeling of being away from the urban environment. The last three greenspaces are local parks (stadsdelspark), city parks (stadspark) and recreational areas (rekreationsområde) of 5-7 hectares, minimum 20 hectares and minimum 100 hectares respectively (ibid). The experience of being away and feeling enclosed by nature becomes more tangible the larger the park is (Grahn & Stoltz 2021b). Conceding that larger areas can contain a broader variety of elements, does not entail higher value, e.g., the vastness of open areas can cause uneasiness whilst smaller spaces are more preferable as it allows users to comprehensively overlook the space

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(Kaplan & Kaplan 1989). The advantage in the close proximity is that it encourages the frequency of outdoor activity, therefore having a positive impact on their health. Embracing the sense of being away, enclosed by nature, of being related to a larger context and evoking fascination (Bengtsson et al. 2024; Kaplan & Kaplan, 1989). While the size can have an impact, the qualities that the greenspace encompasses through design is significant (Kaplan & Kaplan, 1989). The ability to overlook greenspace through windows aids potential restorative qualities as it allows the mind to wander (Kaplan & Kaplan, 1989; Kaplan, 1995; Koprivec et al. 2022).

## The COVID-19 pandemic

During the COVID-19 pandemic, the mental health of many were negatively affected by the isolation and social distancing – resulting in schools and workplaces to close down and the implementation of remote working (Maurer et al. 2023; Pröbstl-Haider et al. 2023). The pandemic can be seen as a *social ecological disturbance* and during this time of distress, greenspaces provided *cultural ecosystem services*, aiding to maintain and improve health during the pandemic which resulted in extremely high visitation quantities to greenspaces (Lin et al, 2023; Maurer et al. 2023; Pröbstl-Haider et al. 2023). A study by Pröbstl-Haider et al. (2023) examined the effects the pandemic had on outdoor recreation based on contributions from several different countries - Japan, China, Brazil, Indonesia, Austria, Croatia, the United States, New Zealand, Taiwan, Australia, Sweden, Poland and Ireland. From the study a trend can be derived; post-pandemic greenspaces have a lower level of visitors than during the pandemic, however the visitation rate is still higher than before the COVID-19 pandemic. This effect may

be the subsequent result of a greater number of people having the prospect to discover the environments in their recreational areas, protected areas, neighbourhood, local or regional parks and have found an appreciation for nature and its benefits for well-being, see *fig. 11* (ibid.).

## Future planning

With a risk of future incidents of social ecological disturbances, it is important to consider the future development of the green infrastructure as the crucial role of greenspaces is evident for the well-being during crisis and humans evolving lifestyles (Lin et al, 2023; Maurer et al. 2023). Furthermore, the well-being affects the health of the individual and the society collectively; thus, requiring large costs for society through reduced work efficiency (Social Insurance Agency 2023). By having long-term strategies for the development of green infrastructure it enables less susceptibility and increased sustainability on the society from an ecological and social perspective (Bengtsson et al. 2020)



Figure 11: A man enjoying sedentary activities in a large park in Malmö, Sweden  
© Kittima Ritthichot (2021)

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# Well-being at Academic Environments

The importance of greenspaces in an academic setting will be addressed to provide an understanding of various factors that specifically affect students and academic staff.

Numerous studies across the globe have addressed the continuous deterioration of mental health issues among college and university students (Emmerton et al 2024; Foellmer et al 2021; Hunt & Eisenberg 2010; Johansson & Kanerva 2017; Söderberg et al 2017). Accompanied by the competitive nature of higher education, studies indicate that students are susceptible to mental illnesses. The academic setting for students involves development into adulthood, presumption of academic success and performance, social relationships, financial constraints etc (Emmerton et al 2024; Foellmer et al 2021; Hunt & Eisenberg 2010). Thus, the prevalence and severity of the mental health issues within the academic setting is a growing concern.

Academic greenspace, as a health resource is repeatedly overlooked despite having potential to enhance the well-being as a greenspace (Foellmer et al 2021). Spending time in nature, having access to nearby nature, experiencing nature through windows have shown correlation to improvement in health, although the quality of the greenspace is important (Foellmer et al 2021; Kaplan & Kaplan 1989; Koprivec et al 2022). Hence, it is of utmost importance to enhance and improve living conditions and well-being of the people and to offer and promote healthy working environments, in alignment to the sustainable development goal 3 for the former and 8.8 for the latter (Global goals 2022a; Global goals 2022b). Colleges and

universities, a learning and working environment, should therefore support and implement the needs to cultivate a healthy environment to facilitate the recovery of attention and enhance the well-being of students and academic staff.

Foremost, students spend numerous hours on campus - studying, reading course materials, completing assignments, executing group projects, writing reports, presenting – in addition to other activities demanding tasks that require concentration (Emmerton et al 2024; Felsten 2009; Foellmer et al 2021). Whilst the mental health of academic staffs is correlated to the universities' culture of mounting managerialism, teaching quality, attainability of research grants, and course planning (Ablanedo-Rosas et al 2011; Foellmer et al 2021; Lee et al 2022). See *fig. 12* and *fig. 13*, individuals need to regularly recover the resources that help them cope with the demanding tasks of everyday life and deteriorating mental health (Malekinezhad et al 2020). Consequently, for an already mentally fatigued person it can become burdensome to pay attention to a subject of no particular interest, whilst facing hardly any challenge for a subject considered intriguing (Kaplan & Kaplan, 1989). While subjects and occurrences could be enjoyable, prospectively it leads to similar result if sufficiently intense and prolonged. Commonly, students can experience this at the end of a semester, as perpetual mental strain can lead to depleted attention (Kaplan, 1995). Therefore, a healthy learning and working environment would improve susceptibility of students and staffs to deteriorating mental health issues (Emmerton et al 2024; Felsten 2009; Foellmer et al 2021).

In addition, Plambech & Konijnendijk van den Bosch



Figure 12: Landscape architect students and lecturers on excursion, Aarhus, Denmark © Kittima Ritthichot (2022)



Figure 13: Students preparing for the dendrology exam © Kittima Ritthichot (2022)

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(2015) argued that nature could enhance creative thinking. Natural environments with the qualities *Nature*, *Space*, and *Serene* (tab. 3: QET, p. 28), seem to be beneficial for the creative professions, therefore, access to various natural environments implicate fruitful promotion in creative endeavours (Plambech & Konijnendijk van den Bosch 2015). Another study by Opezzo and Schwartz (2014) also indicated an increased in creative thinking after the participants walked outside, particularly interesting was the results of university students that generated a more novel response following the time spent outdoors contrasting to being inside. The results suggest that an increase in creative thinking is promising in locations without acute distractions (see *fig.14*, an example of an academic greenspace without acute distractions).

Furthermore, other factors that affect mental health - prevalent in recent years - are major external events (e.g. natural disaster, pandemic, war), which could ultimately impact mental health on individual, local, state, national and international levels (Emmerton et al 2024). A recent event that has impacted mental health on all levels is COVID-19, where the implemented measures (lockdowns, self-isolation, physical distance, masks etc.) also affected the perception of greenspace usage addressed in the preceding chapter Lin et al, 2023; Maurer et al. 2023; Pröbstl-Haider et al. 2023.

To conclude, the academic environment is thus comparable to a work environment both for employees and students. Hereafter, workday and work environment refers specifically to the academic environment. There is a correlation

between exposure to natural environments during the workday and positive impact on both general and work-related well-being (Hyvönen et al., 2018; Largo-Wight et al. 2011). Contact with the outdoors has proven to lead to lowered levels of perceived job stress and higher levels of job satisfaction as well as work attitude (Hyvönen et al. 2018; Largo-Wight et al. 2011; Kaplan & Kaplan 1989). Hyvönen et al. (2018) remarks that modern work life can be demanding as it requires long periods of challenging work that can lead to *direct attention fatigue* (see *ART p.26*). Work environments also contains factors, e.g., time pressure and performance expectations that can lead to psychosocial stressors. Given the opportunities for restoration and recovery during the workday through exposure to naturel environments e.g. by walks, can have a general positive impact on employees and students' health (ibid).



Figure 14: Student enjoying sedentary activities near water without acute distractions in an academic greenspace, SLU Alnarp, Sweden © Elna Boklund

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# Environmental Psychology Theories

Attention Restoration theory will act as the fundamental understanding of recovery of mental fatigue, whereas Four Zones of Contact with the Outdoors differentiates the interactions between zones.

## Attention Restoration Theory

Attention Restoration Theory (ART), an established theory by Stephen and Rachel Kaplan, the improvement in the ability to concentrate after spending time in nature, perceiving nature, and/or experiencing nature. The theory asserts that people have a bifurcation of attention: **involuntary attention** and **directed attention**. The restorative process differs for individuals, thus proposing four aspects that trigger restorativeness: **fascination, being away, extent, and compatibility** (Kaplan & Kaplan 1989; Kaplan 1995).

**Involuntary attention** encompasses the type of attention that does not require effort, i.e., intrinsically fascinating occurrences or stimuli – thus, self-sustaining. Some intrinsically fascinating qualities entails strange objects, moving objects, bright objects, beautiful objects etc.

**Fascination** can also be divided to two categories namely soft and hard. **Soft fascination** presents opportunities to reflect to potentially enhance the ability to recover stress, i.e., walking in a natural setting, sunsets, clouds. **Hard fascination** entails exciting qualities, i.e., watching auto racing, survival, predation (Kaplan & Kaplan 1989; Kaplan 1995).

Whereas **directed attention** is cognitive controlled attention, forcing oneself to concentrate on tedious or dull activities, thus requiring a large amount of effort and susceptible to fatigue. Consequently, mentally fatigued individuals may experience rashness, uncooperativeness, aggression, and querulousness. However, because **involuntary attention** is self-sustaining, it could potentially convalesce directed attention (Kaplan & Kaplan 1989; Kaplan 1995).

**Fascination** stimulates curiosity and enables regenerated involuntary attention, therefore replenishing directed attention. Whilst **being away** implicates the individual's cognitive dissociation of the environment – humans are conceptual beings; hence the divergent and disconnected experience of the generic environment could be an escape from everyday life. Albeit **extent** represents the interrelationship of the individual and their perception and experience of the vastness in the environment. Finally, **compatibility** comprises the environment's characteristics that reciprocates the desires and goals of the individuals (Berman et al 2008; Kaplan & Kaplan 1989; Kaplan 1995).



Figure 16: A walking path in a natural setting where the mind is allowed to wander, Stockholm, Sweden © Kittima Ritthichot (2023)



Figure 15: Birds basking in the sun, an intrinsically fascinating specie to watch © Kittima Ritthichot (2020)



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## Four zones of contact with the outdoors

**Four zones of contact with the outdoors** (Bengtsson et al. 2024), hereafter **four zones**, is a model describing interaction, through *direct* or *involuntary attention* with the physical outdoor environment. The model conveys four different zones: **1. From within a building** **2. From inside transition zones** **3. In the greenspace** **4. The surrounding environment**. Zone zero is also mentioned, representing an area that has a low degree of natural features and greenery. The model can be a helpful tool when designing, planning and managing - the third zone, *in the greenspace* - to create an understanding of the connection to the remaining zones e.g. distance to zone three from the surrounding or possibility to see zone three from a window in zone one thus potentially triggering involuntary attention (ibid).

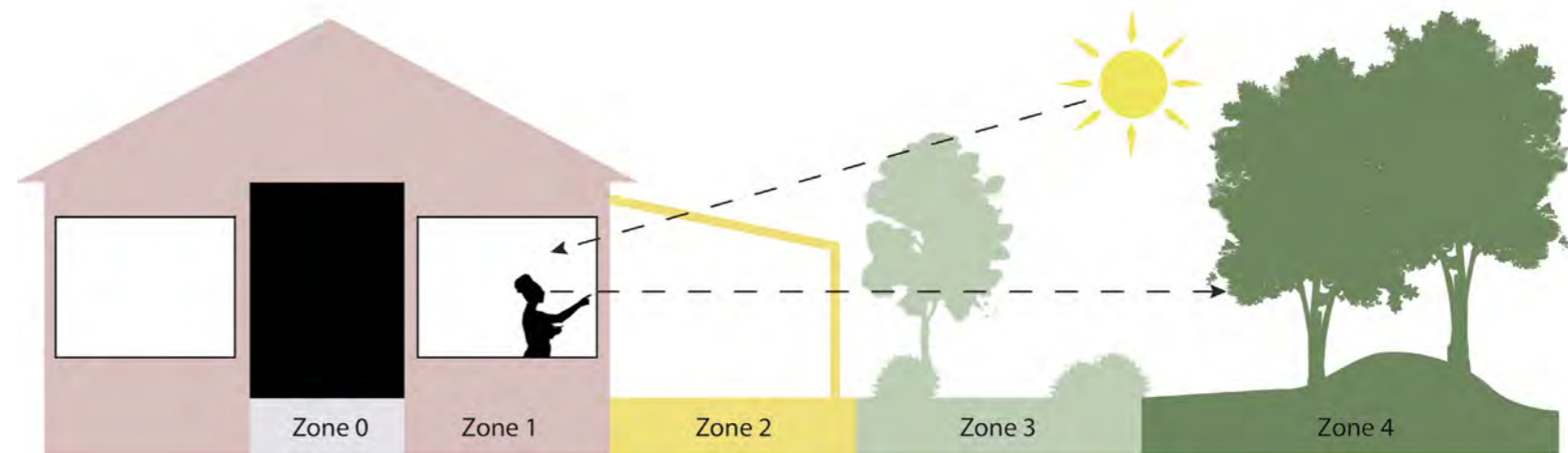


Figure 17: Inspired by Jenny Lilja and Anna Bengtsson (2024). Figure describing the principal model of four zones contact with the outdoors

This following subchapter aims to provide an insight to the theories that will be used in the meta-analysis to examine present and absent qualities at Betonggården, academic greenspaces at Johanneberg campus and reference locations. The frameworks that will be presented are the following: The Quality Evaluation Tool (QET), The Triangle of Supportive Environments (the triangular model), and Healthy Academic Greenspace Framework (HAGF)

## The Quality Evaluation Tool

**The quality evaluation tool [QET]** is an evidence-based design model, constructed to help practitioners to analyse the qualities of the environment. It aims to support the requirements of users', in addition to their health and well-being. QET encompasses a plethora of requirements and preferences of the general demographic, likewise certain needs of, i.e., vulnerable individuals (Bengtsson et al 2024). Therefore, QET defines 19 evidence-based environmental qualities divided in two categories: comfortable and stimulation (Table 1-3). **Comfortable** entails six environmental qualities that supports the users' accessibility of the outdoor design, i.e., space usage on equal terms. Whereas stimulation contains 13 environmental qualities concerning the contact with nature and the surrounding life. Thus, prompting stimulation of senses and spending time outdoors. The activities range from social and physical to solitude and tranquillity (ibid). Eight of the 13 qualities are derived from

	Quality	Description
<b>Comfortable</b>		
a	Closeness and easy access	The area is close at hand for users. It is easy to spot and easy to access
b	Entrance and enclosure	The entrances are clear and welcoming. The enclosure of the outdoor environment (hedges, fences, etc.) corresponds to the level of protection that is needed by the users.
c	Safety and security	a) Risks of physical discomfort are very small, such as the risk of falling or slipping, risks of poisonous plants, etc. Ground coverings are accessible in terms of width, surfaces, edges, and slopes. The distance between benches suits users and there are handrails to hold where needed.  (b) The risks of psychological discomfort in the outdoor environment are very small; the outdoor environment is appealing, without intrusive elements that can be interpreted negatively.
d	Familiarity	The green area appears to be a natural part of the environment as a whole and the various elements and activities that the green area offers are easy to comprehend.
e	Orientation and wayfinding	The design of paths, places, landmarks, nodes, and edges is clear and helps users to understand and to be able to orient themselves in the outdoor environment. For people with difficulties in orienting themselves, it is important, for example, that paths do not lead to dead ends and that a variety of places along the paths provide opportunities for different experiences and activities.
f	Different options in different kinds of weather	Paths and places offer variation in terms of sun, shade, protection from the wind, and shelter from the rain.

Tables 1: © Bengtsson et al (2024). The table describing the environmental qualities for people to be comfortable in the green area \* = Qualities that correspond to the

Perceived Sensory Dimensions [PSD] identified by Grahn and Stigsdotter (Bengtsson et al 2024; Stolz & Grahn 2021a). PSD links to preferred qualities in greenspace; whereas the remaining qualities are based on research on vulnerable demographics, e.g., elderly and individuals with specialised needs (Bengtsson et al 2024).

Additionally, the category **stimulation** further is divided into two categories namely **highly stimulating** and **low stimulating** qualities (fig. 18). By analysing the spectrum of the gradient, it is possible to determine whether it is *directed attention* or *soft fascination*. The gradient implicate that combinations of adjacent qualities are more compatible, whilst it is challenging to combine qualities at the opposite ends of the spectrum (Bengtsson et al 2024). See fig. 19-24 for examples of different qualities.

	Quality	Description
<b>Highly stimulating qualities</b>		
g	Contact with surrounding life	The space offers possibilities to take part in life, for example, to experience people, animals, and movement.
h	Social opportunities (social*)	There are opportunities for entertainment as well as places where it is possible to meet other people. In these places there are plants and other things to talk about. There are seating options that make it easy to meet and socialize outdoors.
i	Joyful and meaningful activities	There are places for sedentary activities (e.g., relaxing, drinking coffee, reading), social activities, and physical activities. There are walking paths that can be used for exercise as well as for leisurely walks. There are opportunities for children to play and interact with the outdoor environment.
j	Culture and connection to past times (cultural*)	There are places in the outdoor environment that provide an opportunity to be fascinated by human culture and values. There are objects that stimulate memory. Plants and elements of the outdoor environment give the place its own character and meaning.
k	Openness (open*)	There are inviting open green spaces overlooking nature and plants.
l	Species richness and variety (diverse*)	There are areas with species richness in terms of plants and/or animals that give varying expressions of life.
m	Sensory experiences of nature	There is the opportunity to see, feel, hear, smell and taste what nature offers, such as trees, plants, flowers, fruits, animals and insects. There is an opportunity for nature experiences of sun, sky, wind, water, sunrise and sunset.

Tables 2: © Bengtsson et al (2024). The table describing the environmental qualities for people to be comfortable in the green area Bengtsson et al (2024). The table describing the environmental qualities for stimulation and positive impressions. \* = Qualities that correspond to the eight PSD as named by Stolz and Grahn (2021).

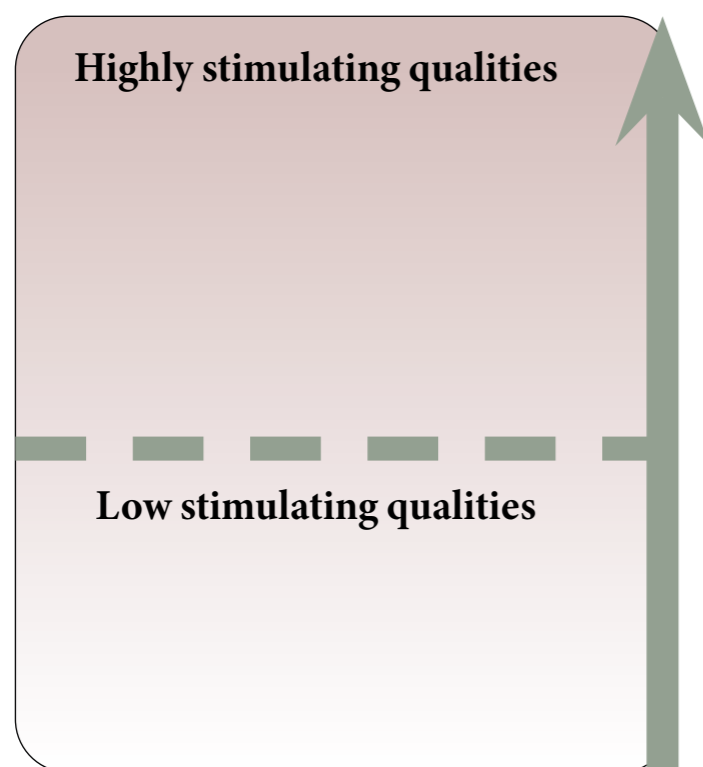


Figure 18: Bengtsson et al (2024). Figure describing the gradient of varying needs and preferences. Highly stimulating entails outwards involvement & active participation from *The Triangular Model* and social space and activity space in *HAGF*. Whereas low stimulating involves emotional participations and inwards involvement from *The Triangular Model* and symbolic space and experienced space from *HAGF*. The top symbolises the demand for directed attention while the lower ranges is correlated to involuntary attention (ART).

	Quality	Description
n	Seasons changing in nature	It is possible to follow the year's changes in nature, partly with your senses but also through experiences and activities in the outdoor environment.
<b>Low stimulating qualities</b>		
o	Symbolism and reflection	There are elements in the outdoor environment that can give rise to symbolism and metaphors between one's own life and nature. The experience of timelessness in the vicinity of a large moss-covered rock is one example.
p	Space (cohesive*)	There are areas that give the feeling of entering an undisturbed world or coherent whole, for example, in a beech forest.
q	Serene and peaceful (serene*)	There are peaceful places in the outdoor environment that are neither overpopulated nor have disturbing elements. Well-kept areas with soothing elements of water and/or greenery offer relaxation, peace and silence. Pleasant sound of water is especially soothing.
r	Wildness and nature (natural*)	There is the opportunity to experience nature on its own terms. There are areas where plants appear to have come by themselves and where they are allowed to develop freely.
s	Secluded and protected (shelter*)	There are surrounded and secluded green places where you can do whatever you want, be left alone, have private conversations or just watch other people from a distance.

Tables 3: © Bengtsson et al (2024). \* = Qualities that correspond to the eight PSD as named by Stoltz and Grahn (2021). \* = Qualities that correspond to the eight PSD as named by Stoltz and Grahn (2021)

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## Examples of Qualities



Figure 19: A walking path that encourages walking while enjoying nature on its own terms (i, r), Halmstad, Sweden © Kittima Ritthichot (2021)



Figure 21: Foxglove (*Paulia tomentosa*) flowering in "Lilla Torg", a beloved historical square, that is further enhanced by the flowering of this species (j), Malmö, Sweden © Kittima Ritthichot (2023)



Figure 23: A relatively open and species rich composition with several layers of vegetation, allowing users to feel sensory experiences, seasonal change, diversit (k, l, m, n), Leiden, the Netherlands © Kittima Ritthichot (2024)



Figure 20: Fallen petals on the ground that could create a symbolism or reflection of the passing of time, likewise, does it enhance the sensory experiences with the smell and seasonal change (m, n, o), Gothenburg, Sweden © Kittima Ritthichot (2021)



Figure 22: A clear path that is easy to comprehend and accessible to many. The railing provides security whilst users as they enjoy physical or sedetary activities near water (c, e, h), Stockholm, Sweden © Kittima Ritthichot (2023)



Figure 24: An example of a serene and peaceful space that provides the soothing elements of water and greenery (q), Malmö, Sweden © Kittima Ritthichot (2021)

# The Triangle of Supportive Environment

**The Triangle of Supportive Environment**, hereafter **The Triangular model**, was created by Patrik Grahn in his doctoral thesis in 1991. The concept of the triangular model is to use it for (1) fundamental green structure planning; (2) a tool to increase the prospect of the physical environment's ability to contain a variety of qualities that supports the users' need throughout the gradient stages of mental health – thus, creating a supportive environment for the users. The model contains four extensive categories: **inwards involvement, emotional participation, active participation** and **outwards involvement**, of physical and social engagement that individuals may prefer in an UGS based on their mental health. The base of the triangle indicates environments for those sensitive to overstimulation and in need of *inward-directed involvement*. Whereas the top of the triangle qualities prefers *outward-directed involvement*. Consequently, there is a gradual gradient between the opposite sides of the triangle. The shape of the triangle represents the amount of impact the environment can have for the individual, e.g., the base can have the greatest impact on a stressed and more vulnerable person (Bengtsson et al 2024).

The triangle of supportive environment provides the theoretical basis for QET, where the 19 different qualities can be integrated in the triangular model. The comfortable qualities are needed throughout the design, while the stimulating qualities can be seen as at gradient of challenge starting with the least stimulating in the bottom of the triangle to the most stimulating at the top, conforming to the gradient of the four categories from *inward involvement* to *outwards involvement*. The low stimulating qualities require less atten-

tion encouraging, *soft fascination*, increasing the restorative properties. While *high stimulating qualities* encourage *direct attention* and generates an increasing demand on attention (Bengtsson et al 2024).

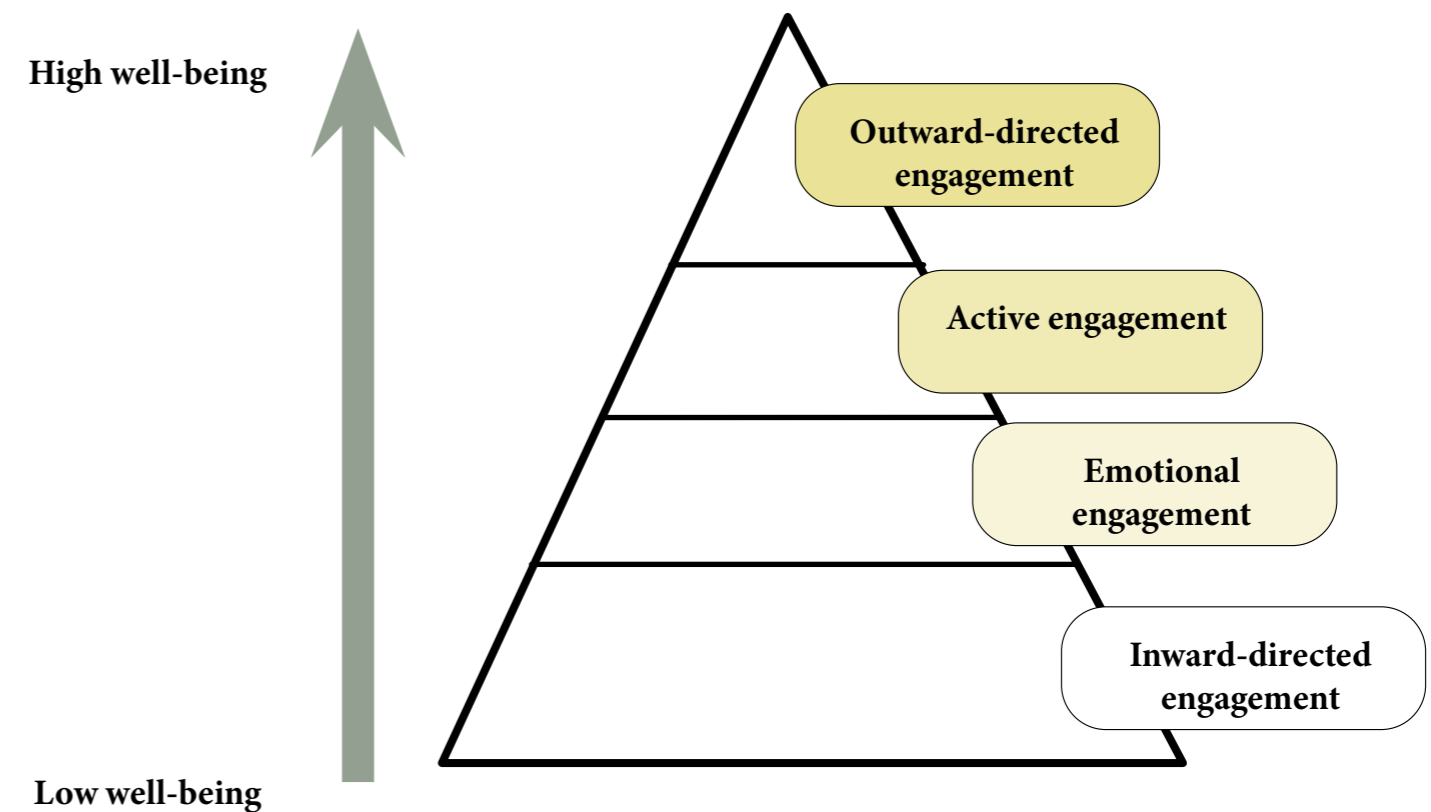


Figure 25: Inspired by Sanaz Memari, Mahdieh Pazhouhanfar & Patrik Grahn (2021). Figure describing the categories of the Triangular Model; students and academic staff can experience all categories depending of their well-being.

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## Healthy Academic Greenspace Framework

**Healthy Academic Greenspace Framework [HAGF]** is a framework derived from Völker and Kistemann's four dimensions of appropriation expanding the concept of therapeutic landscapes (Völker & Kistemann 2011; Foellmer et al 2021). The framework was established to address the importance of academic greenspace as a health resource, potential to restore attention, shaping identities, and social encounters. The framework can be used to assess the physical space of academic greenspace and their potential to sustain a healthy learning and working environment (Foellmer et al 2021).

The appropriative dimensions include *social space*, *symbolic space*, *activity space* and *experienced space*. The dimensions of **social space** represent the individuals' shared rituals, everyday routines, social relations, and activities. Whilst the dimension of **symbolic space** involves belongingness, historical significance, identities, and the sentiment towards therapeutic landscapes. Whereas the dimensions of activity space refer to the understanding of the human behaviour and **activity in space**, including active and passive recreational activities in blue and greenspace and their impact on health and well-being. Lastly, the dimensions of **experienced space** analyses and interprets the individuals landscape design preferences correlated to their values and associations (Foellmer et al 2021; Völker & Kistemann 2011).

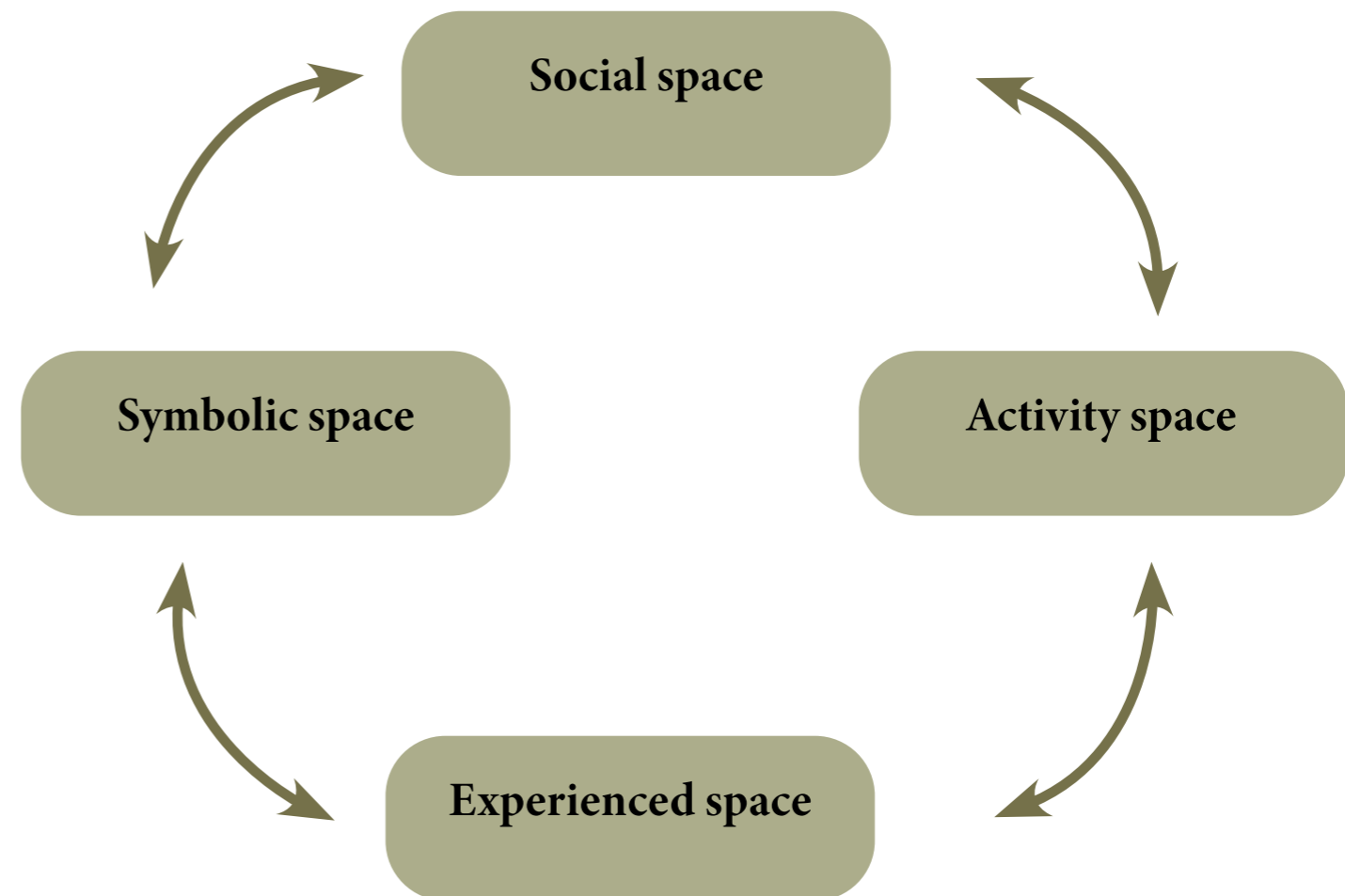


Figure 26: Inspired by Foellmer et al 2021. Figure depicting the interrelationship of the appropriative dimensions.

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# Preferences and Perceptions

The aim of this subchapter is to discuss the restorativeness of built environments versus natural environments, explore indirect experience of nature, and further investigate and comprehend how various elements in the landscape can be experienced through the perspective of environmental psychology. Subsequently, the information on *Elements of the Landscape* will be used as a complement to interpret theory to practical solutions in the design.

## Natural Environments vs Natural Built Environments

Research have shown that natural environments enhance the recovery of restorativeness in contrast to urban settings (Van den Berg et al 2014; Stragà et al 2023). According to Kaplan & Kaplan (1989) built environments dominated by nature generated more favourable response than those with human intrusion, additionally supported by e.g., Bergman et al 2008, Koprivec et al (2022), Sonntag-Öström et al (2014), Stragà et al (2023), and Van den Berg et al (2014).

### *Disclaimer*

*Natural environments*, as in *nature on its own term*, will refer to following environments with similar characteristics to forest, mountains, rivers, and natural meadows. Whereas *natural built environments* are akin i.e., to libraries, museum, parks, square/plaza, pocket parks, and green roof/walls. The characteristics were initially derived from Stragà et al (2023)

understanding of hospitable natural environments (natural environments) and hospitable built environments (natural built environments), which has been modified to conform to the intention of this study.

Although studies have supported the claim that natural environments are more favourable, likewise does natural built environments have the potential to support restorativeness (Bengtsson et al 2024; Grahn & Nilsson 2024; Grahn & Stoltz, 2021b; Stragà et al 2023). According

to Stragà et al (2023), the natural environments received high evaluations on overall restorativeness – however, natural built environments also indicated high restorative potential implicated by directly and indirectly experiencing and learning. Another study by Van den berg et al (2014) on various type of greenspaces implicate that moderate type of *urban wilderness* has the potential to foster degrees of restoration – which may stimulate enjoyment and revitalisation. Hence, natural built environment can be considered significant in terms of potential aid in restorativeness.



Figure 27: Manmade wall, Ringmuren, embedded in nature, Visby, Gotland © Elna boklund (2023)



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## Indirect Experience of Nature

Studies suggest that being close to natural areas, vegetation and water is beneficial as it evokes positive feelings (Grahn & Stoltz, 2021b; Kaplan & Kaplan 1989; Sonntag-Öström et al 2014; Völker & Kistemann 2011) Hence, studies have investigated the restorative qualities of viewing nature through windows as indirect experience suggest the possibility to restore *involuntary attention* (Koprivec et al 2022; Kaplan & Kaplan 1989; Sun et al (2018). According to Koprivec et al (2022) study, the restorative quality of perceiving nature through windows was correlated to the quality of nature presented. Additionally, negative characteristics of the window view caused neutral and/or undesired effects (Koprivec et al 2022).

Another study conducted by Sun et al (2018) investigated three ways of perceiving a Japanese garden (directly, through a pane of glass, and a projected slide) as they argue that visual stimuli - gardens - have vital implications in therapeutic situations. The conclusion of the study presents different evaluation dependent on how the garden was perceived. In this instance, direct experience entails physically spending time in the space whilst indirect entails viewing nature from a pane of glass or from a projector (ibid). Remarkably was that longer durations allowed the users to have a more optimistic evaluation of viewing nature from a pane of glass (Sun et al 2018). Therefore, with longer duration of viewing it could positively affect the perception if the quality of nature is adequate.

In conclusion, while one study suggest that the quality of indirectly experienced nature depends on the quality of the greenspace, the other suggest that the duration of *indirect experience* (e.g., through windows or projected) also affects the perception of how the elements are perceived.

Therefore, a purposeful design should also enhance the qualities of the greenspace perceived from *zone 1* in lieu of solely focusing on the zones where individuals are outside (see *fig. 28* where nature is well integrated in the infrastructure, although it is modest compared to the large structures it does have an impact on the buildings).



Figure 28: Vegetation integrated in the green infrastructure seen from a roof garden, Bangkok, Thailand © Kittima Ritthichot (2023)

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# Elements of the Landscape

## The Concept of Visual energy

The concept of *visual energy* is derived from Nelson's concept of visual energy where active characteristic entails higher visual energy in contrast to passive characteristics (Nelson 1985, cited in Robinson, 2016, p.131). *High energy* presents excessive properties i.e., bold texture, bright colours, diagonal lines, fastigate forms; *low energy* presents recessive properties i.e., fine texture, dull colours, horizontal lines, rounded forms. The balance of *visual energy* can be used to achieve a purposeful composition (Robinson 2016). The results of Celikors & Wells (2022) study indicated that low-level visual features weakly affect the perception of restorative qualities, although it crucially supports the perception of nature's ability to embody restorative qualities (Celikors & Wells 2022). Hence, *visual energy* can be utilised in composition. According to Robinson (2016), the most important principles of visual composition are *harmony, contrast, balance, emphasis and accent, sequence, and scale*.



Figure 30: A plantation that greatly utilises visual energy, the figure depicts a grass with an extravagant character (high energy) that pairs well with the round forms of its neighbour, Stockholm, Sweden © Kittima Ritthichot (2022).

## Harmony

*Harmony* entails the relatedness found in similar forms, textures, characters of line, and closely related colours where an increase of harmony transcends in the correlation of the aesthetic qualities. Furthermore, harmony refers to the balance between identification and differentiation (Robinson 2016). Harmony embodies all principles of visual composition as it creates cohesiveness to the overall design and could be integrated in many aspects.

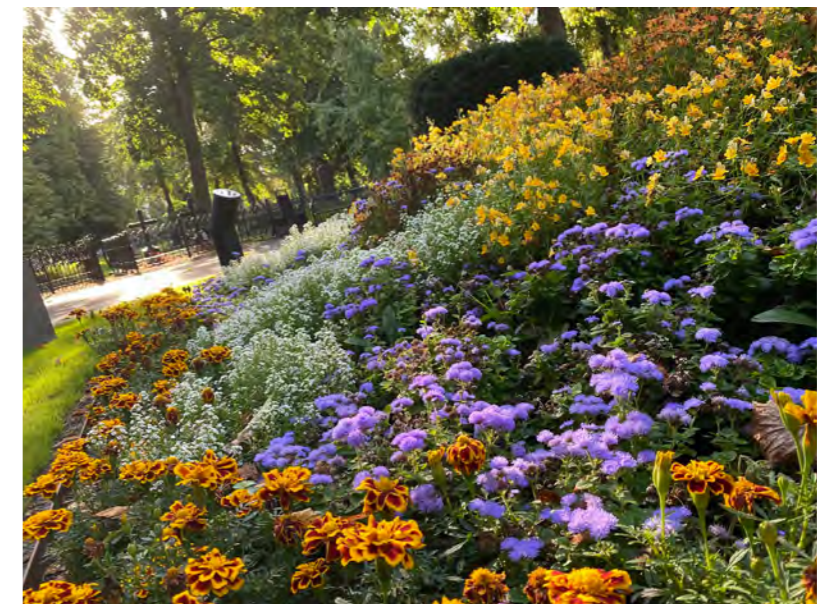


Figure 29: Yellow and purple creating a harmonious impression © Kittima Ritthichot (2021).

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## Contrast

*Contrast* - aesthetic diversity - entails the abundance of colours, textures, directions of line, forms and qualities. Excessive diversity could become imperious and create a strain, thus creating a coherency to unify the contrast would subsequently lead to minimum confusion (Robinson 2016). The coherency can be created through simple measures, e.g.: reiteration of a distinctive plant in the plantations and balancing harmonious and contrasting qualities (colours, hues, texture, lines) to create a rhythm (Dunnet 2019; Robinson 2016). Embodying contrast is important in relation to ART as it has the potential to trigger *fascination* in the terms of adding contrasting elements to the composition.



Figure 31: Grasses forming strict vertical lines contrasting rounded perennials, Uppsala, Sweden © Kittima Ritthichot (2022).

## Balance

*Balance* is associated with the vegetation mass, regarding abundancy, position, and visual energy. Robinson (2016) claims that visual balance implies that: (1) parts of the composition have visual energy; (2) a foundation (fulcrum/ axis) that the energy integrate with. The foundation is an essential part of the composition as its role is to attract and structure the remaining elements (ibid), the fulcrum or axis could be a sinuous s-shaped curved or series of defining lines (Dunnett 2019). Elements in compositions should be easy to comprehend as it allows users to easily familiarise and navigate the space (Bengtsson et al. 2024; Kaplan & Kaplan 1989). Therefore, balance could present *familiarity* in combination with *harmony*, it provides coherency to the composition.



Figure 32: A high visual plantation with plants that have a prominent character that is balanced out with the airy and round form of Siberian bugloss (*Brunnera macrophylla*), Malmö, Sweden © Kittima Ritthichot (2022).

## Emphasis and Accent

*Emphasis and accent* are utilised in entrances, steps, seatings, or water where plants accentuate the elements (see fig. 33) – referred to as *accent plantations* and is associated to plantings with *high visual energy*. Subsequently, it is closely related to *contrast* as it is used to attract attention through strong contrast or abrupt change (Robinson 2016). *Emphasis and accent* could improve nearly all the *comfortable* (tab. 1 a-f) and several *stimulating qualities* of QET (tab. 2 h, j, l, m). Equally does it contribute to creating a *symbolic space* (HAGF) as it can attach a symbolic meaning or sense of identity to the composition.



Figure 33: Topiary contrasting to the overall forest to emphasise the entrance, SLU Alnarp, Sweden © Kittima Ritthichot (2021).

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## Sequence

*Sequence* refers to how the composition changes or unfolds for the observer, hence it is akin to *rhythm*, i.e., in music where *rhythm* provides temporal structure for the composition (Robinson 2016). *Rhythm*, in this case, refers to the drift of repetition and pattern – i.e., a distinctive plant or groupings of plants with similar forms, colours, textures (Dunnett 2019; Robinson 2016). *Sequence* could generate *fascination*, particularly *soft fascination* as it intrinsically unfolds the scenery in motion and emphasises the various qualities of nature (e.g., foliage, colours, texture). As the scenery unfolds before the users, the aspect of *being away* could arise.



Figure 34: A purposefully designed road that alerts users as the unknown landscape unfolds, Gothenburg, Sweden © Kittima Ritthichot (2020).

## Scale

*Scale* involves relativity to size. On a *landscape scale* it displays the correlation between various elements in the space, whereas the *human scale* it refers to the interrelationship the size of the composition and the observer (Robinson 2016). Kaplan & Kaplan (1989) implicates that individuals are susceptible to spatial properties in the environment. Likewise does the spatial properties affect the level of *comfort* and qualities for *stimulation* (QET) and could potentially trigger the restorative aspects of *being away* and *extent*.

Individuals tend to perceive one scale of pattern at a time (Robinson 2016). Therefore, plantings that allow users to perceive qualities (e.g., foliage, texture, flowers, and fruits) are successful. Therefore, the interrelation between human scale and landscape scale should be considered to purposefully restore or enhance *directed attention* through *fascination*, *being away* and *extent*. It is also important to consider the spatial properties in the terms of HAGF, *the triangle of supportive environments* and *four zones* as it supports the spatial needs of different groups.



Figure 35: Tall trees inside a courtyard that brings down the scale and visually distract users from of the tall buildings in the vicinity, Malmö, Sweden © Kittima Ritthichot (2023).

## Summary

In summary, by utilising the concept of the visual energy and composition, the qualities of ART, QET, and HAGF can be translated into practical implications in the landscape. Although visual energy and composition is discussed in the realm of plantations, it is applicable to all elements in the landscape as the elements and composition can be perceived as an enumeration of the landscape. Understanding the composition also provides an assessment of the physical space that supports HAGF, *the triangle of supportive environments*, and *the four zones of contact with the outdoors* that is crucial as the designs should support the users' needs.

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## Colours Enhancing Design

Colour is among the primary impressions attained upon perceiving a scene (Robinson 2016) – characteristics of colours have briefly been addressed i.e., bright and dull, in the perspective of aesthetics. However, it is important to address colour psychology to grasp how colours affect people and how it can be used to enhance psychological benefits. Colours will primarily be discussed as a trait of plants and flowers.

Although there is a limited scope of research conducted on the effect of colours on flowers in a therapeutic landscape (Zhang et al 2023) – existing research recognises the restorative function of plants and colours of flowers (Elsadek & Fuji 2014; Kexiu et al 2021; Neale et al 2021; Thorpert et al 2023; Zhang et al 2023). Zhang et al (2023) study presented white, blue, and orange as the most favourable colours for flowers. Blue and white flowers were associated with relaxation/stress reduction whereas orange,

yellow, and red prompted uplifting, and positive emotions. Therefore, cool colours (blue, purple, green) are implicated significant in the primary stages of the restorative process, whilst warm colours (red, orange, yellow) could rebuild the positive affirmations (Zhang et al 2023).

Additionally, studies on different shades of green and variegated plants have been conducted (Elsadek & Fuji 2014; Kexiu et al 2021; Thorpert et al 2023). The results on different shades of green (of green walls) suggested that a combination of green with small range of light intensity allowed a less stressful experience and that warm shades of green evokes stimulation and anticipation (Thorpert et al 2023). Another study suggested an enhancement in relaxation and calmness in green and green-white variegated plants in Japanese residence, differing from Egyptian participants that found similar qualities in light green and green-yellow (Kexiu et al 2021).

In summary, colours have the potential to enhance the therapeutic experience of landscapes. Therefore, cool colours can be utilised to enhance relaxation and warm colours to encourage uplifting experiences – colours in combination with visual energy could be utilised in the designing process to purposefully enhance the desired effect in the therapeutic landscape.



Figure 36: Plantation with focus on warm colours © Elna boklund (2022).



Figure 37: Plantation with focus on cool colours © Elna boklund (2022).

# META-ANALYSIS

## SUMMARY

This chapter consists of five subchapters that will elaborate on the meta-analysis, site context, and reference locations. Thus, an explanation of the method used to analyse the existing and absent qualities of the locations will be provided. Likewise, interpreted design solutions that can be derived from reference locations.

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# Meta-analysis

A meta-analysis is the combined results from several different theories (NE 2023). In this analysis three different theories have been used – *The quality evaluation tool*, *The Triangle of Supportive Environment* and *Healthy Academic Greenspace Framework (HAGF)*. The qualities and aspects of the different theories and models used in the meta-analysis overlap; hence a graphic illustration will portray the interrelationship between the qualities (fig. 38). The excerpt of which theories meta-analysis are based on are derived from the comprehension of the literature overview. The perceptive of how different qualities are experienced and interpreted is mainly based on *ART* and the room's cohesion and connection to the surroundings from *Four Zones*. By using a combination of analysis methods, the risk of incorrect assumptions and results decreases (NE 2023). For a more in-depth description of the theories see previous chapter.

The meta-analysis commences with *QET*, it is used to analyse the existing qualities of the site based on *QET*'s 19 environmental qualities. By carrying out this step, an inventory of the places was conducted to highlight the present and absent qualities according to *QET*.

Thereafter *The Triangular model* and *HAGF* is used as a complementary tool in addition to *QET*, creating a spatial analysis to measure the various qualities and variables needed to be implemented to create a supportive and restorative environment in an academic context. *HAGF* is an important complement as it highlights and assess specific qualities needed in an academic greenspace.

The meta-analysis has been applied in three different instances: *Betonggården*; four other academic greenspaces at *Johanneberg* campus; and three domestic reference locations in Sweden. The meta-analysis was conducted at *Betonggården* to get an understanding about the present qualities in the space. The meta-analysis was carried out at the four other, well-used, academic green spaces, to comprehend and distinguish prevalent and absent qualities at *Johanneberg* campus. The meta-analysis has been performed at three different reference location: *Albano* (Stockholm), *Priorn* (Malmö) and *Ulls hus courtyard* (Uppsala) – to differentiate the strong suits in the design of the different projects.

Many parts of the analysis required us, the authors, who conducted the analysis to estimate and value of the physical and perceived qualities, thus, there is a risk of subjectivity influencing the decisions and creating incorrect results. To mitigate this problem the analyses have been conducted from a transdisciplinary perspective, with a background in landscape architecture based on the perspective of environmental psychology.

All locations have been analysed through site visits, photos, google maps street view, and maps from The Land Survey for an overview.

## The Quality Evaluation Tool

## The Triangular Model

## Healthy Academic Greenspace Framework

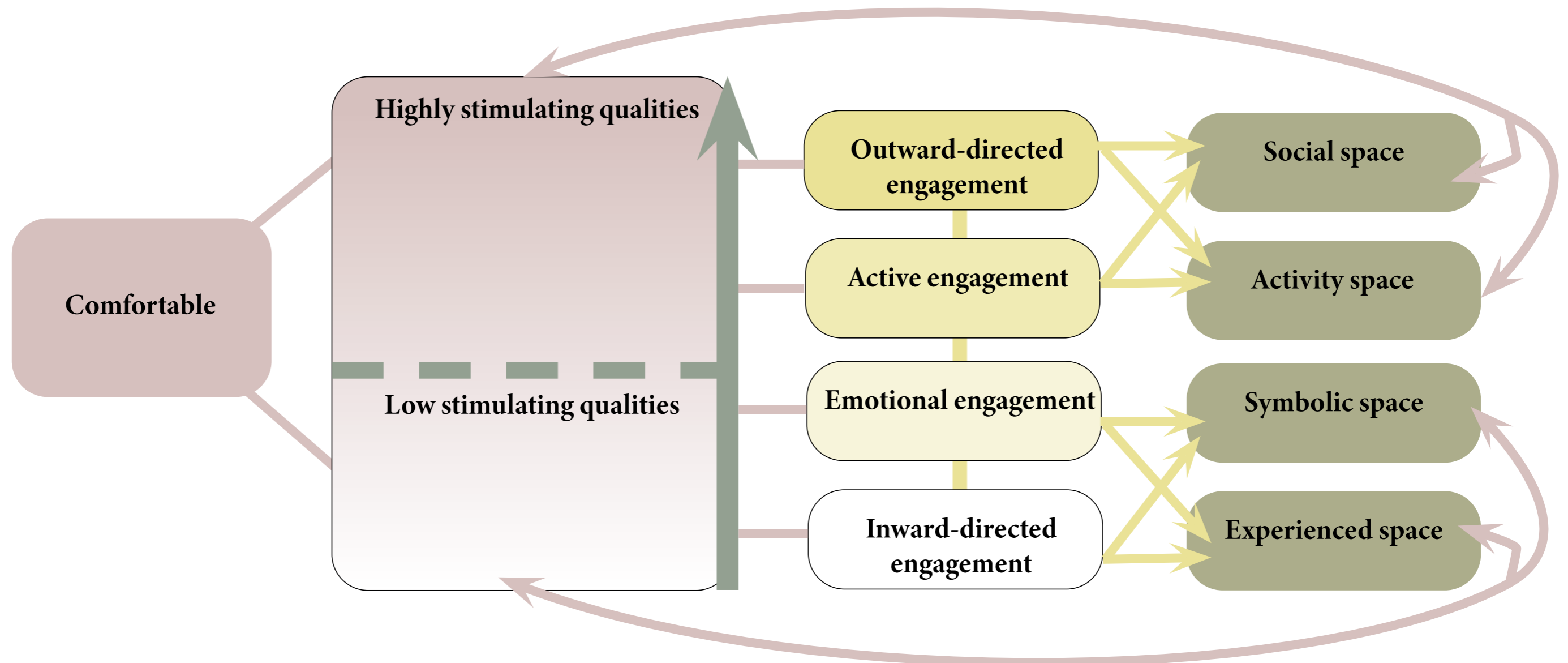


Figure 38: Figure depicting the interrelationship of the theories. The analysis commence with QET where all qualities were analysed and documented (notes, imagines, and in person visits). Subsequently, the qualities were evaluated with the triangular model and HAGF. Although the qualities of the triangular model and HAGF overlap, one does not encompass the other. The was used to assess the users engagement whilst HAGF was used to asses the of physical space. Whilst the trigular model establishes what users are seeking, HAGF elaborates on the appropriative dimensions, i. e., active engagement would require a social space that supports social relationships, shared rituals or activities.



# Johanneberg Campus

## Location

Chalmers University of Technology in Sweden, hereinafter, Chalmers. Johanneberg campus is responsible for nearly all of Chalmers' engineering degree programmes, architects, external establishment, in addition to most of the research being conducted here – thus, hosting roughly 8500 people daily (Chalmersfastigheter 2024). In addition, the campus has good connection to public transport, adjacency to large greenspaces (Mossen, Krökbacken, Johannebergsparken & Berbanefästet), student accommodations, and restaurants (Chalmers tekniska högskola et al 2019).

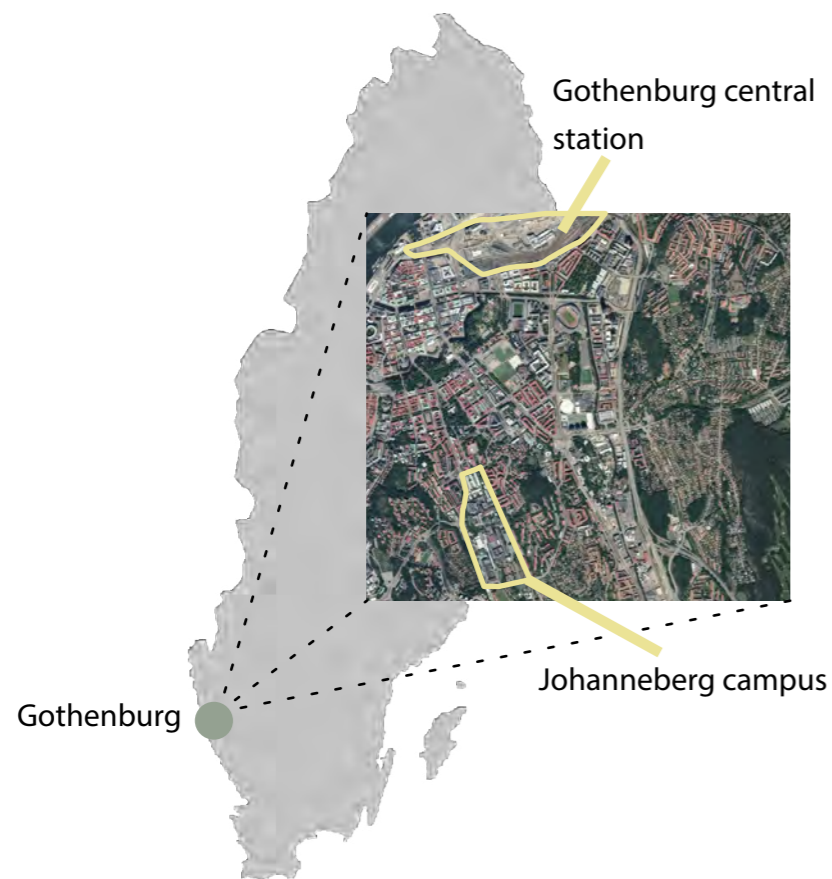


Figure 40: Map depicting Johanneberg in Gothenburg © Lantmäteriet (2024).

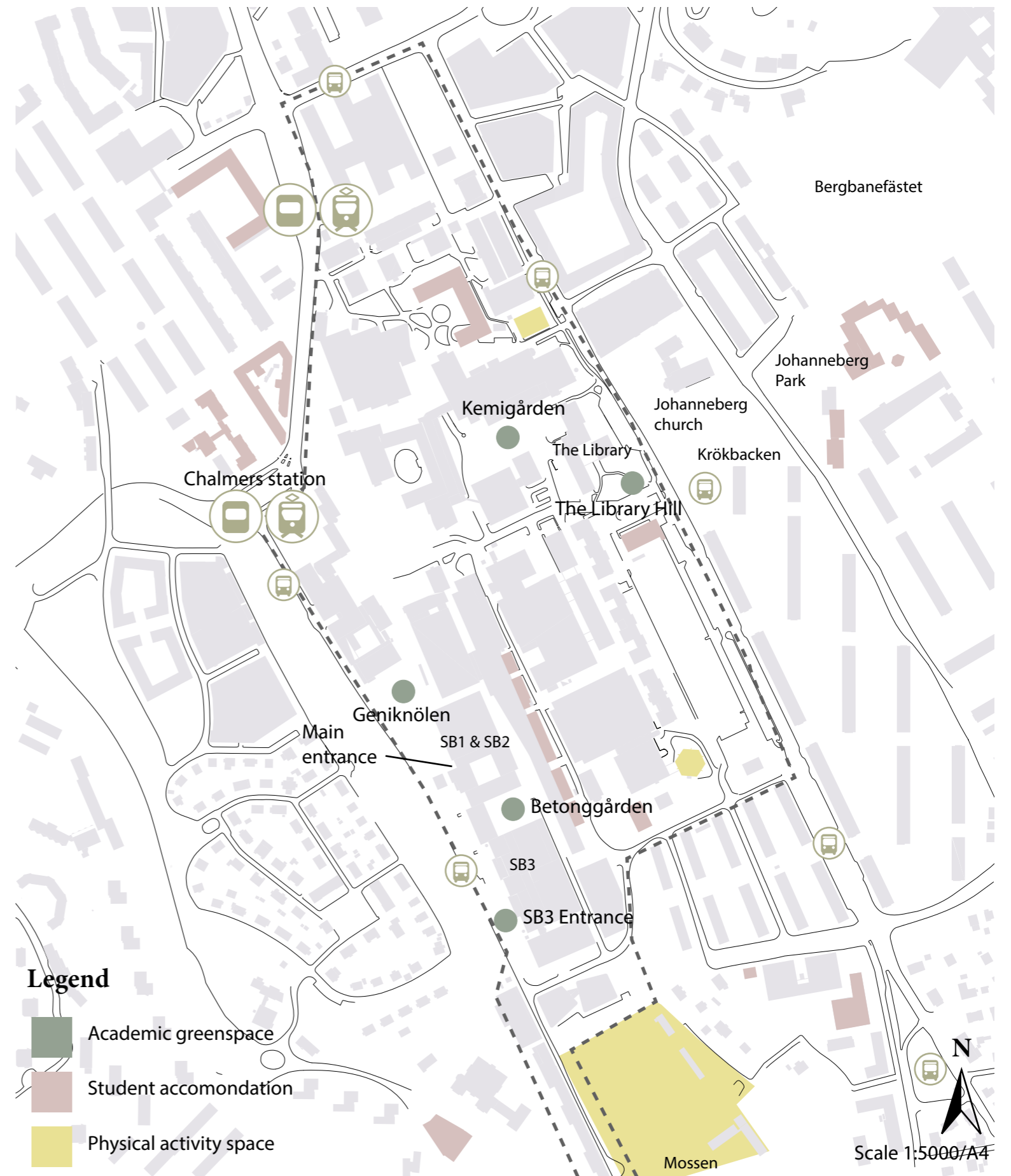


Figure 39: Figure presenting site context Johanneberg campus area, base map driven from CAD.

## Disconnected green infrastructure

Certain areas of the campus are not as well integrated as others due to the challenging topography in the area (Chalmers tekniska högskola et al 2019). Furthermore, it is stated in the campus plan that the campuses of Chalmers are considered *interstructures (interstruktur)*, a system of various meeting points and the interrelation where the exterior and interior paths interact. In contrast, Johanneberg campus is not well integrated into the vicinity. Hence, it is important to minimise the barriers of the topography by improving the accessibility and the quality of the meeting points (ibid). Therefore, improving the overall green infrastructure at the campus could potentially generate a more comprehensive campus. Henceforth interlinking several meeting points to the city's green infrastructure and potentially improve the connection to the vicinity.

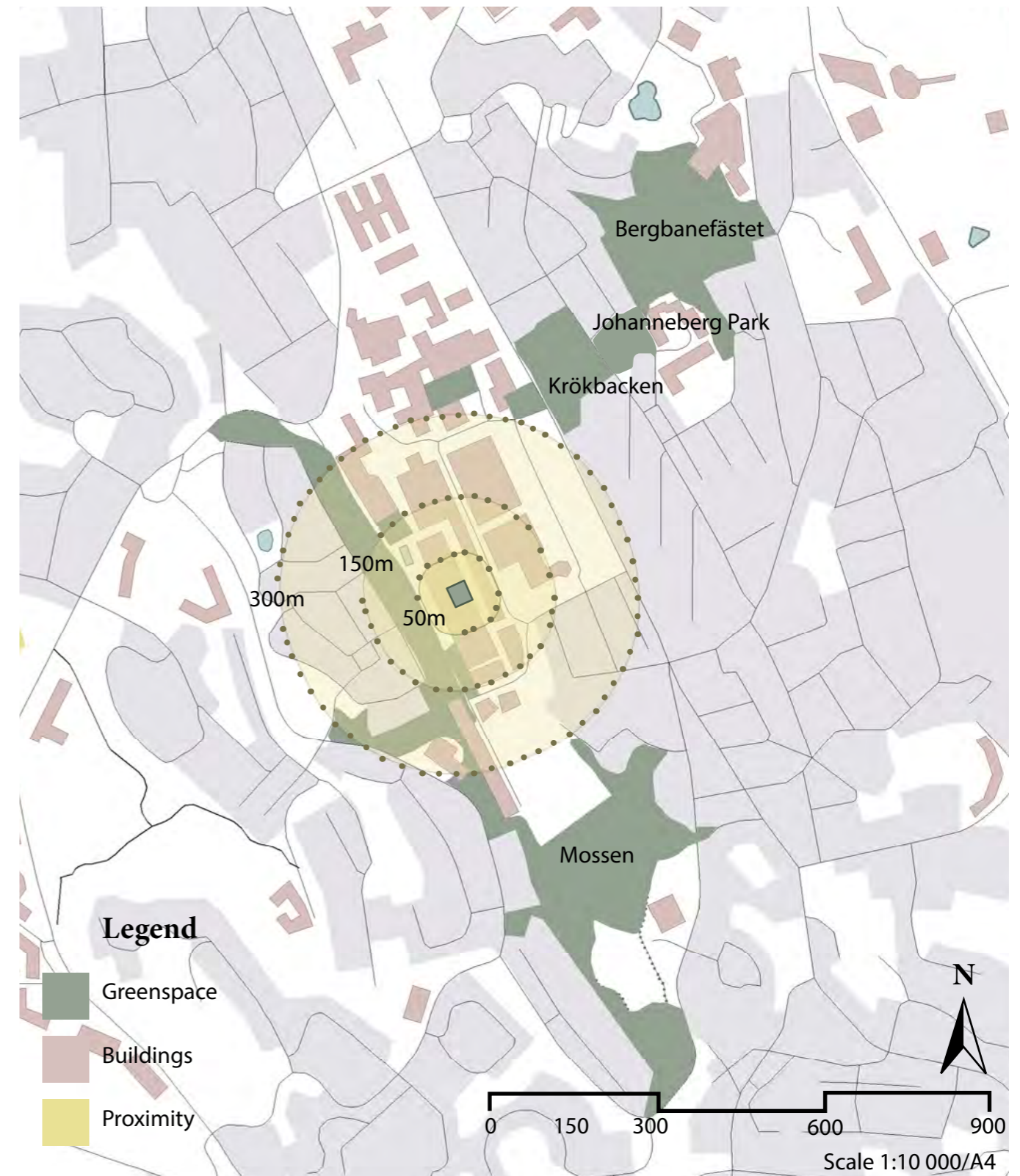


Figure 41: Figure portaying the threshold value of the walking distance (300m) to greenspace neighbourhood parks, which is derived from Stoltz & Grenh 2021. This map also shows the buffer from 50-150m distance with consideration to the topography, 300m distance in a difficult terrain would most likely take more than 5min to walk, which is why the immeduete greenspace is important. Proximity buffer of 300m, 150m and 50m from from Betonggården in relation the vicinity derived from the topographic map and othophot © Lantmäteriet (2016).

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## Future improvements

According to the planning manager at *Chalmersfastigheter* (a property company managing Chalmers' outdoor environment, and campuses), there has been a continuous dialogue to develop several areas on Johanneberg campus within the management. The planning manager argues that the perception and usage of greenspace has been changed following COVID19 (Zahlbruckner 2024).

Additionally, the *campusindex* - a yearly questionnaire for students and staffs conducted by Chalmersfastigheter to synthesise an overview of the usage and demands on the campuses' environments – addressed similar requests to improve the academic greenspaces (Chalmersfastigheter 2022; Chalmersfastigheter 2023a; Zahlbruckner 2024). According to the summary presented at campusindex 2022 and 2023, the students expressed the need for more greenspace, plants, benches, and tables on campus. The overwhelming need to enhance existing academic greenspaces and overall spaces on campus was prevalent. Students wanted more plants, trees, and flowers – many also addressed the lack of colours on campus, on buildings and ground material. While many students requested improvements on existing academic greenspaces, several expressed the needs for spaces where they could relax, designated for smaller groups or solitary activities (Chalmersfastigheter 2022; Chalmersfastigheter 2023a). Furthermore, enhancing existing academic greenspace



Figure 42: Students at Chalmers walking to their departments during morning rush hour © Kittima Ritthichot (2024).

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entailed the numerous requests for increased seating options (ibid). Although the campus has many seating options throughout the campus area, many students have expressed the needs for more seating options and benches where they could enjoy *sedentary activities* (QET). The absence of places for social encounters and meeting points during different weather conditions were also addressed. Moreover, point of interest (e.g. art, statues, technical solutions) were also highlighted (Chalmersfastigheter 2022; Chalmersfastigheter 2023a). These qualities were also prevalent in previous year's student workshop of "Enhancing Outdoor Environment" that the staff from Chalmersfastigheter organised for students. 12 students participated in three groups to create their ideal campus where an i.e., improvement in greenery and greenspaces, protected outdoor space, points of interests, and symbolic spaces were discussed (Chalmersfastigheter 2023b). The following statements are derived from campus index 2022 and 2023 where the students expressed their needs:



Figure 43: Modest plantations near the entrance of the SB2 building © Kittima Ritthichot (2024).

*"I believe the greenspaces and seating options outdoors should be increased so we can spend more time outdoors and study together." (Student, campusindex 2023)*

*"Plantations should be appealing, not placeholders..." (Student, campusindex 2022)*

*"I like greenspaces, although it is nice to have many student pubs, it is not my type of recreation.../ I would love to see more calm and cozy spaces." (Student, campusindex 2022)*

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# Betonggården

Betonggården is an enclosed courtyard behind the entrance of the SB2 building located at the southern part of the campus. The western side of the courtyard, i.e. across road Betongvägen, has an existing bank that follows the road to a turnaround zone for larger vehicles. The bank is a hill with many identified native species, i.e., Norway maple (*Acer platanoides*), Bird cherry (*Prunus padus*), and Elder (*Sambucus nigra*).

The courtyard is located near several academic greenspaces (SB3 Entrance & Geniknölen) and larger greenspaces (fig. 45). The courtyard was renovated during 2018-2019, prior to COVID-19, stated in an interview with the campus planning manager (Zahlbruckner 2024). Prior to the renovation there was no seating option and the vegetation consisted of five trees, which were observed on Google maps in June 2011 (Google maps 2011). The planning manager stated that there is a need for improvement at Betonggården following COVID-19 as they observed a shift in the importance and usage of the outdoor environment. Likewise, was there a need for increased outdoor spaces around the campus (Zahlbruckner 2024).

Betonggården is relatively open with two plantations near the facades of the buildings (eastern and northern) and one towards the parking space. The plantation has a moderate species richness after the renovation where several species were introduced i.e., Ginkgo (*Ginkgo biloba*), Hybrid witch hazel (*Hamamelis x intermedia spp.*) and several perennials. Whilst the seating options consist of four wooden benches with tables and two long benches on a stonewall –of which

are near the northern façade to receive sun. The remaining equipment were bike parking racks near the northern façade and sheltered bike parking near the escape route. Additional parking spaces were added and a cylinder-shaped construction was erected, for technical reasons assumed (Zahlbruckner 2024).

Furthermore, Betonggården is a shared space with the adjacent establishment that occasionally receives cargo and conducts material experiments on the courtyard. Moreover, the space is used yearly for fraternity events during the summer and in August (Zahlbruckner 2024). There are several entrances at Betonggården and many of them are used regularly due to the location of many nearby student accommodations and lecture halls at SB2 building. However, some entrances are for practicality reasons, namely for maintenance and as an escape route. Betonggården has become favoured among students and staff, subsequent to the renovation (ibid). Consequently, the primary users of Betonggården are students, university staff, and staff from the adjacent establishment. Thus, Betonggården is a transitional zone between zone two and three (four zones) due to the characteristics and the impact of those engaging in the space.

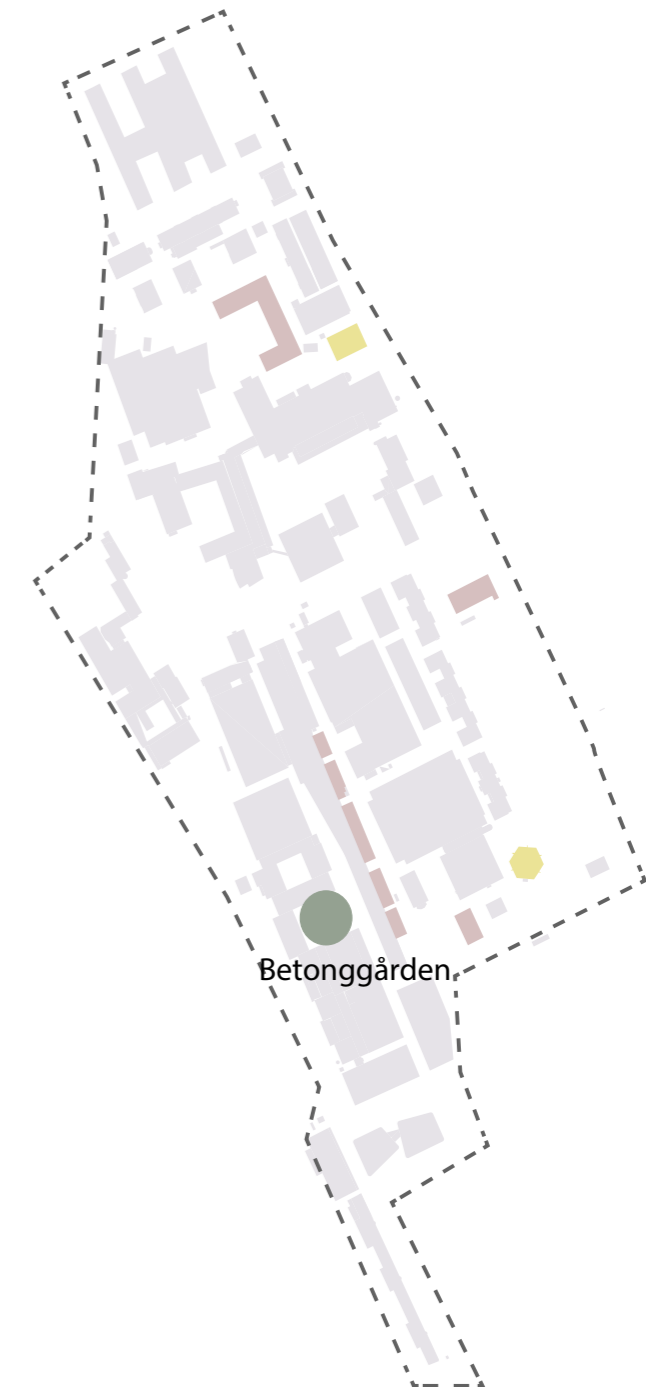


Figure 44: Location of Betonggården at Johanneberg campus.

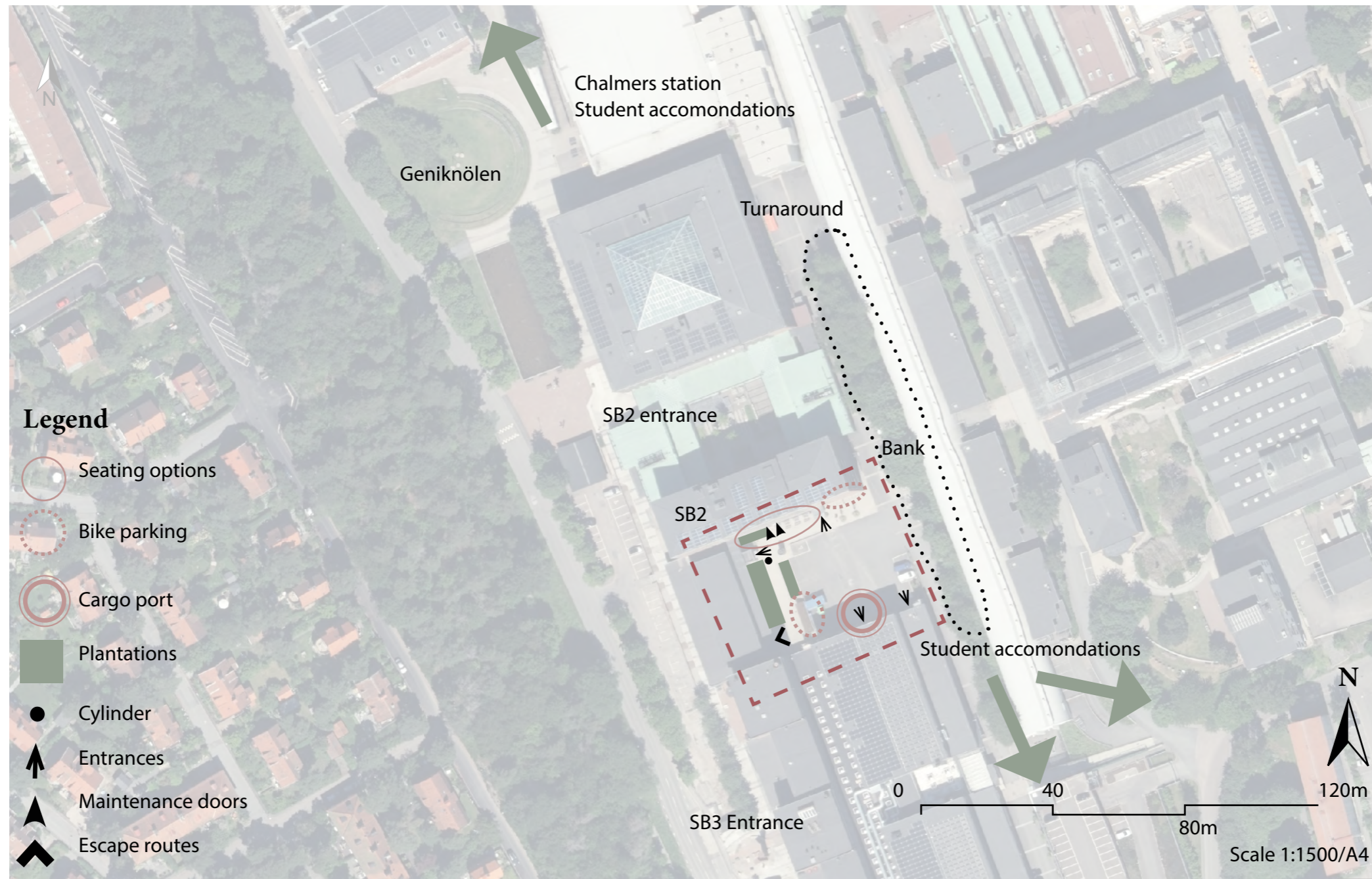


Figure 45: Map describing the site context © Lantmäteriet (2024).



Figure 46: Betonggården, at entrance floor level, from a lecture hall at the SB2 building © Anna Zahlbruckner (2024).



Figure 48: Betonggården through the large windows near the western entrance © Kittima Ritthichot (2024).



Figure 50: View of the bank from the turnaround point © Kittima Ritthichot



Figure 47: Bike parking rack near the entrance. The windows with shutters are seminar rooms; middle are windows in the stairwell; right restroom windows © Kittima Ritthichot (2024).



Figure 49: Entrance port for facility workers and cargo port, some part of the open space is used for material experiments and fraternity activities © Kittima Ritthichot (2024).



Figure 51: Turnaround point © Kittima Ritthichot (2024).

The term climate can be divided into several subcategories. Microclimate is the category that Betonggården belongs to, i.e. the climatic conditions on a surface from a few millimeters up to 1000 meters (Deak Sjöman et al 2018). The following has been observed regarding Betonggården's microclimate: Betonggården is located in plant zone two (Riksförbundet för Svensk Trädgård n.d.). In year 2023 Gothenburg had approximately 1400-1600mm precipitation and has received unparalleled precipitation in the preceding years (SMHI 2023; SMHI 2024). Betonggården is surrounded by houses to the north, south and west of varying heights from two to six storeys. The enclosed conditions make the site wind protected. East of Betonggården is a raised tree-covered bank which further reinforces the site being wind protected. The buildings in

the south, with up to six storeys create the most shaded parts, while the most sun covered area is along the facade in the north. Noted during the site visit was that *Hamamelis x intermedia*, which stands in a planting along the house in the west, had abundant flowering, which *Hamamelis* mainly gets if there is enough sunlight. From that observation, it was concluded that it is mainly in the south and the corner in the southwest that is in the heaviest shade. While the surface in the west is sufficiently sunlit for plants that tolerate some shade to survive. This was later confirmed by the sun and shade study (See fig. 52-54).

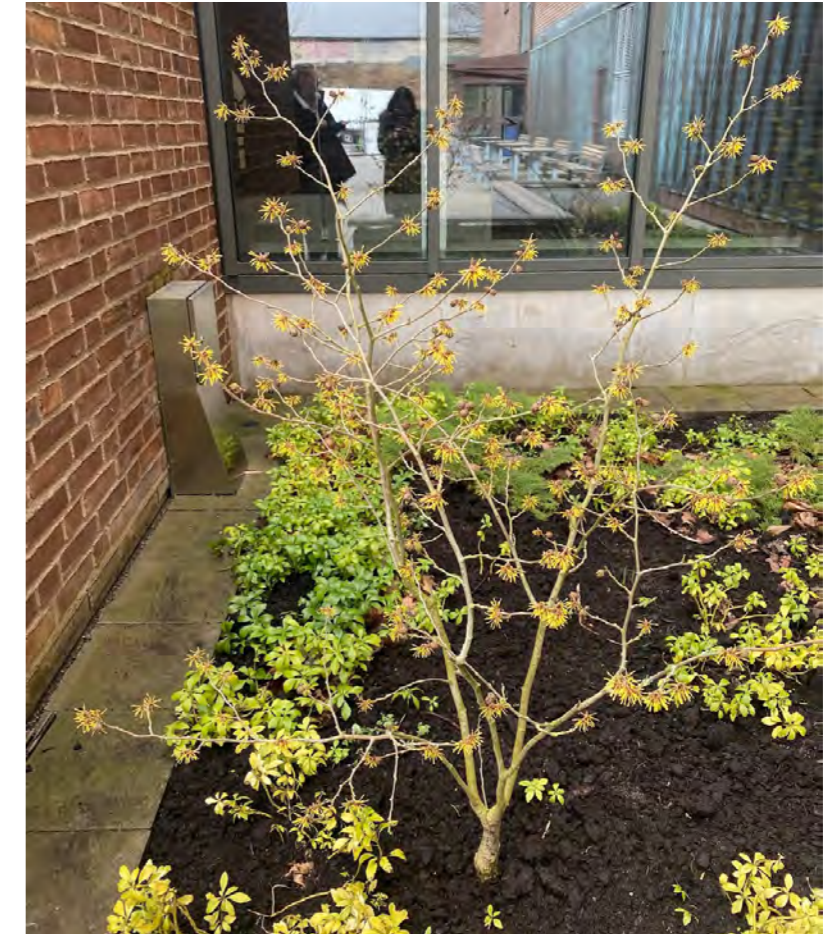


Figure 55: Flowering hybrid witch hazel

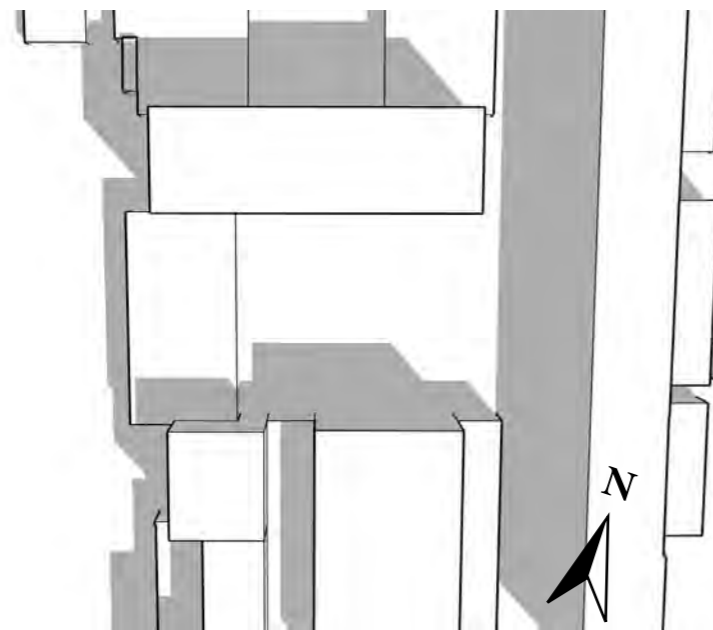


Figure 52: Shade study during the March equinox at 09:00.

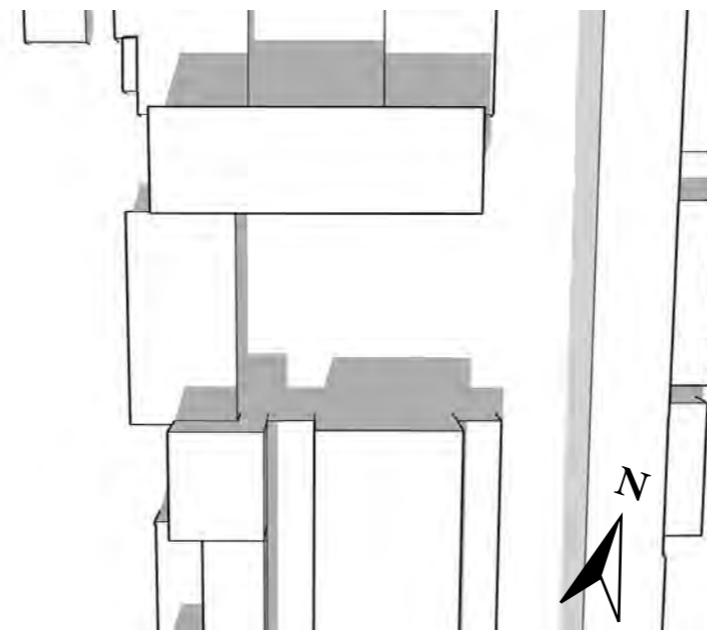


Figure 53: Shade study during the March equinox at 12:00.

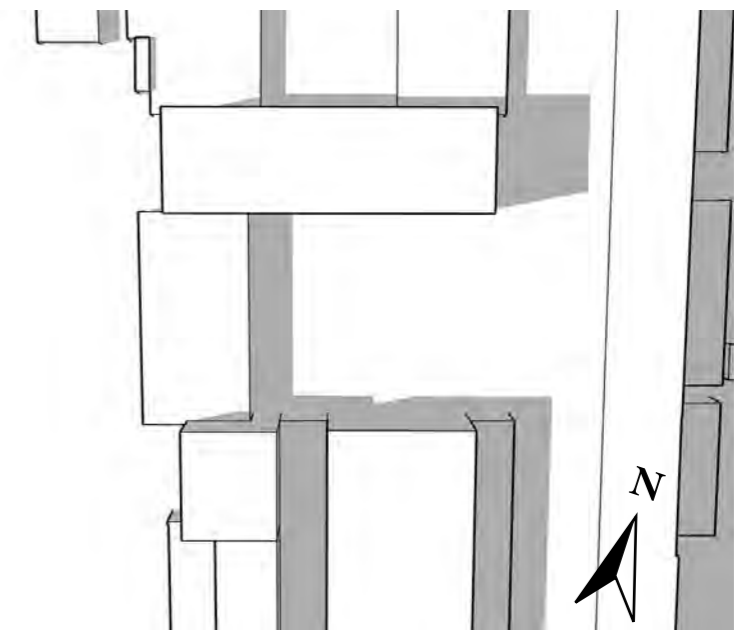


Figure 54: Shade study during the March equinox at 15:00.



## Site-analysis of Betonggården

This is the presentation of the site-analysis of Betonggården, carried out through the meta-analysis. Betonggården is essentially a space for practicality, i.e., entrances, parking, and cargo – despite being the sole location that is protected and enclosed. Although the space is regularly used during the warm months for sedentary activities, e.g., lunch. Additionally, the space is also used yearly for some fraternity events. Therefore, with the flow of people and frequency of the usage it can be concluded that Betonggården provides space for outward-directed engagement and active engagement (the triangular model). Consequently, it does not support any engagement for those at the bottom half of the triangular model, nor experienced space that is tangential to the former. Although it is possible under certain circumstances, explicitly not during rush hours or fraternity events. Hence, it is a space where students can foster new identities and meet other students, thus, e.g. a social space (HAGF) that can enhance the well-being on campus and foster positive emotions. It also has the potential to become a symbolic space (HAGF) as the sense of identity, i.e. social belongingness, can likewise foster well-being and academic success. However, there is an absence of spaces for emotional bonding and symbolic meanings – whence interrelate to symbolic space. Moreover, Betonggården does have activity space (HAGF) as they exist in other areas at the campus.

Furthermore, while Betonggården accumulated several scores on *comfortable* and *highly stimulating* qualities, it had a low score on *low stimulating* qualities (QET) (table 4). The area is easy to access from front and back of the SB2 building, although it is easy to orientate, it is slightly disconnected from the other academic greenspace on the front of the university. The renovation was instigated and introduced two Gingkos (*Gingko biloba*), multi-stemmed shrubs, and perennials in addition to new south facing seating options, bicycle parking and car parking slots. Conversely increasing i.e., *the species richness and variety, seasons changing in nature and social activities*. Although, *wilderness and nature* is arguable due to the bank, it was not included as a part of the analysis at Betonggården users are not allowed to experience the bank – i.e., sit down and perceive the seasonal changes. It can be concluded that Betonggården is comfortable and highly stimulating, whilst being the sole location that is secluded and protected academic greenspace (fig. 56).

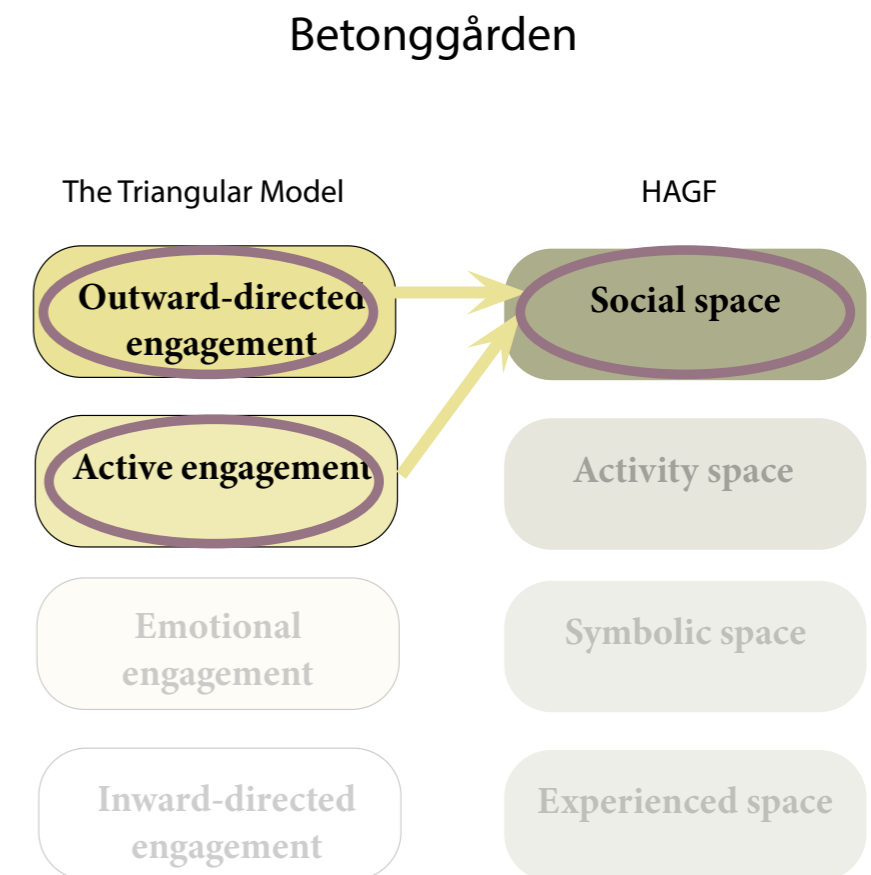


Figure 56: Framework model base by Figure displaying the interrelation between the trigular model and HAGF. The focus was solely to create a space for social engagement, in addition to practicality purposes.

These qualities have previously been discussed in the preceding summary of the Betonggården. The table simply depicts the interrelation between these qualities. The qualities of QET received scores ranging from 1 to 3: (1) existing but inadequate, (2) Moderate, (3) Good. The total sum of the points is not core, it merely describes the qualities that is provided in a simplified manner. Therefore, the essence is what these qualities provide, whence have been summarised.

Comfortable

Highly stimulating

Low stimulating

	Qualities	Motivation	Score
a	Closeness and easy access	Easy to access.	2
b	Entrance and enclosure	Clear entrances and surrounded by buildings.	3
c	Safety and security	Physically it feels comfortable, but mentally it feels inappropriate because of the containers.	2
d	Familiarity	Feels very divided due to the two different sides (the facilities and the campus building), but Betonggården it is next to the campus building, which enables the connection.	1
e	Orientation and wayfinding	Easily oriented, clear and structured ground material.	3
f	Different options in different kinds of weather	-	-
g	Contact with surrounding life	There are opportunities to make contact with others in the surrounding.	2
h	Social opportunities (social*)	A good meeting place.	2
i	Joyful and meaningful activities	Social and sedentary activities such as coffee breaks, reading and lunch.	2
j	Culture and connection to past times (cultural*)	-	-
k	Openness (open*)	Open and easy to overlook.	3
l	Species richness and variety (diverse*)	Relatively species rich in perennials, several shrubs but one sole tree specie.	2
m	Sensory experiences of nature	-	-
n	Seasons changing in nature	The plants in the courtyard have some qualities that can be expericed throughout the season.	1
o	Symbolism and reflection	-	-
p	Space (cohesive*)	-	-
q	Serene and peaceful (serene*)	-	-
r	Wildness and nature (natural*)	-	-
s	Secluded and protected (shelter*)	Secluded and protected environment.	3

Tables 4: Table by Bengtsson et al (2024). Modified table describing the environmental qualities for people to be comfortable in the green area at Betonggården.

\* = Qualities derived from PSD. - = absent qualities



Figure 58: Top left: the only seating options in the area are placed in the best location to enjoy the sun, creating a space for social opportunities and sedentary activities. Bottom left: a view of the open space at Betonggården, the area is protected from wind as it is embedded between buildings - therefore also providing a milder microclimate. Top right: Bicycle shelter and a plantation that can be seen from the inside through the large windows that also provide experienced changes in nature and seasons through the windows. Bottom right: an up-close view of the seating options placed near the plantations, this type of plantation could possibly generate a feeling of being embedded or a backing if the plants were allowed to broaden in width. Additionally, the plantation is surrounded by windows that allow users to indirectly engage with nature through zone 1 (four zones). © Kittima Ritthichot (2024).

# Four Academic greenspaces, Johanneberg

The following academic greenspaces have been selected after discussing the usage and frequency of visitations with the planning manager, likewise was the size of space considered – greenspaces of similar areas as Betonggården. The meta-analysis was carried out on four other greenspaces at Johanneberg to comprehend the existing and lacking qualities within the campus area. The results of the meta-analysis are intended as a part of the premise for the design work. In the following part, the results from the meta-analysis of Betonggården and the four other academic greenspaces are discussed.

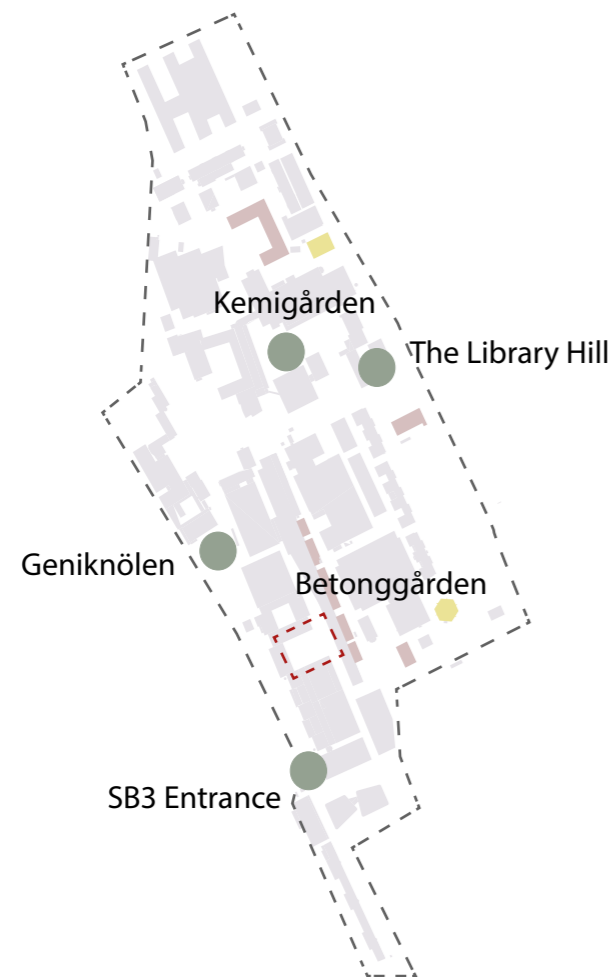


Figure 60: Location of relevant academic greenspaces at Johanneberg campus in relation to Betonggården.



Figure 59: Pictures of Geniknölen. Top left: Overview of Geniknölen where seatings are concentrically surrounding the hill. Bottom left: View of Emil, Emilia, and the train car that allows the users to connect to the culture and connection to past times, likewise does it creates a space for symbolism. Top right: View from the top of the hill allowing users to overlook the passage of people to the main entrance of the SB2 building, important as it connects the space to the adjacent buildings and enables easy orientation. Bottom right: View from seatings surrounding the hills which allows the users to have contact with the surrounding life enables many social opportunities as the fraternity restaurant is located nearby. © Kittima Ritthichot (2024).

## Summary of Meta-analysis

The results of the meta-analysis (fig. 65- 68 & tab. 5) of the academic greenspaces at Johanneberg campus (Betonggården, Geniknölen, Kemigården, The Library Hill, SB3 entrance) highlighted the predominance of social opportunities. Thus, the academic greenspaces primarily focused on *highly stimulating qualities* (QET) where social opportunities were encouraged and less on *low stimulating* (QET) and restorative qualities. In accordance with the campusindex and the workshop, students also expressed the absence of relaxing and calming environments (Chalmersfastigheter 2022; Chalmersfastigheter 2023a; Chalmersfastigheter 2023b).



Figure 61: Pictures of Kemigården. Top left: view of Kemigården from the west side that shows modest plantations and the half-enclosure created by the granite blocks. Middle: Multi-stemmed Birchbark cherry providing seasonal experiences through with its beautiful shiny and flaky mahogany brown bark, white flowers, and red fall foliage. Bottom left: Shows another form of enclosure created by Rhobodenron shrubs that also provide seasonal experiences with their pink flowers and evergreen foliage. Top right: A view from one of the main paths from the library to Kemigården. This portrays how the enclosure created by the granite blocks and the sunken space creates a strong backing for the users, which enables a form of protection whilst also allowing the users to observe others as they pass through without feeling disturbance from the back. Bottom right: Same view as top right, this shows the openness provides an overlook of the space for easy orientation, although the several entrances and ground material creates an uncertainty with no clear paths. © Kittima Ritthichot (2024).

In the triangular model, the highly stimulating qualities of QET are akin to *outward-directed attention* and *active engagement*, whereas in HAGF it is *social space* and *symbolic space* to a certain extent. Spaces for *activity space* (HAGF) exists on other parts of the campus, although they have been excluded from the analysis of the academic greenspaces as most of the activity spaces are indoor facilities (fig. 39). However, the absence of spaces for *emotional engagement* and *inward-directed engagement* (the triangular model) and *experienced space* (HAGF) is prevalent as these corresponds to the *low stimulating qualities* of QET. The focus of this study is to convalesce mental fatigue; hence, it is important to address the absence of the quality *emotional engagement* and *inward-directed engagement* as they aid the recovery process of mental fatigue. Additionally, these qualities correlates to two of the four aspects that trigger restorativeness: *being away* and *extent*.

Kemigården, the Library Hill, Geniknölen, and Betonggården are the most bustling academic greenspace on campus – particularly on warm days (Zahlbruckner 2024). Contrarywise to the open and “formal” academic greenspaces. Betonggården is the sole location that is nearly enclosed, thus providing shelter and a milder microclimate as it is embedded between buildings, in contrast to the remaining academic greenspaces that are relatively open. Hence, Betonggården as a physical space, has the prerequisite for the aspects *being away* and *extent* (ART). The existing prerequisites are unattainable at many locations due to the characteristics of the vicinity and the purpose of the space (social meeting point, square,



Figure 62: Pictures of SB3 entrance. Top left: One of the smaller rooms with a sun stool allowing the users to enjoy another type of seditary activity with an enclosure of plants. Bottom left: View from the SB3 entrance overlooking the pocket park. The hedge enclosure creating smaller rooms is visible from this view. Middle: A meandering path along the pocket park that allows users to leisurely walk and reflect, this is the sole location where nearly all the paths are accessible. Top right: A view of a type of social seating option where users have more contact with the surrounding life as it is pocketed within he main meandering path. The smaller paths are also clearly laid out making it easier to orientate and access. Bottom right: A view from the edge of the pocket park where a space of multiple group seating options occupy which comprimises larger social opportunities for groups. © Kittima Ritthichot (2024).

entrance etc.). Whereas Betonggården is a backyard with several entrances and with the prerequisites, there is a potential to further improve the restorative aspects of the space to aid the recovery of mental fatigue.

Furthermore, the noise pollution from vicinity was prominent at all locations as Johanneberg campus is integrated to the city's infrastructure (fig. 63). Upon the site visits the noise pollution was modestly obtrusive at the locations that were embedded in the buildings i.e., Kemigården and Betonggården, contrary to the remaining locations that are in relatively open or located near roads.



Figure 63: Modified noise pollution map from 2021 at Johanneberg campus derived from Gothenburg's Environmental Management. The campus is susceptible to noise pollution as it is integrated to the city's infrastructure. However, certain locations that are more embedded between buildings are less susceptible to the noise pollution. The pollution varies in degrees of obtrusiveness where red entails obtrusive and dark turquoise least obtrusive. © Gothenburg's Environmental Management

Whilst the academic greenspaces achieved many or nearly all *comfortable qualities*. The *low stimulating qualities* were scarce at all locations, although these qualities trigger *involuntary attention* – which is crucial as it intrinsically recovers mental fatigue. In addition, there were no options for *different kinds of weather* in any of the locations – therefore the students and staffs lack a variation of protection (i.e., shelters and paths) in their outdoor environment throughout the seasons. Although some locations offer a form of enclosure, the experienced space does not offer any *serene and peaceful* environment (tab. 6: q). Furthermore, there was a substantial lack of *species richness and variety, sensory experiences of nature and seasons changing in nature* at Kemigården, Geniknölen, and the Library Hill as it is primarily a grass lawn and/or compose of few plant species (tab. 6: l-n) . Whereas Betonggården and the SB3 entrance are more species diverse, the absence of the remaining qualities makes the locations less appealing as a restorative academic greenspace (tab. 6). Johanneberg campus is partly surrounded by nature, howbeit, the nature is not integrated into the existing academic greenspace (Chalmers tekniska högskola et al 2019). Henceforth, introducing wild characteristics could extend the restorative qualities at Johanneberg campus. The evidence on the restorative qualities of nature on its own terms – natural environments exclusive of human intrusion – have been addressed in preceding chapters.

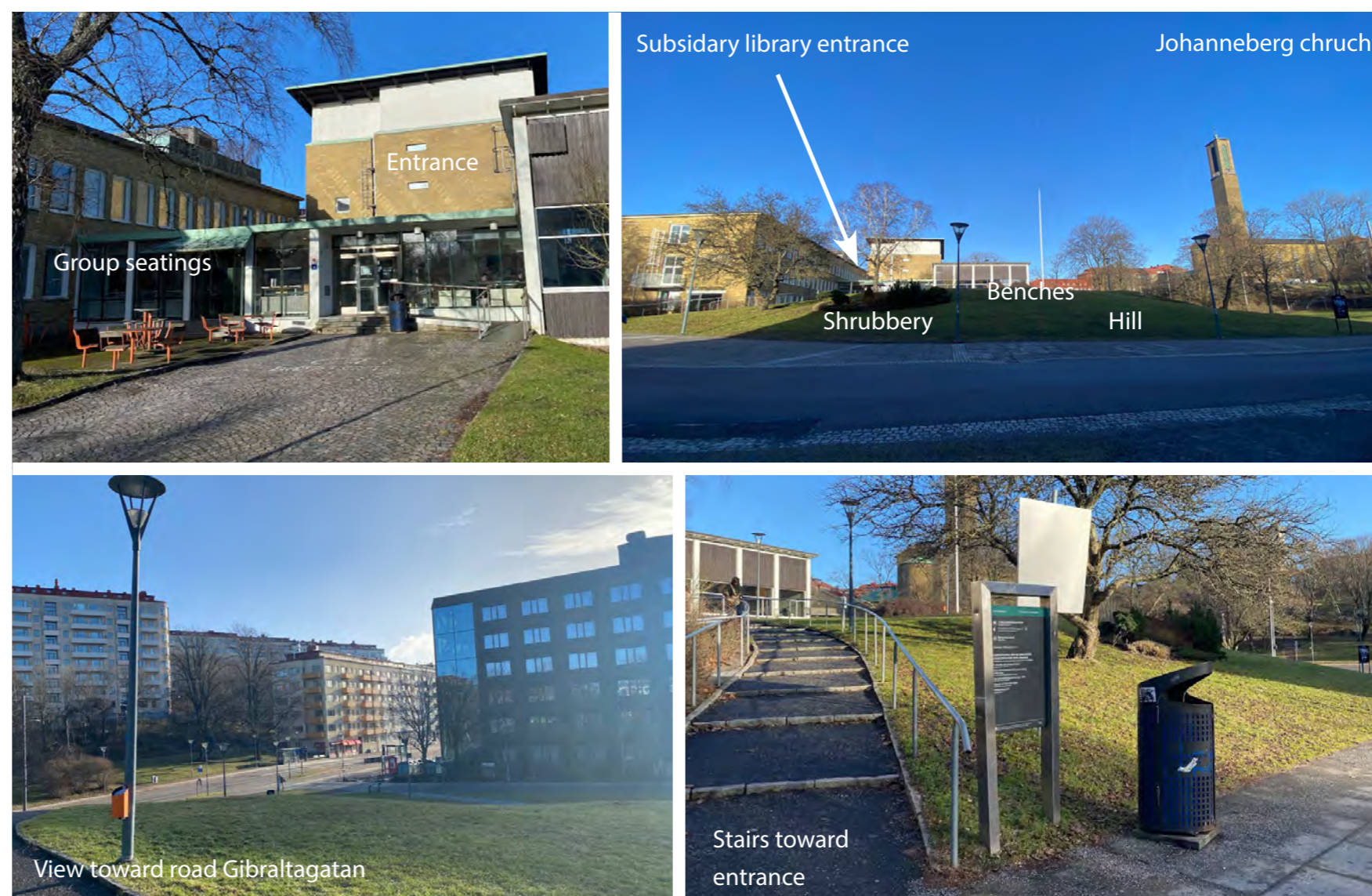


Figure 64: Pictures of The Library Hill. Top left: A view of the group seatings near the main entrance with great overlook of the vicinity, although some users might not appreciate being watched from the inside as study tables are placed near the windows. Bottom left: A view from the main road on the hill overlooking the cityscape, this is the best place to sit for a good overlook of the city whilst also not feeling eyes behind ones neck, some common park benches are placed here (placement, top left). Top right: A view from the bottom of the hill that portrays the different elements of the space. According to the planning manager and the campus index, many students enjoy sitting on the grassy hill on warm days, thus making this place quite suitable for sedentary activities. Bottom right: A view from the stairs towards the entrance showcasing the challenges of the difficult terrain in the area that subsequently makes many areas on campus less accessible to mobility impaired users. © Kittima Ritthichot (2024).



## Collocation of Meta-analysis

A collocation of existing qualities at the remaining academic greenspaces at Johanneberg campus. These qualities have previously been discussed in the preceding summary of the meta-analysis. The figure simply depicts the interrelation between these qualities. Whilst the qualities of The Triangular Model and HAGF tangent, fulfilling a certain quality does not implicate that the quality in the other model is fulfilled. The qualities that are fulfilled are highlighted with ovals.

### Geniknölen

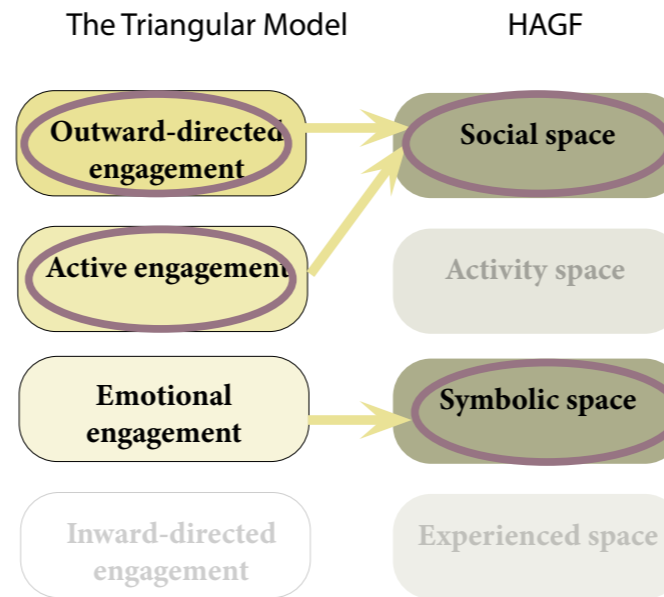


Figure 65: Figure displaying the interrelation between the trigular model and HAGF at Geniknölen where the focus was on social engagement. Although there was room for contemplation and reflection as the space is surrounded by several cultural and historical momuments.

### Kemigården

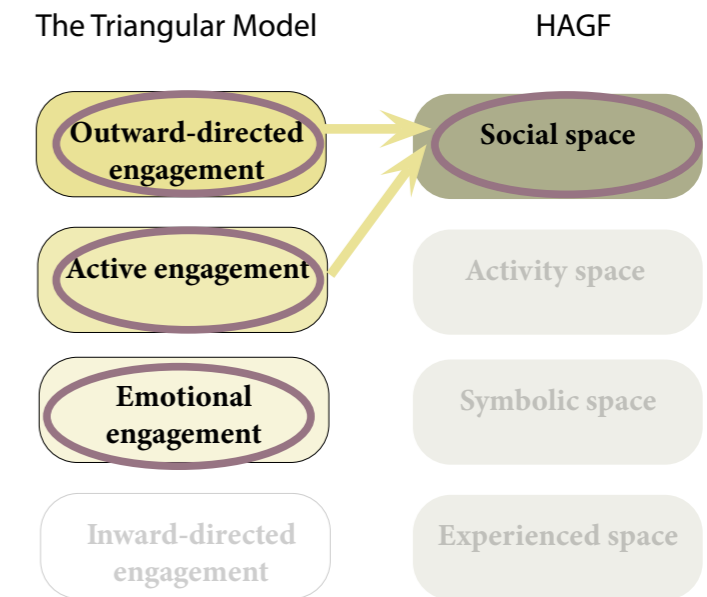


Figure 67: Figure displaying the interrelation between the trigular model and HAGF at Kemigården where the focus was on social engagement. Albeit there was room for emotional engagement, there was an absence of enclosure and quite busy as it is one of the main entrances to the Chemistry Department.

### SB3 Entrance

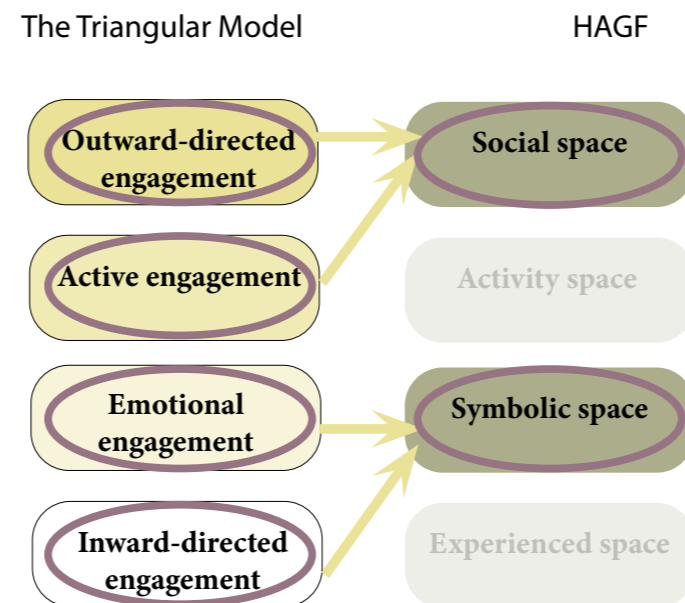


Figure 66: Figure displaying the interrelation between the trigular model and HAGF at SB3 Entrance where there was room for varying degrees of engagement. However, the location could be a distadvantage for this academic greenspace. Likewise, the busy road adjacent to the space. Whilst this is the sole location at Joahnnenberg campus that offers seating options for solitary use and has some enclosure.

### The Library Hill

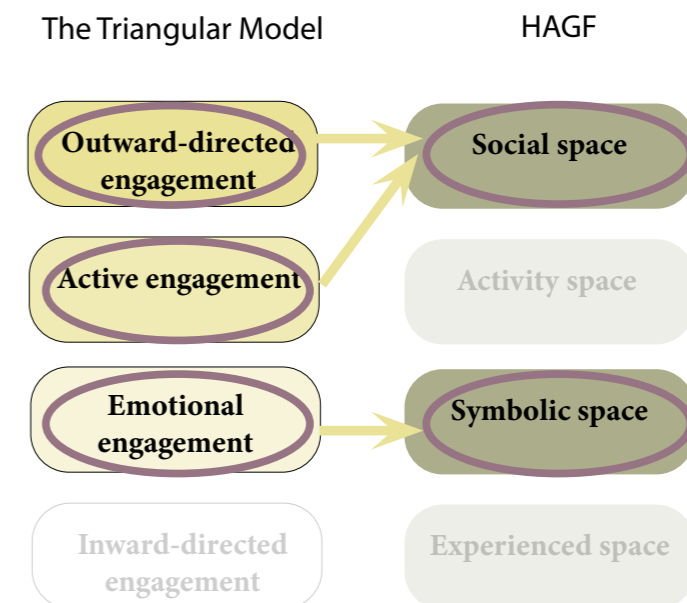


Figure 68: Figure displaying the interrelation between the trigular model and HAGF at The Library Hill where the focus was on social engagement. Whereas there is room for emotional engagement, the space is adjacent to a busy road and therefore counterproductive for users with low well-being. However, an opportunity for emotional engagement could arise with consideration to the site context.

## Collocation of QET at remaining academic greenspaces

These qualities have previously been discussed in the preceding summary of the meta-analysis. The qualities of QET received scores ranging from 1 to 3: (1) existing but inadequate, (2) Moderate, (3) Good. The motivation for analysed qualities of QET is attached at the end of the thesis. The total sum of the points is not core, it merely describes the qualities that is provided in a simplified manner. Therefore, the essence is what these qualities provide, whence have been summarised.

Comfortable

Highly stimulating

Low stimulating

	Qualities	Geniknölen	Kemigården	SB3 Entrance	The Library Hill
a	Closeness and easy access	3	1	3	2
b	Entrance and enclosure	-	2	3	2
c	Safety and security	3	2	3	2
d	Familiarity	3	1	-	3
e	Orientation and wayfinding	3	1	3	3
f	Different options in different kinds of weather	-	-	-	-
g	Contact with surrounding life	3	3	3	3
h	Social opportunities (social*)	3	3	3	3
i	Joyful and meaningful activities	3	2	3	2
j	Culture and connection to past times (cultural*)	3	-	2	2
k	Openness (open*)	3	3	3	3
l	Species richness and variety (diverse*)	-	1	3	-
m	Sensory experiences of nature	-	1	2	-
n	Seasons changing in nature	1	2	3	1
o	Symbolism and reflection	3	-	-	3
p	Space (cohesive*)	-	-	2	-
q	Serene and peaceful (serene*)	-	-	-	-
r	Wildness and nature (natural*)	-	-	-	-
s	Secluded and protected (shelter*)	1	2	2	-

Tables 5: Bengtsson et al (2024). The table describing the environmental qualities for people to be comfortable in the green area . \* = Qualities derived from PSD. - = absent qualities

# Reference Locations

In this chapter three reference location will be analysed similarly to the previously mentioned academic greenspaces at Johanneberg campus. The reference locations were used in an inspirational purpose, to study practical solutions and interpretation of various theories in environmental psychology. The chosen reference locations are the following: Albano, Stockholm; Priorn, Malmö; Ulls hus, Uppsala. All reference locations are located in various parts of Sweden and were chosen for similarity in site context and size.



Figure 71: Map with locations of reference locations in relation to Gothenburg where Betonggården is located © Lantmäteriet (2024)

## Albano entrance, Stockholm, Sweden

Albano is one of Stockholm University's newly established campuses located near the city centre of Stockholm, Sweden. The chosen location is the entrance near Albanotrappan extending to the adjacent canal environment with a total area of roughly 3000m<sup>2</sup>. The area functions as a main entrance to the university for nearly 14 000 students, moreover, connecting various greenspaces in the university area, i.e., Albanoparken, the canal, and Albanoterrassen (Akademiska hus 2023; Christensen & Co n.d).

Albano supports social and intimate aspects to a certain extent, it is a place that greatly balances these aspects. It supports *outward-directed engagement* and *active engagement* (the triangular model) due to the flow of people and the student activities. Moreover, there are places for *emotional engagement* (the triangular model) adjacent to the canal – namely, seating options and a walking path. Thus, it also provides a *social space* and *activity space* (HAGF). Likewise, does the vicinity of the canal have the potential to support inward-directed engagement (the triangular model) – it is sunken down and embedded, allowing users to enter a nearly undisturbed world. Therefore, it also provides an *experienced space* and a *symbolic space* (HAGF).



Figure 72: Circular benches with planters near the main entrance and large staircase © Kittima Ritthichot (2024).

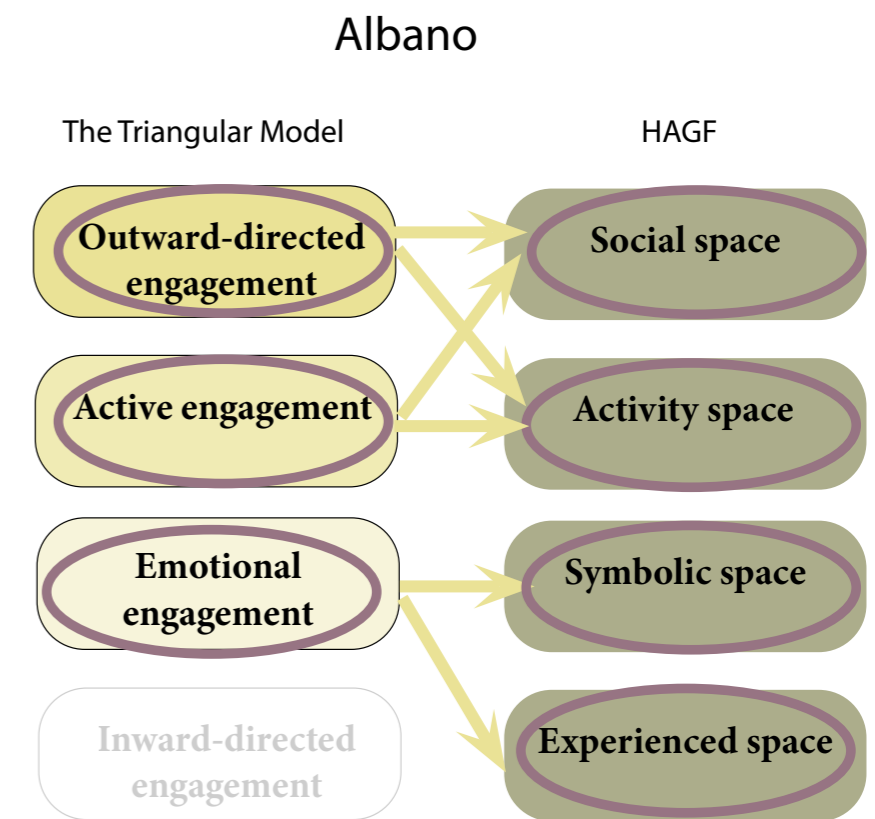


Figure 70: Figure displaying the interrelation between the trigular model and HAGF at Albano. The space offers a greate opportunity for users to be near water and nature on its own term, therefore enhances emotional engagement.

The entrance covered nearly all qualities of QET, receiving high scores despite the noise pollution that disrupt the experienced *serene and peaceful* qualities. The space is open allowing the users to overlook and easily navigate, whilst offering shelter near entrances to buildings. It is well integrated in the environment; thus, users can experience contact with the surrounding environment. Likewise does the area encourage many social opportunities and sedentary activities, unlike the remaining reference locations the area near the canal allows to users to experience nature and water more intimately by creating small paths near the canal. The location has three types of plantations (raised planters, planters at ground level, plantations near the canal) that are species diverse – therefore, increasing species richness and variety, sensory experiences of nature and seasons changing in nature. Although the space is coherent and secluded to a certain extent, it does not feel like an undisturbed space due to the noise pollution and the large amount of people passing through every day.



Figure 73: Plantations near the entrance with large line drainage that also enables walking inside the plantation © Kittima Ritthichot (2024).



Figure 75: Floating plantations near the entrance that allow users to walk inbetween © Kittima Ritthichot (2024).



Figure 76: Shelter near entrances © Kittima Ritthichot (2024).



Figure 74: A view from one of the bridges showing the path adjacent to the canal, seating options, and the main entrance to the facilities at Albano near the large staircase. The grassy hills has signs of a meadow © Kittima Ritthichot (2024).

# Priorn, Malmö, Sweden

Priorn, a therapy garden inspired roof, designed by White Arkitekter in collaboration with researcher from SLU Alnarp, psychologists, doctors, and healthcare staff. The roof garden is on the third floor, with a modest area of approximately 700m<sup>2</sup>. Priorn was inspired by the therapy garden at SLU in Alnarp, with the intention to create a therapeutic space for patients and healthcare staff to, i.e., contemplate, practice medicinal yoga, therapeutic gardening, and alleviate stress (Sveriges Arkitekter n.d; White Arkitekter n.db).

Priorn was the sole location that fulfilled all requirements for the trigular model, HAGF, and nearly all on QET – despite being the smallest location. Therefore, size is not a restriction to create a small space with restorative qualities. The space provides several rooms that supports the entire triangular model, likewise, HAGF. Social activities can be engaged in the larger rooms, whilst there is space for solitary activities in smaller rooms. Additionally, there are certain areas where users can watch others engaging

in the space. Furthermore, there is a walk and talk trail, yoga, and therapeutic gardening that supports physical activity. Likewise, does this place have several elements that alleviates stress and symbolic elements, i.e. water for the former and the spherical view of the city for the latter.

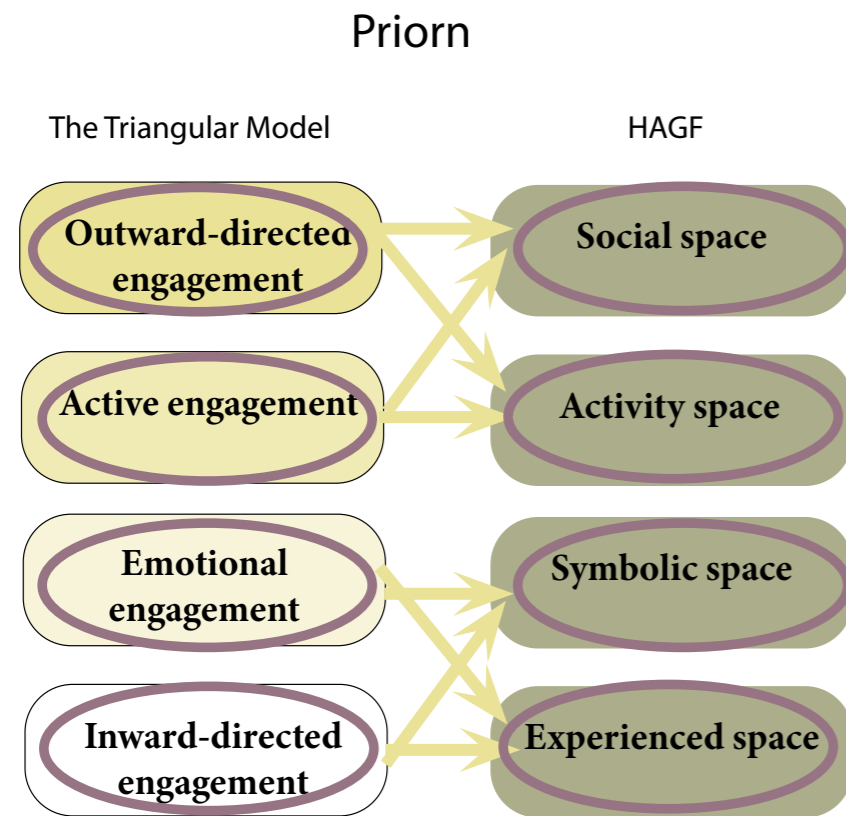


Figure 78: Figure displaying the interrelation between the trigular model and HAGF at The Library Hill. Priorn achieved the aspects, although it supports social engagements, it is catered towards smaller groups. With consideration to the site context, larger groups would not be suitable for this location.

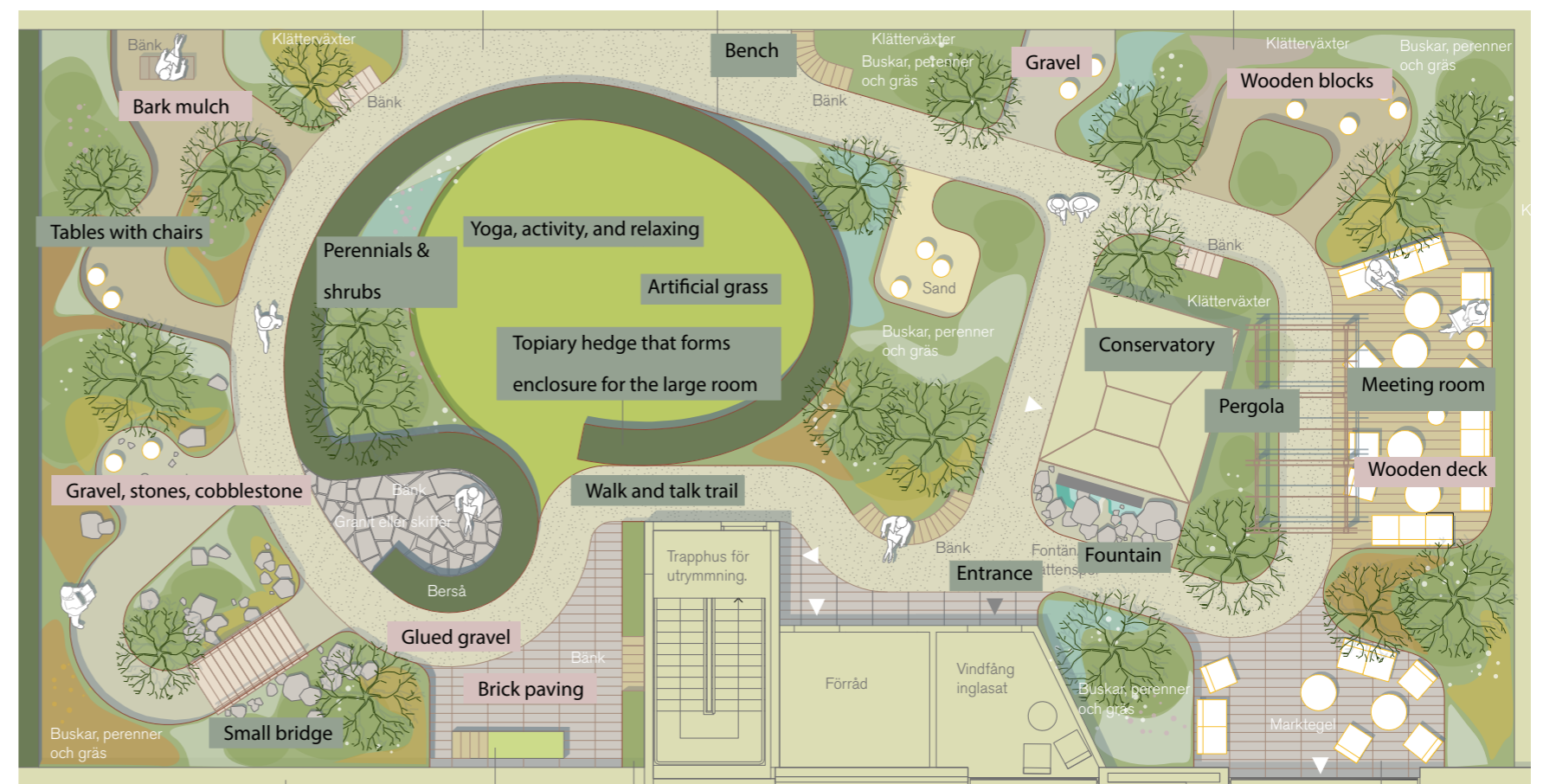


Figure 77: illustration plan by White Arkitekter that depicts Priorn with translantions that elaborates on details - green for general details and activities, pink for ground material. The illustration clearly portrays that the rooms are divided by utilising ground material, lifted plantations, and vegetation that is further elaborated on the QET analysis © White Arkitekter (2016).

Priorn has received the highest score in all categories of QET compared to the Albano entrance and Ulls hus courtyard, despite the modest size. It is a *comfortable and easy oriented space*, offering good visibility to the adjacent buildings and the urban life. The roof garden utilises plants to enclosure seatings, thus creating several small diverse rooms for varying intentions and activities – including nearly all highly and low stimulating qualities. A walk and talk trail placed in the centre, establishing easy and accessible road of rubber granule, whilst also creating a larger flexible activity space in the middle. It is also the location with the most *species richness and variety, sensory of experience, and seasons changing in nature* – with the extensive list of plants. Although several plants could arguably be considered “tall”, there are among the shrubbery a variety between tight respectively not tight and airy qualities – the plants, however, creates good enclosure for a *secluded and protected* space. The roof garden is the sole reference location that has *different options in different kinds of weather* – the conservatory, in addition to which has a space for horticultural therapy.

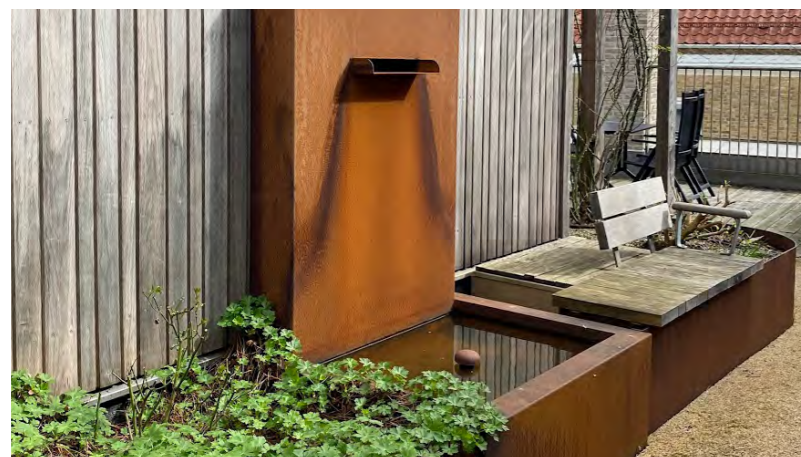


Figure 81: Seating options near water elements that exposes users to sensory experiences © Kittima Ritthichot (2024).



Figure 79: A view from inside one of the smaller rooms overlooking the walk and talk trail under the pergola with various climbing plants © Elna Boklund (2024).



Figure 80: Two small rooms with group seating options enclosed by raised plantations and plants © Elna Boklund (2024).



Figure 82: A view from the largest room overlooking the city. The conservatory placed in the middle provides shelter during bad weather, likewise is it a meeting place for social engagements © White Arkitekter, photo by Johan Bävman (n.d.d).

## Ulls hus courtyard, Uppsala, Sweden

Ulls hus courtyard located at the Swedish University of Agricultural sciences (SLU) in Uppsala, Sweden – approximately 2300m<sup>2</sup>. The courtyard was designed by White Arkitekter, also responsible for the Ulls hus building, completed in 2015. The courtyard is a shared space for the university environment – a catalyst for social encounters, festive events, or contemplation (Landzine 2015; White Arkitekter n.d.).

Ulls hus is primarily a space that supports the top half of the trigular model where social activities was prioritised. Therefore, it supports outward-directed engagement and active engagement (the trigular model) – creating a social space (HAGF) for students and staffs to actively or indirectly participate in social activities. The social activities can vary depending on the seating options; hence, one is able to observe these activities from distance, i.e. emotional engagement (the trigular model). Additionally, the space also provides a symbolic space (HAGF) with certain elements, e.g. water fountain and characteristic trees. There is potential for inward-directed engagement due to the enclosure of the space, however, there is an absence of a strong enclosure and the space is not divided to support solitary usage.



Figure 85: The water fountain that invites users users to experience the element as they transion through the courtyard © Bo Gyllander (n.d.e).



Figure 84: Students enjoying the sun at Ulls hus courtyard during the earlier stages post-completion © White Arkitekter, photo by Åke E:son Lindman (n.d.d).

## Ulls hus

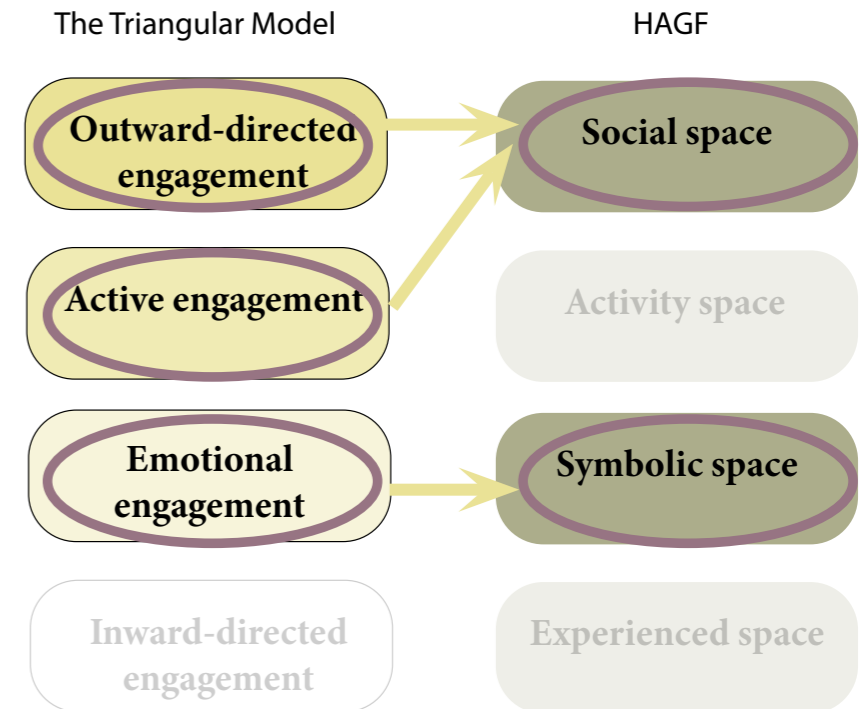


Figure 83: Figure displaying the interrelation between the trigular model and HAGF at The Library Hill where many aspects were achieve, although the design did not emerge from environmental psychology. However, the space is quite open and therefore more suitable for social engagement than solitary use.

The courtyard covered nearly all qualities on comfortable and highly stimulating qualities of QET, while receiving a lower score on low stimulating qualities. The space is easy oriented and comprehensive – although large areas are covered with gravel making it is less accessible as a result. The enclosure of the courtyard allows the users to experience a large undisturbed area. The moveable and additional furniture also provide different seating options, consequently creating *social opportunities* and *joyful and meaningful activities*. The airy trees with occasional topiaries and delicate foliage triggers *soft fascination* – as well as enabling *sensory experiences* and *change of seasons in nature*. The pleasant sound of water from the fountain offers *serene and peaceful* qualities as the users transits the courtyard to different buildings, or while students and staffs enjoy the sun during their lunch hours.



Figure 87: Ulls hus courtyard at night highlighting the habitus of trees © Kittima Ritthichot (2024).



Figure 86: Illustration plan by White Arkitekter with translation depicting the various elements at Ulls hus courtyard. The plan portays how the strictly shaped paths and canals connects the courtyard to the vicinity, whilst also depicting the placement of the trees and the divided seating options © White Arkitekter (n.d.c).



## Collocation of QET at remaining academic greenspaces

A collocation of existing qualities at the reference locations. These qualities of this table have previously been discussed in the preceding summary of each reference location. The qualities of QET received scores ranging from 1 to 3: (1) existing but inadequate, (2) Moderate, (3) Good. The motivation for analysed qualities of QET is attached at the end of the thesis. The total sum of the points is not core, it merely describes the qualities that is provided in a simplified manner. Therefore, the essence is what these qualities provide, whence have been summarised and is also attached at the end of the thesis.

Comfortable

Highly stimulating

Low stimulating

	Qualities	Albano	Priorn	Ulls hus
a	Closeness and easy access	3	-	3
b	Entrance and enclosure	2	3	3
c	Safety and security	3	2	3
d	Familiarity	3	2	3
e	Orientation and wayfinding	3	3	3
f	Different options in different kinds of weather	2	3	-
g	Contact with surrounding life	3	-	3
h	Social opportunities (social*)	3	3	3
i	Joyful and meaningful activities	3	3	3
j	Culture and connection to past times (cultural*)	2	2	1
k	Openness (open*)	3	2	3
l	Species richness and variety (diverse*)	3	3	-
m	Sensory experiences of nature	2	3	2
n	Seasons changing in nature	3	3	1
o	Symbolism and reflection	2	3	-
p	Space (cohesive*)	2	3	2
q	Serene and peaceful (serene*)	-	3	2
r	Wildness and nature (natural*)	1	-	-
s	Secluded and protected (shelter*)	1	3	-

Tables 6: Tables by Bengtsson et al (2024). The table describing the environmental qualities for people to be comfortable in the green area for remaining academic greenspaces at Johanneberg campus. \* = Qualities derived from PSD. - = absent qualities

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## Summary

In conclusion, the three reference locations have provided an insight into the interpretation of practical solutions from QET, the triangular model, and HAGF. Albano and Priorn have greatly depicted how restorativeness and wild characteristics in vegetation can be utilized, in addition to creating spaces for intimate social engagement. Priorn is a prime example of a space designed with the intentions of environmental psychology to cater those with low well-being. Whereas Albano and Ulls hus was catered towards the upper half of the triangular model. Therefore, these three locations provided a great comparison of how space can be divided to support different groups from the trigular model. Priorn utilized plantations, vegetation, and ground material to create a strong framing and enclosure. Whereas Albano and Ulls hus utilized the environment in the vicinity to create enclosure. Additionally, did the locations provide valuable insights how comfortable and low stimulating design can be interpreted from theory to a practical solution. Priorn utilizes a mix of various ground material to frame and differentiate spaces, whereas Albano and Ulls hus had a relatively coherent ground material that creates a form of unity.



Figure 90: Seating option near vegetation allowing users to perceive and experience © Kittima Ritthichot (2024).

# DESIGN

## SUMMARY

This chapter will elaborate on the result of the design proposal from an overview to an in-depth exploration, entailing the concept, design principle, predetermined site conditions, various layers and the succession. The results of design proposal was based on the theories in literature overview and meta-analysis. It was interpreted through the evidence based design model, namely the intuitive model - "Research inspires Design". Whilst the material on the preference and perception subchapter concretizes the interpretation of the theories to possible design solutions.

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## *Into the Glade* – Concept explanation

The concept for Betonggården is inspired by how a glade appears - a glade is defined as “an open space in a forest” (Dictionary 2024). The design is divided into two main parts, the vegetation and the rooms. The many distinctive trees in Betonggården stand in an irregular pattern. The placement of the trees mimics the feeling given by the bank, south of Betonggården where one can be mesmerized by all the tree trunks rising from the ground. With age the trees develop various interesting features. Along with the trees there is a lower layer of perennials and shrubs with elements of taller plants; this creates an easy overview of the space with addition of hidden nooks and crannies where one can find oneself in a private sphere. On the site there are four rooms of different sizes which imitate the openings in a glade, where the trees disperse and let the light come through. These open spaces allow people to slow down. Between the rooms there are walkways that guide the visitor through the courtyard and take them from one room to another with a view of the vegetation. The design is not trying to recreate a natural glade, but the concept has drawn inspiration for how the rooms are divided and how the trees in some areas can disperse and let the light trickle in to create a more dynamic space. Through the proposed design the student and staff of Chalmers will be able to move Into the Glade, exchanging environment from the surrounding concrete jungle and embracing oneself in the calmness of the new and improved Betonggården.

Into the Glade is designed to primarily support and promote the restorativeness at Betonggården for students and staffs at Chalmers University. The design concretises



Figure 91: Concept drawing portraying “Into the Glade”.

the preceding theory in the literature overview where we wanted to create a space that would enable attention restoration and relieve mental fatigue, to support the students and staffs in the stressful and competitive environment.

### **Design proposal introduction**

Entrenched upon the preceding literature overview, the design has four rooms with purposefully placed vegetation, paths, and *seating options* to support the active and *emotional participation*. Therefore, the focus will be on comfortable and low stimulating qualities (QET tab. 1 & 3). Additionally, the placement of these various elements enhances the restorative aspects of *being away* and *extent*

(ART) by creating enclosure and limiting the view with plants - further elaborate on layers. Likewise, introducing spaces that allows users to overlook also ensures their experienced safety. Furthermore, presenting wild characteristics and various changes throughout the season that can be enjoyed under shelter also encourages the users to spend more time outdoors.

The following pages will elaborate on the various parts of the design in more detail, starting from the fundamentals of the design to detail, and finally the succession/future. In order to create clearings, it was important to create rooms in the vegetation, to see the general process how the design was developed see fig. 93-95.

# The Fundamentals of Into the Glade

The preceding literature overview highlighted the importance of various aspects that triggers restorativeness i.e., fascination, being away, extent and compatibility (Kaplan & Kaplan, 1989; Kaplan, 1995). The primary users of this space are students, staff, and the nearby establishment - although there are varying degrees of mental fatigue for different users, the aspects that triggers restorativeness remains.

By evoking *fascination*, the users could potentially restore *involuntary attention* as they experience intrinsically fascinating qualities of nature, i.e., *soft fascination* (Kaplan & Kaplan, 1989) – through seasonal changes, scents, and decay of plants, sounds of leaves rustling, animals, and insects. The plant composition stands on top of several small hills ranging from 15cm-35cm to mirror on the existing topography and to enhance the wild characteristics. Whilst the plant composition changes throughout the seasons, with several evergreen species that continuously provide volume and year-round interest. The plants differ in form and texture - thereafter elaborated on the following chapter, layers - while the ornamental plants to frame entrances and provide delicate details, e.g. fruits, flowering, foliage. Other species provide wild characteristics that can be found in nature, i.e. an interesting and unpredictable habitus (see fig 92 & schematic plant overview p. 82-92). These qualities can be experienced throughout the seasons from windows in adjacent buildings, under the pergola, and inside the plantations. Hence, providing several qualities of QET (tab.

Seating options:  
hammock, group seatings & benches

Furniture:  
bike shelter, seating options, rubbish bin, tree lattice

Vegetation:  
Trees, shrubs, perennials, bulbs & climbing plants

Ground, paths & hills:  
main paths, shortcuts, and hills.

The layers

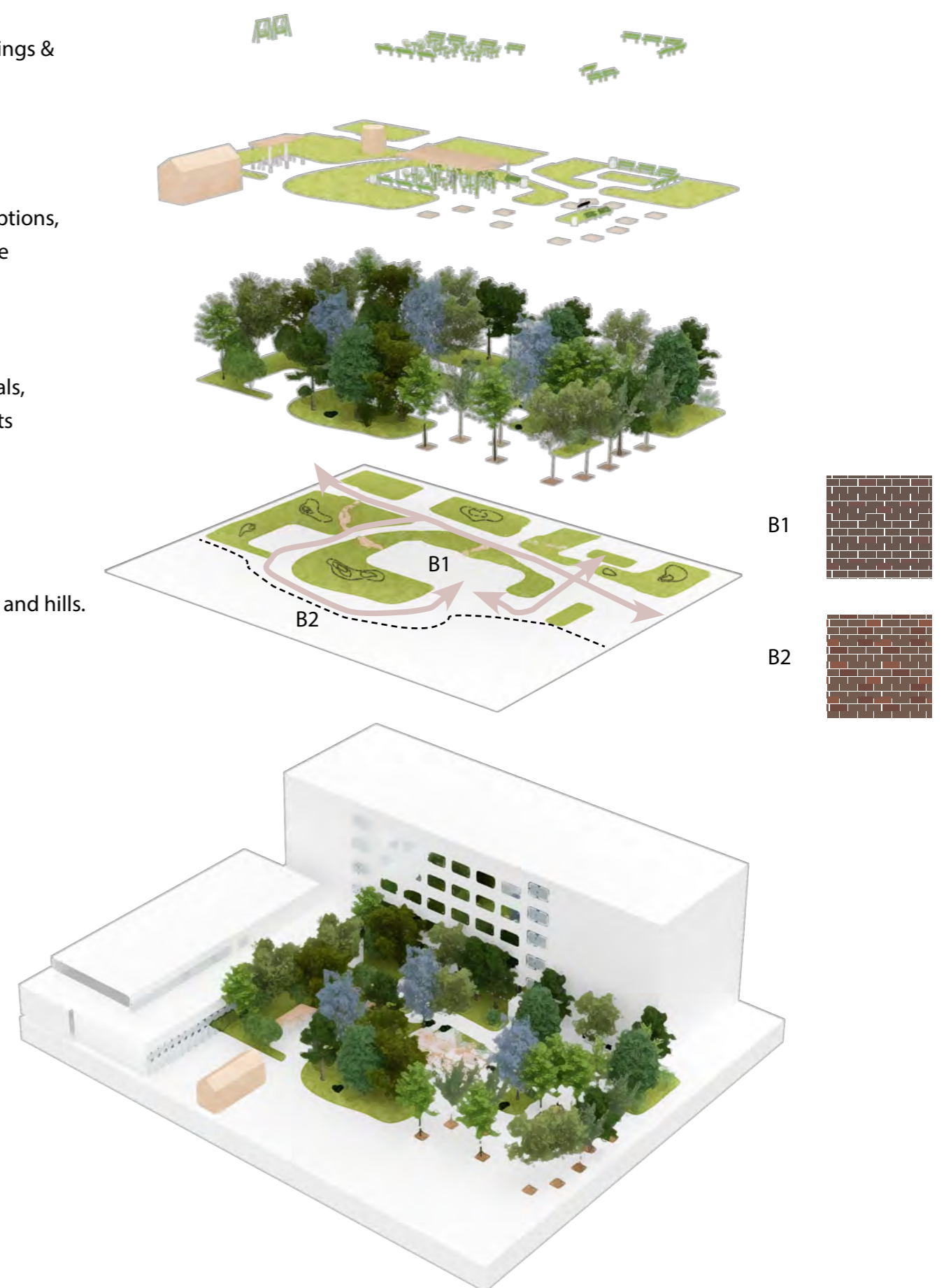


Figure 92: Figure portraying the layers of the design proposal, late May- June.

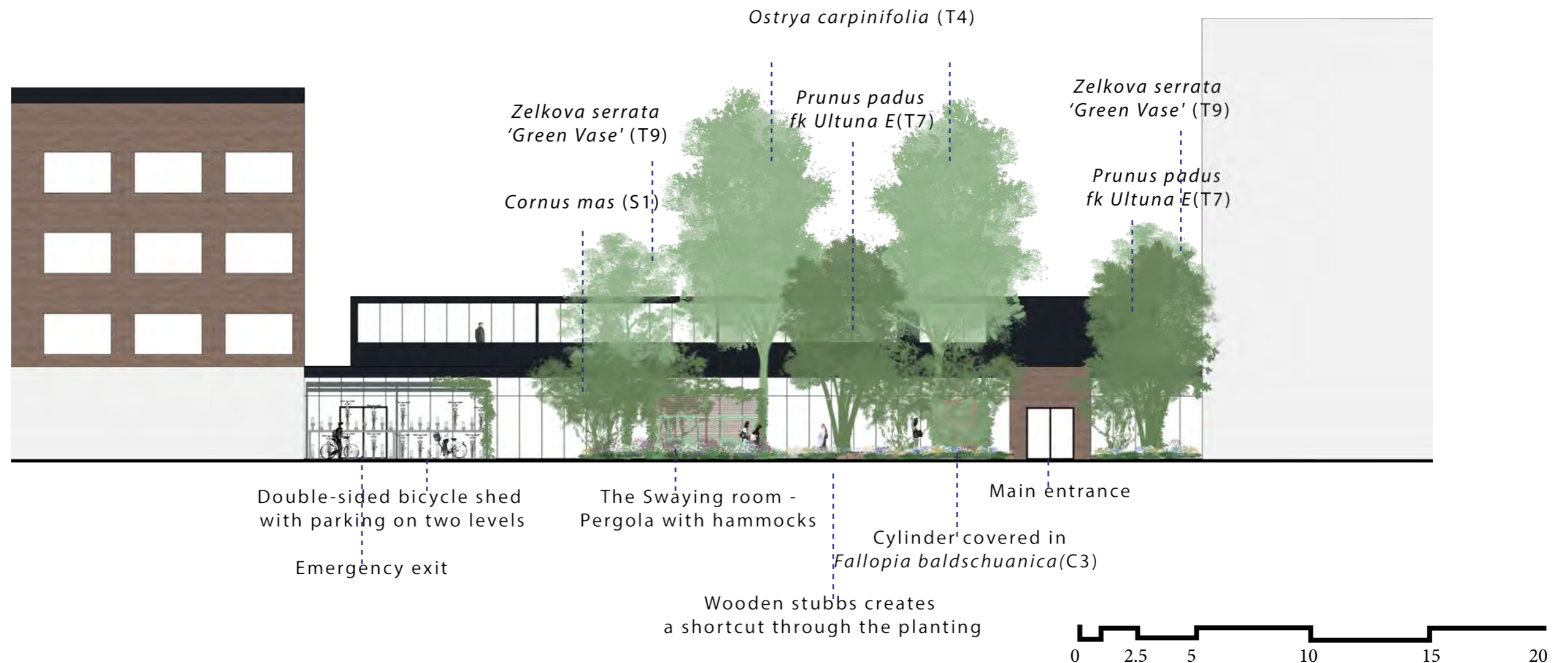
1-3: f, l-n, o, r).

Additionally, the colours of the flowers are primarily focused on cool colours as they enhance relaxation and implicated a significance in the primary stages of the restorative process, whereas yellow encourages positive and uplifting emotions (Zhang et al 2023). Hence, the flower palette composes of white, pink, purple, blue, and yellow (see schematic plant

lists p. 82-83, 88-89 & 91-90 & mix 1-3 p. 85-87 ). Although the flowering is concentrated during spring and fall, the flowering has a modest start in winter as the Arrowwood's (*Viburnum bodnantense 'Dawn'*) flowers bedecks the grey winter skies; following up with spring bulbs and witch hazel (*Hamamelis x intermedia*) prior to the grasses and massive perennial floral display in spring; with fall welcoming the students and staffs with another floral display that ends

with striking colours from plants in all of the vegetation layers that evokes *fascinations*, as the snow finally decorates the trees modestly during winter.

Furthermore, the restorative aspects of *being away* and *extent* (ART) are crucial in the part of creating a restorative environment for Betonggården, as there is an absence of a space providing these qualities at Johanneberg



Section B-b portaying the bike shed in relation to the swaying room and the one of the entrances to SB2, late May-June.

Scale 1:200/A3

campus (see *Four Academic greenspaces, Johanneberg* p. 52-58). The aspects of *being away* and *extent* can be experienced through purposefully utilising visual energy in the composition of the landscape and of plants. *Being away* can be experienced by creating dividing spaces into “rooms” and emphasising the boundaries with i.e., plants, paths, furniture. Thus, allowing the users to experience the changes in the generic landscape visually and cognitively – accentuating the cohesiveness and extending the feeling of entering an undisturbed world (QET tab. 3: p). This aspect is particularly important for the base of *the triangular model* as these users have low well-being and prefer less stimulation that can be achieved in less populated areas. However, the design is fundamentally catered to support emotional participation – with room for *active participation* and *inwards involvement*. Although *inwards involvement* might be attainable exclusively at certain a timeframe, i.e. during short breaks, due to the flow of movement at the campus area. Measures to enhance the experience of *being away* have been emphasised, e.g. through embedment of smaller rooms. Therefore, no large group seating options (max. 4 users), and divided seating options are provided to purposefully to focus on *emotional participation* and generate less stimulation.

Finally, predetermined site conditions will limit certain measurements. Hence, the predetermined site conditions will be taken into consideration by compromising design solutions for practicality reasons. The predetermined site conditions are the following: clear and accessible entrances, maintenance doors and escape route; make space for cargo, material tests, and events; bike parkings; accessibility to the cylinder; oversight of Betongvägen for safety purposes, i.e.

moving vehicles.

**To summarise, the design principles are the following:**

- Restore mental fatigue in a natural built environment by focusing on comfortable and low stimulating qualities (QET),
- Introducing wild characteristics in plantations to increase nature with less human intervention,
- Enhancing the restorative aspects of being away and extent (ART) that corresponds to emotional engagement and inward-directed engagement (the triangular model) and experienced space (HAGF),
- Incorporating elements that evoke fascination allowing the mind to wander and to convalesce involuntary attention,
- Create options for different kinds of weather.

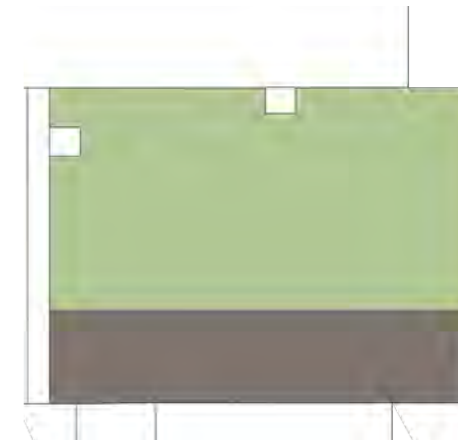


Figure 93: Step 1: Divide the work area in two main areas, vegetation and the cargo zone.

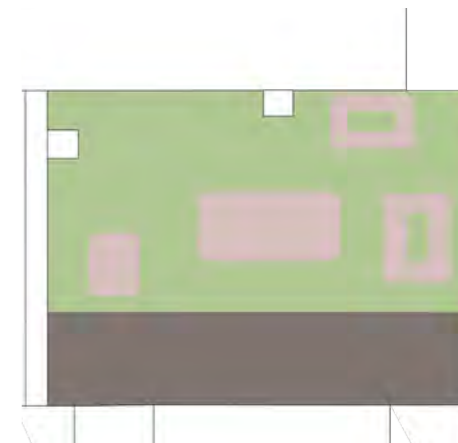
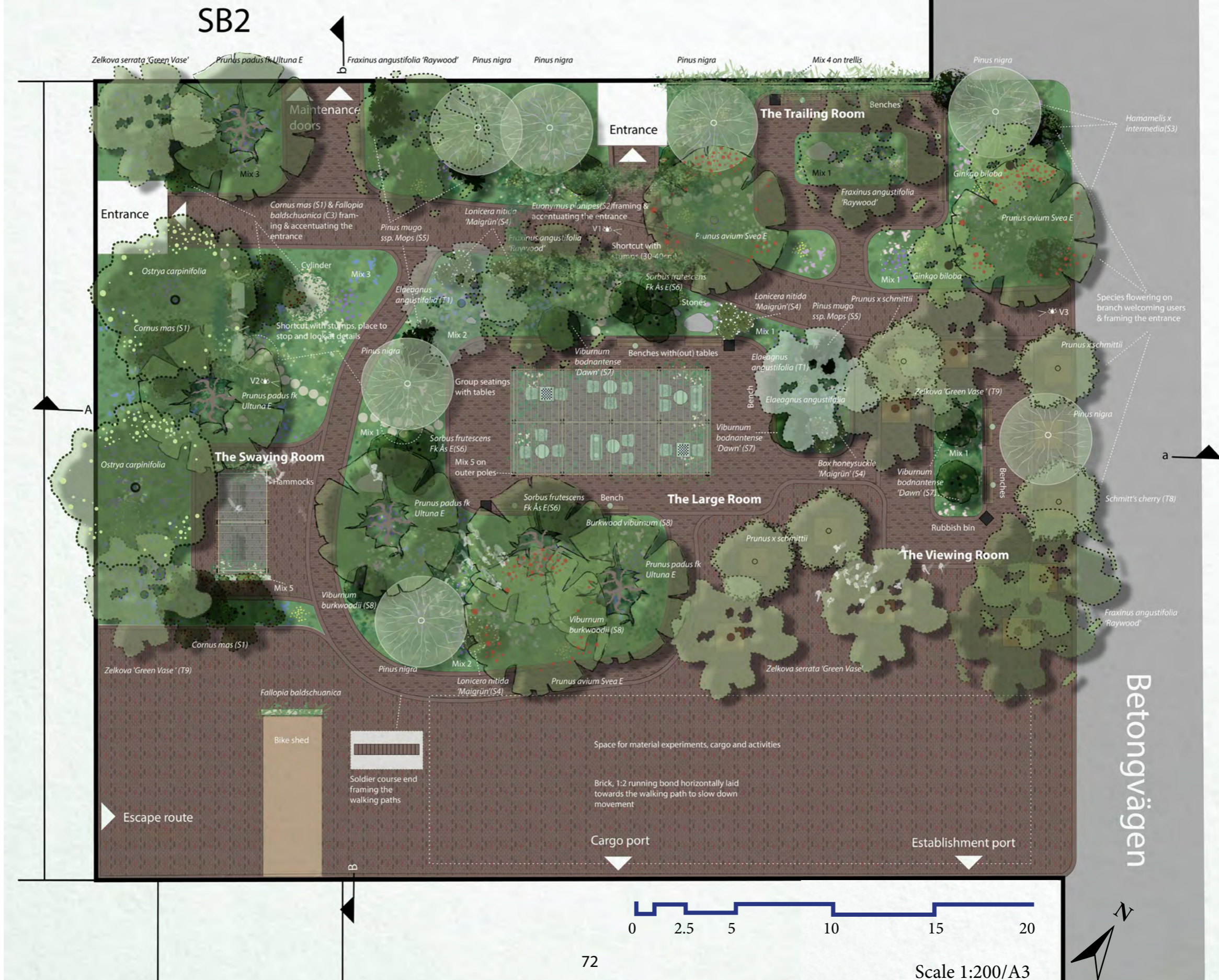


Figure 94: Step 2 Place the rooms in the vegetation. The shape of the rooms imitates the surrounding buildings but with softer edges.



Figure 95: Step 3: Connect the rooms with walkways

Figure 96: Illustration plan of the final design proposal for Betonggården.





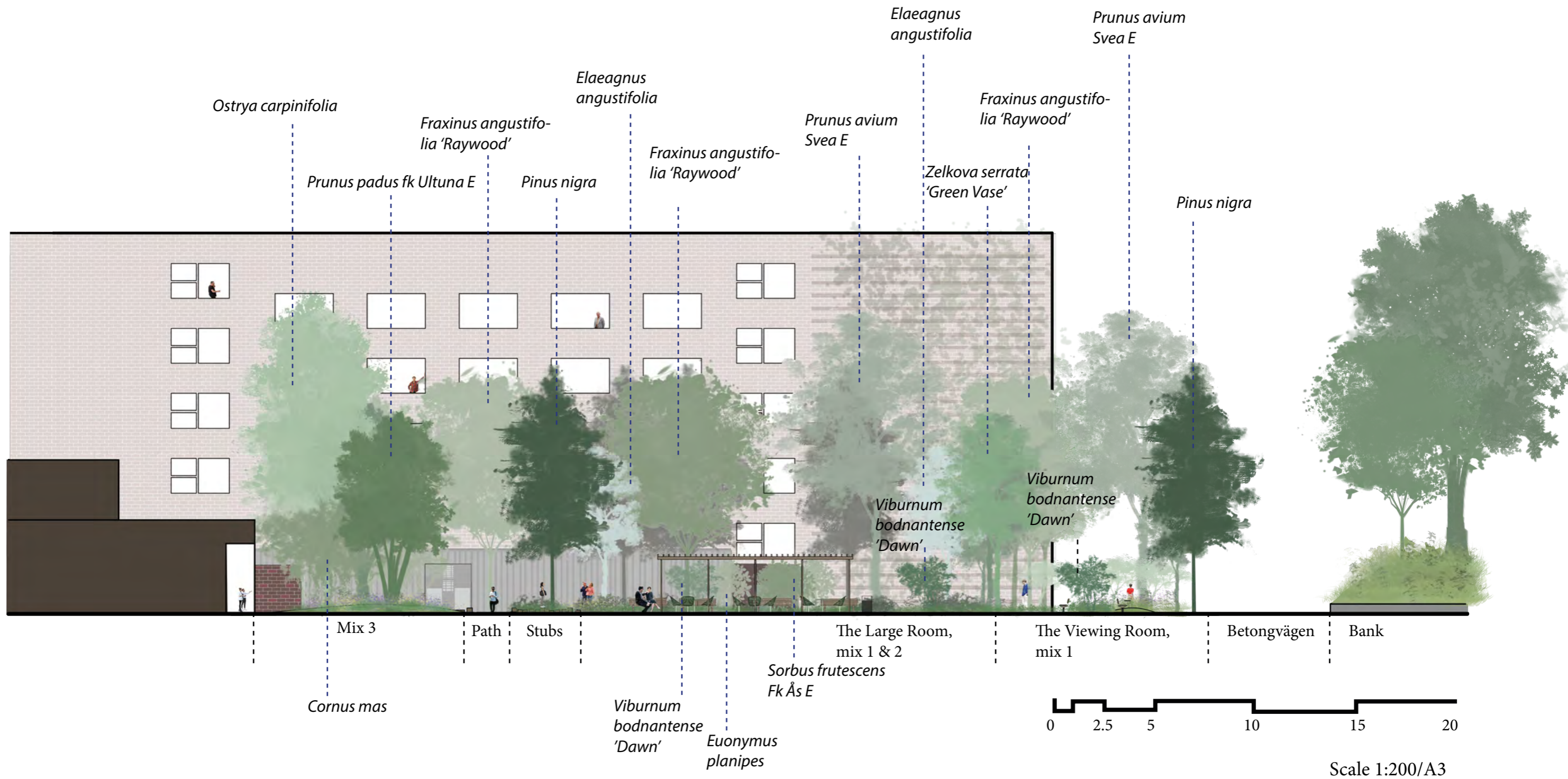
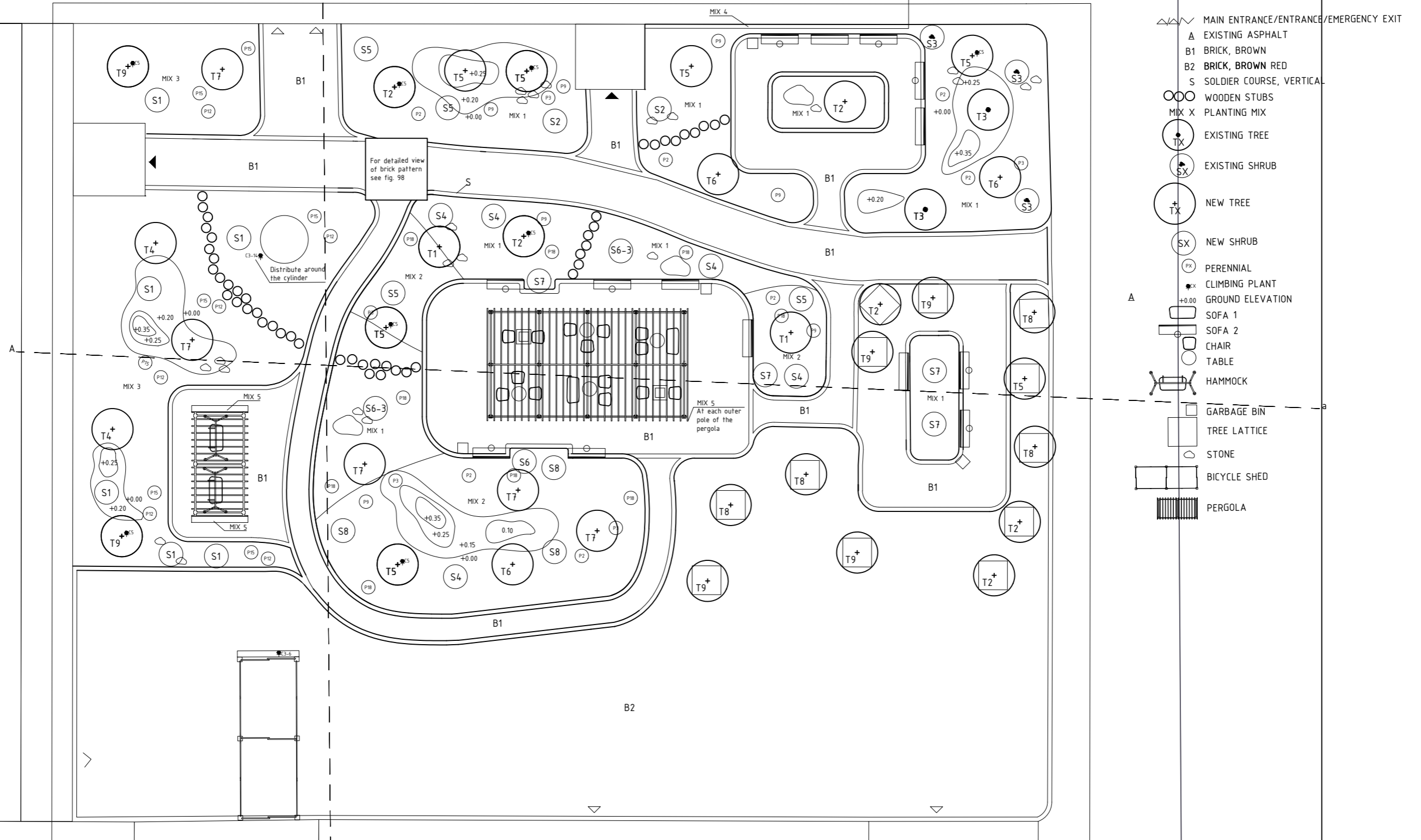
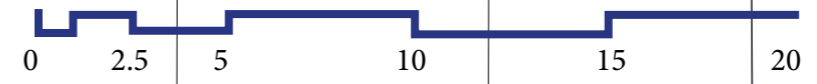


Figure 97: Section A-a portaying the various rooms and volume of the vegetation in relation to the vicinity, late May-Jun.

# The Planting and Equipment Plan



- △△△ MAIN ENTRANCE/ENTRANCE/EMERGENCY EXIT
- A EXISTING ASPHALT
- B1 BRICK, BROWN
- B2 BRICK, BROWN RED
- S SOLDIER COURSE, VERTICAL
- WOODEN STUBS
- MIX X PLANTING MIX
- TX EXISTING TREE
- SX EXISTING SHRUB
- T+ NEW TREE
- S+ NEW SHRUB
- P+ PERENNIAL
- C+ CLIMBING PLANT
- +0.00 GROUND ELEVATION
- SOFA 1
- SOFA 2
- CHAIR
- TABLE
- HAMMOCK
- GARBAGE BIN
- TREE LATTICE
- STONE
- BICYCLE SHED
- PERGOLA



Scale 1:200/A3



# List of Plants

	Latin names	Common name	Flowering	H/W	Quality cm	c/c cm	Quantity	Planting note	Note
<b>Trees</b>									
T1	<i>Elaeagnus angustifolia</i>	Russian olive	-	5-10/ 4-7 m	sol 250-300		3		Nitrogen fixing, fast growth.
T2	<i>Fraxinus angustifolia</i> 'Raywood'	Narrow-leaved ash	-	10-12/ 8-10 m	Hst 4x K 25-30		5		Dark red autumn color.
T3	<i>Ginkgo biloba</i>	Ginkgo	-	10-15/ 5-6 m	Existing		2		Existing tree. Male species.
T4	<i>Ostrya carpinifolia</i>	European hop-hornbeam	-	15-20/ 10-15 m	Hst 4x K 18-20		2		Fruit that adorns the tree during the winter
T5	<i>Pinus nigra</i>	Black pine	-	20-25/ 8-10 m	Hst 5x K 30-35		7		Slow growth.
T6	<i>Prunus avium Svea E</i>	Wild cherry	may	15-20/10-15 m	Hst 3x K 16-18		3		Clear stem, fast growing, can occasionally shoot roots, edible berries.
T7	<i>Prunus padus</i> fk <i>Ultuna E</i>	Bird cherry	may	8-12/ 4-8 m	flst 3x K 250-300		4		Multi-stem, edible berries.
T8	<i>Prunus x schmittii</i>	Schmitt's cherry	april-may	10-12/ 3-5 m	Hst 4x K 20-25		5		Fast growth.
T9	<i>Zelkova serrata</i> 'Green Vase'	Zelkova 'Green Vase'	-	8-12/ 6-8 m	Hst 4x K 20-25		6		Moderate growth.
<b>Shrubs</b>									
S1	<i>Cornus mas</i>	Cornel	mar-apr	4-6/ 5-7 m	sol 5x K 300-350		6		Purple-yellow autumn color, edible red berries
S2	<i>Euonymus planipes</i>	Spidle		2-3m/ 1,5-3m	sol 4x K 150-175		2		Striking autumn colours, cerise red fruit.
S3	<i>Hamamelis x intermedia</i>	Hybrid witch hazel		2 m	Existing		3		Existing shrub. Flowering on branch.
S4	<i>Lonicera nitida</i> 'Maigrün'	Box honeysuckle 'Maigrün'	-	0,5-1/ 1 m	C 2l 30-40	60	15		E.
S5	<i>Pinus mugo</i> ssp. <i>Mops</i>	Dwarf mountain pine	-	0,5-0,7/ 0,5-0,7 m	C/K 30-40	60	16		E. Aromatic
S6	<i>Sorbus frutescens</i> Fk <i>Ås E</i>	Rowan Fk Ås E	june	2-3/2 m	flst 125 - 150	100	7		F. Edible fruits, can make jello. Fall foliage.
S7	<i>Viburnum bodnantense</i> 'Dawn'	Bodnant viburnum	feb-mar	2-3/1,5-3 m	sol 4x K 200-250		4		Flowering on branch. Aromatic. Fall foliage.
S8	<i>Viburnum burkwoodii</i>	Burkwood viburnum	may	1-2/2-3 m	sol 4x K 175-200		3		E. Aromatic
<b>Perennials</b>									
P1	<i>Achillea millefolium</i>	Common yarrow	june-oct	30-80 cm	A-kv		30	In groups of 3-5.	Native. Aerodynamic, stoloniferous. Achillea can be mat-forming or upright perennials, mostly. Aromatic.
P2	<i>Aconitum napellus</i>	Monkshood	july-aug	100 cm	A-kv		30	In groups of 1-3.	Native. Self-seed
P3	<i>Agastache</i> 'Black Adder'	Hyssop	june-sep	100 cm	A-kv		30	In groups of 3-5.	Aromatic. Short lived but self-seed. Bushy, upright.
P4	<i>ArunCUS aethusifolius</i>	Dwarf goat's beard	june-july	30 cm	A-kv		30	In groups of 1-3.	Au. compact, clump-forming, fern-like.
P5	<i>Briza media</i>	Common quaking grass	june-july	20(50) cm	A-kv		30	Filler plant. In groups of 3-5-7	Native. Clump-forming grass with narrow blue-green leaves and upright stems.
P6	<i>Brunnera macrophylla</i>	Siberian bugloss	may-june	30 cm	A-kv		30	In groups of 1-3.	rhizomatous, clump-forming
P7	<i>Calamintha nepeta</i>	Lesser calamint	may-oct	25 cm	A-kv		30	Placed in front of taller species	Compact, bushy perennial with aromatic grey-green leaves.
P8	<i>Campanula persicifolia</i>	Peach-leaved bellflower	july-aug	80 cm	A-kv		30	In groups of 1-3-5.	Native. Aerodynamic. Rosette-forming perennial with narrow.
P9	<i>Deschampsia cespitosa</i>	Tufted hair grass	june-july	40-60(110)cm	A-kv		30	In groups of 1-3	Native. Self-seed. An evergreen grass forming a neat tussock of narrow, leathery, dark green leaves. Sprouts early.
P10	<i>Eurybia divaricata</i>	Aster divaricatus	aug-oct	50 cm	A-kv		30	In groups of 3.	Stoloniferous, bushy.
P11	<i>Geranium 'Dreamland'</i>	Cranesbill	may-oct	40 cm	A-kv		30	Placed with	compact, matt-forming.
P12	<i>Geranium phaenum</i>	Dusky cranesbill	june-july	60 cm	A-kv		30	According to placement	Native. Stoloniferous
P13	<i>Helleborus foetidus</i> 'Wester Flisk'	Stinking hellebore	Dec, mar-apr	30-50 cm	A-kv		30	In groups of 3-5-7.	E. erect stems and palmately-divided leaves with narrow, dark green leaflets
P14	<i>Luzula sylvatica</i>	Greater wood-rush	june-july	30 cm	A-kv		30	In groups of 3-5-7.	S/E. Native. clump-forming. Slow spreading rhizomatous.
P15	<i>Molinia caerulea</i>	Purple moor-grass	july-aug	20(90) cm	A-kv		30	According to placement	Native. Clump-forming, bright green leaves. (Au).
P16	<i>Origanum vulgare</i>	Origanum	aug-sep	20-80cm	A-kv		30	In groups of 3-5.	Native. Self-seed. A bushy, woody-based, aromatic perennial sub-shrub with upright stems
P17	<i>Pachysandra terminalis</i>	Japanese spurge	may-june	15 cm	A-kv		30	Filler plant.	E.
P18	<i>Primula veris</i>	Cowslip	may-june	25 cm	A-kv		30	In groups of 3-5-7. Placed in front of taller species.	Native. Self-seed. Semi-evergreen perennial. Aromatic.
P19	<i>Saxifraga x urbium</i>	London pride	june-july	20 cm	A-kv		30	Placed in front of taller species	Spreading mat of loose rosettes.
P20	<i>Vinca minor</i>	Lesser periwinkle	may-june	10 cm	A-kv		30	Placed in front of taller species. Filler plant. In groups of 3-5-7.	E. Fast spreading, carpet forming.
P21	<i>Viola tricolor</i>	Heartsease	apr-oct	20 cm	A-kv		30	Placed in front of taller species. In groups of 3-5-7.	Native. Self-seed.
<b>Climbing plants</b>									
C1	<i>Clematis (Atragene-Gruppen)</i> 'Albina Plena' E	Clematis	may-oct		A-kv		30		
C2	<i>Euonymus fortunei</i> var. <i>vegetus</i>	Evergreen bittersweet	-	0,4-1,5 / 1-2 m.	C/K 40-50		30		E.
C3	<i>Fallopia baldschuanica</i>	Bukhara fleeceflower	july-oct	7-9 m	A-kv C		30		Fast growing
C4	<i>Hedera helix</i>	English ivy	-	5-6 m	A-kv C		30		E. sol C/K 60-80 80-100
C5	<i>Parthenocissus quinquefolia</i> var. <i>engelmannii</i>	Virginia creeper	-	9-12 m	A-kv C		30		Dark red autumn color
<b>Geophytes</b>									
B1	<i>Anemone blanda</i>	Winter windflower	apr-may	10-15 cm	A-kv		5	Spread out evenly in groups of 3-5, approx. 30m²	Spreading, quickly forming large clumps.
B2	<i>Anemone nemorosa</i>	Wood anemone	apr-may	10-20 cm	A-kv		5	Spread out evenly, 30m²	Native. Spreading, quickly forming large clumps.
B3	<i>Colchium autumnale</i>	Autumn crocus	aug-oct	10-15 cm	A-kv		8	Spread out evenly in groups of 3-5, approx. 30m²	Columnar upright. Late f. propagation by lateral bulbs.
B4	<i>Colchium autumnale</i> 'Album'	Autumn crocus 'Album'	sep-oct	15-20 cm	A-kv		8	Spread out evenly in groups of 3-5, approx. 30m²	Columnar upright. Late f. propagation by lateral bulbs.
B5	<i>Convallaria majalis</i>	Lily-of-the-valley	may-june	15-25 cm	A-kv		8	Spread out evenly in groups of 3-5, approx. 30m²	Native.
B6	<i>Corydalis solida</i>	Corydalis	apr-may	10-25 cm	A-kv		8	Spread out evenly in groups of 3-5, approx. 30m²	Spreading. Fragrant, rhizomatous.
B7	<i>Crocus biflorus</i> 'Lady killer'	Crocus	mar	10-15 cm	A-kv		8	Spread out evenly in groups of 3-5, approx. 30m²	
B8	<i>Crocus tommasinianus</i> 'Albus'	Crocus	feb-mar	10-15 cm	A-kv		8	Spread out evenly in groups of 3-5, approx. 30m²	Propogates quickly, both by seed and by lateral bulbs
B9	<i>Eranthis hyemalis</i>	Winter aconite	mar-apr	5-12 cm	A-kv		5	Spread out evenly, 30m²	Native. Self seeds
B10	<i>Galanthus nivalis</i>	Common snowdrop	feb-apr	10-20 cm	A-kv		13	Spread out evenly in groups of 3-5, approx. 30m²	Native. Tuft forming. Self seeds
B11	<i>Muscari armeniacum</i>	Grape hyacinth	apr-may	15-20 cm	A-kv		5	Spread out evenly in groups of 3-5, approx. 30m²	Aromatic. Self seeds
B12	<i>Muscari</i> 'Pink Sunrise'	Grape hyacinth 'Pink Sunrise'	may	15 cm	A-kv		5	Spread out evenly, 30m²	Self seeds
B13	<i>Narcissus pseudonarcissus</i> 'Mount Hood'	Narcissus	apr-may	45 cm	A-kv		10	Spread out evenly in groups of 3-5, approx. 30m²	Aromatic.
B14	<i>Scilla forbesii</i>	Glory of the snow	apr-may	10-15 cm	A-kv		5	Spread out evenly, 30m²	Propogates quickly, both by seed and by lateral bulbs
B15	<i>Tulpan sylvestris</i>	Tulip	apr	10-20 cm	A-kv		10	Spread out evenly, 30m²	Aromatic.

## List the Mixes

Litt.	Latin name	Common name
<b>Mix 1 (Sun)</b>		
	Achillea millefolium	Common yarrow
	Aconitum napellus	Monkshood
	Agastache 'Black Adder'	Hyssop
	Briza media	Common quaking grass
	Calamintha nepeta	Lesser calamint
	Campanula persicifolia	Peach-leaved bellflower
	Deschampia cespitosa	Tufted hair grass
	Eurybia divaricata*	Aster divaricatus
	Geranium 'Dreamland'	Cranesbill
	Origanum vulgare	Origanum
	Pachysandra terminalis*	Japanese spurge
	Primula veris	Cowslip
	Vinca minor*	Lesser periwinkle
	Viola tricolor	Heartsease
<b>Mix 2 (Halfshade)</b>		
	Aconitum napellus	Monkshood
	Agastache 'Black Adder'	Hyssop
	Briza media	Common quaking grass
	Brunnera macrophylla	Siberian bugloss
	Deschampia cespitosa	Tufted hair grass
	Eurybia divaricata*	Aster divaricatus
	Geranium 'Dreamland'	Cranesbill
	Pachysandra terminalis*	Japanese spurge
	Primula veris	Cowslip
	Saxifraga × urbium(*)	London pride
	Vinca minor*	Lesser periwinkle
<b>Mix 3 (Shade)</b>		
	Aruncus aethusifolius	Dwarf goat's beard
	Brunnera macrophylla	Siberian bugloss
	Eurybia divaricata*	Aster divaricatus
	Geranium phaeum*	Dusky cranesbill
	Helleborus foetidus 'Wester Flisk'*	Stinking hellebore
	Luzula sylvatica	Greater wood-rush
	Molinia caerulea	Purple moor-grass
	Pachysandra terminalis*	Japanese spurge
	Saxifraga × urbium(*)	London pride
	Vinca minor*	Lesser periwinkle
<b>Mix 4</b>		
C1	Clematis (Atragene-Gruppen) 'Albina Plena' E	Clematis
C2	Euonymus fortunei var. vegetus*	Evergreen bittersweet
C5	Parthenocissus quinquefolia var. engelmannii	Virginia creeper
<b>Mix 5</b>		
C3	Fallopia baldschuanica	Bukhara fleeceflower
C4	Hedera helix*	English ivy

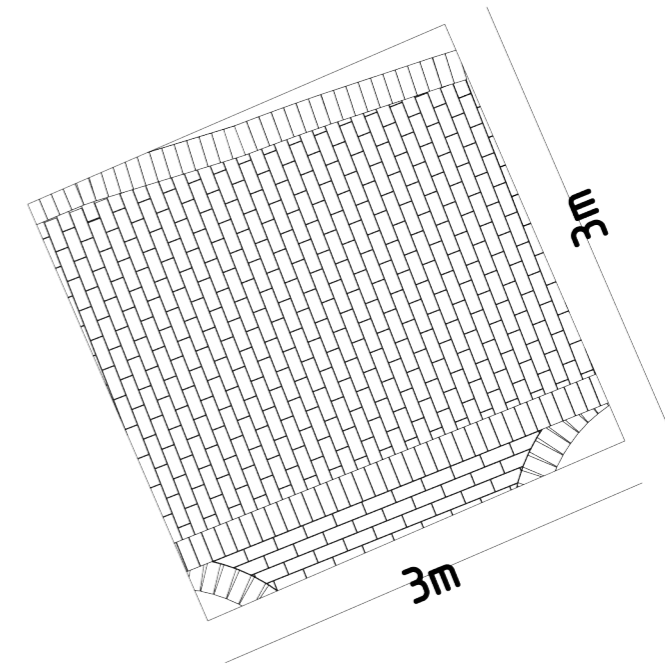


Figure 98: The ground material is laid in a running 1:2 bond pattern with soldier course (vertical). Scale 1:50 m.

## The layers

### Rooms and Furniture

*The Large room* is placed in the centre of the courtyard with an extensive pergola decorated with climbing English ivy (*Hedera helix*) and Bukhara fleecflower (*Fallopia baldschuanica*), additionally a Plexiglas is installed on the wooden panel roof to protect the users from various weather conditions. Therefore, it enables usage and protection for various weather conditions (QET tab. 1: f). There are two seating options: (1) group seatings in the pergola; (2) benches around the edges of the pergola. Seating option (1) are divided in six smaller groups, whence have two chess tables, as another measure taken into consideration to generate smaller groups. – specifically with *emotional participation* in consideration, and *active participation* secondary (the triangular model). In this space, users are allowed to participate actively or emotionally depending on their well-being. This space can, e.g., be used for watching others play chess, having lunch or reading as they are equipped with café tables. Whilst seating option (2) are benches that primarily allows emotional participation, however, from this seat one can observe others or plants in the nearby framing plantation. Several benches are also equipped with smaller tables to offer similar benefits to regular tables.

There are three smaller rooms - namely, *the Viewing room*, *the Trailing room* and *the Swaying room* - varyingly embedded by vegetation to enhance the low stimulating qualities of QET (tab. 3: o-s), *being away* and *extent* (ART). There are two types of seating options in the smaller rooms:



(1) hammocks; (2) benches around edges or plantations, akin to those in the larger room. The smaller rooms are primarily catered to users that prefer *emotional participation* and possibly *inwards involvement*, where *the Trailing* and *Swaying room* is more suitable for the latter. *The Trailing* and *Swaying room* have a stronger embedment as it is indented and enclosed by plants, thus emphasizing the experience of *being away* and *extent*. In addition, *the Swaying room* with hammocks has a smaller pergola providing shelter, allowing users to leisurely enjoy the swings regardless of season – a good place for sedentary activities (QET tab. 1- 3: f, m, &, n) i.e., reading, eating, and crocheting. While *the Viewing room* could receive more frequent undesired attention as it is placed at the entrance with modest embedment for safety purposes, i.e., transporting vehicles. However, the openness of this room allow users to enjoy the seasonal changes and sensory experiences of nature on the bank - i.e., fall foliage and spring flowers (QET tab. 1 - 3: b-c, m-o, r) .

The division of smaller rooms were inspired by those found at Priorn, although in larger sizes that appropriate for this location. Whilst the placement of the seating options were inspired by all reference locations. Group seatings were particularly inspired by Ulls hus and Priorn, whilst seating options near vegetation was inspired by Albano and Priorn.

Finally, a wooden bike shed equipped with two-tier bicycle rack was added as it was a predetermined site condition. The shed is decorated with climbing plants to reflect climbing plants on the facade of the SB2 building. Likewise, was wood chosen to reflect the components of the design.

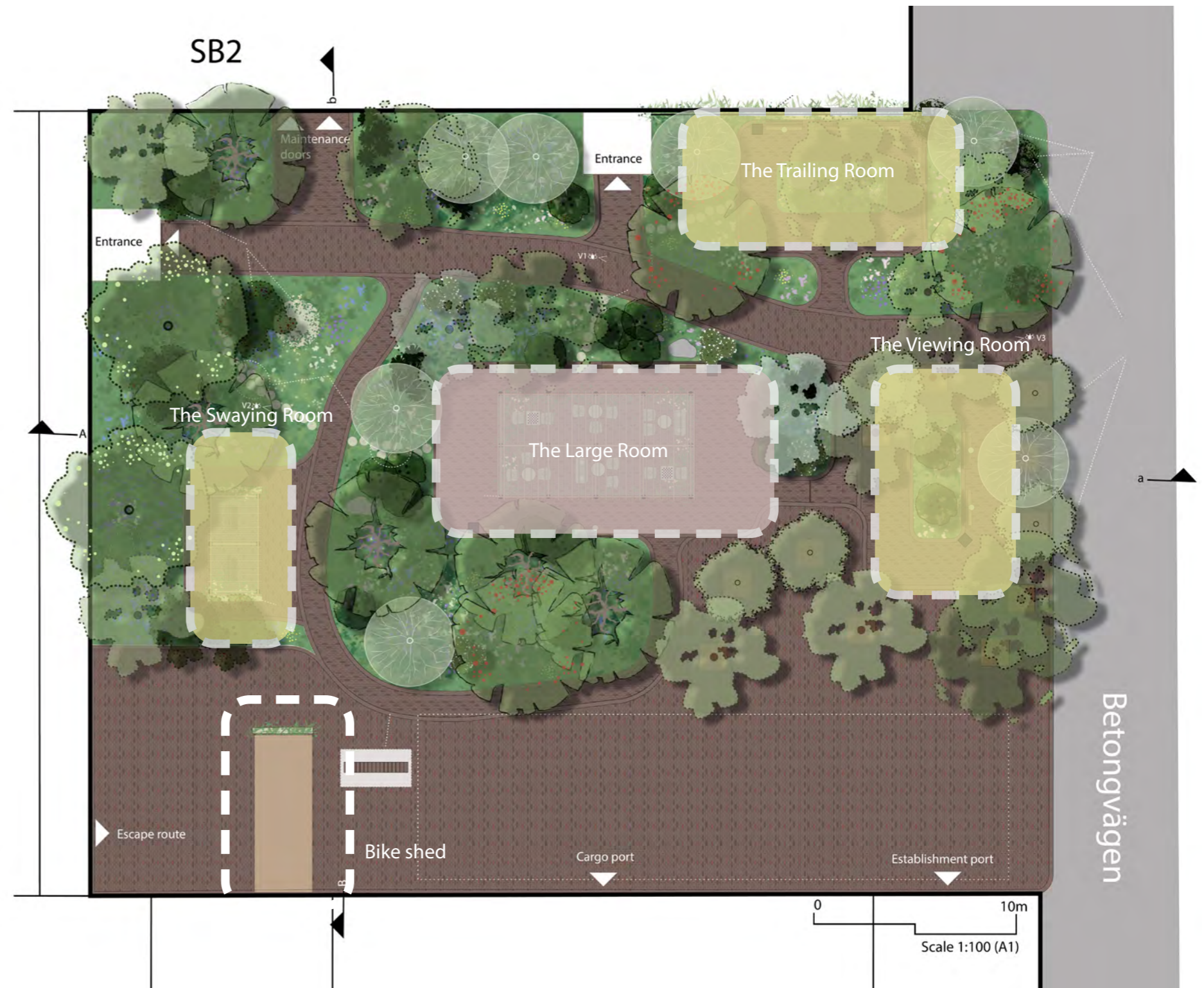


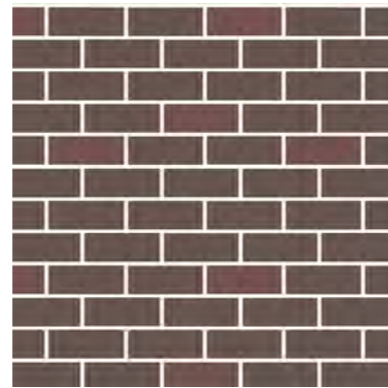
Figure 100: Figure portraying the divisions of the space and the bike shed.

## Ground and Paths

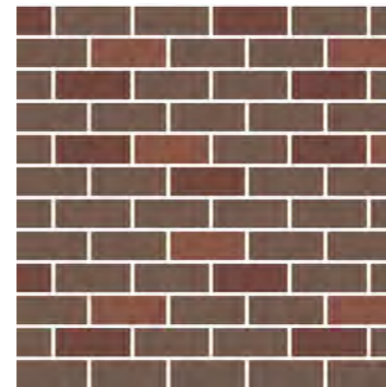
The grounds and main paths consist of brick in two shades of brown, with hint of red at the cargo space, in a running 1:2 bond. Brick is found in the adjacent SB2 building, likewise throughout the university. Therefore, the space will have a coherent appearance that connects it to the vicinity and Johanneberg campus, whilst also being easy to comprehend and navigate (QET tab.1: d & e). Similarly to Albano and Ulls hus that had a more cohesive ground material. The tiles are laid horizontally towards the walking paths to slow the movement in the area. Vertical tiles would quickly direct the users towards the designated goal, counterproductive to the intent of the design, to create a calm space for those that require alleviation of distractions. The running bonds ends with a soldier course (vertical), separating all the paths and rooms, creating a coherent finish on pattern.

The paths are divided into main paths and shortcuts, where the former is accessible and the latter not. The shortcuts compose of wooden stubs with chicken wire, approximately 30 - 40cm in diameter as organic material varies. Stubs are commonly between 10 – 20cm in public spaces (fig. 101 ), whence 30 - 40cm in diameter to ensure modest experienced safety (QET tab. 1: c). There are four shortcuts inside the plantations, allowing users to have an intimate experience in nature where sensory experiences, seasons changing in nature, wilderness and seclusion is enhanced (QET tab. 2 - 3: i, l – o, r & s). Therefore, the shortcuts provide space where one can contemplate in an undisturbed world, surrounded by several elements that rouses symbolism (QET tab. 3: o; HAGF *symbolic space, experienced space*), i.e., delicate flower petals/leaves falling

portrays the passing of time and trees depicts growth and stability. The shortcuts are narrow compared to the main paths, thus, restricting the numbers of users and therefore suited for *inward-directed engagement*.



Brick pavern used in the common spaces



Brick pavern used in the cargo area



Figure 103: Running bond with soldier cours depicting how material meets © Elna Boklund (2024).



Figure 101: Example of how wooden stubs (size approx. 10-20cm) can be used as small paths in plantations at Täby sqare, Stockholm, Sweden © Kittima Ritthichot (2023).



Figure 102: Running bond with similar colours that used in the design , Leiden , the Netherlands © Kittima Ritthichot (2023).

## Vegetation layers

The preceding literature review argued that built environment with less human intrusion was favoured by people (Kaplan & Kaplan 1989). Whilst the comfortable and low stimulating qualities of QET emphasises comfortable design, impression and perception - whence entails experienced space & symbolic (HAGF). Therefore, a compromise between wild characteristics of plants and QET were made. The plants are placed according to three S-curves with the principles of visual energy, ART, and QET, in consideration. The S-curve was used to portray a *sequence* in the plantation of which entails *harmony* and *balance* (Visual energy). Certain species are in groups to create rhythmicity, whereas others recur to create coherency. The plant composition comprises native and exotic species to prolong, enhance and accentuate seasonal changes, sensory experiences, and species richness in the space (QET tab. 2-3: I-n). Likewise, to suit the microclimate at Betonggården.

The diversity of the plantation was generally inspired by the species diversity at Priorn, whilst there are not large trees at Priorn there are multi-stemmed shrubs that provides volume and openings. Therefore, certain shrubs allow users to overlook other spaces while the latter provide a strong backing.



Figure 104: Figure depicting the curves used for the placement of the plants.



## Trees and shrubs

The trees and shrubs entail three layers of evergreen and deciduous species: the canopy layer (tall trees, < 12m), understory layer (middle sized trees, 3m ≥ 12m), and the shrub layer (< 3m). The species inside the larger plantations are not tall clear stemmed trees, i.e., they are allowed to grow more freely to enhance the wild characteristics of the plantation. Clear stemmed trees are solely used near road Betongvägen and at the cargo area for practicality and safety purposes. The trunk and shrubs create walls, enhancing the borders dividing the rooms and the feeling of being enclosed by nature; whereas the leaves and needles create a roof that varies from thick to delicate in detail. The thickness depicts a sturdy wall/roof providing shelter and privacy, whilst the delicateness can evoke *fascination*, e.g., as the sunlight filters through the foliage.

Likewise, does many trees and shrubs flowers in winter and spring in a variety of colours, whilst providing striking fall colours in yellow, red and orange (See fig. 105 & schematic plant overview p. 82-83) to evoke positive emotions, emphasise sensory experiences and seasons changing in nature (QET tab. 1 & 2: m,n). Additionally, certain shrubs and trees bare edible fruit that could perhaps create a social engagement where users pick fruits together or simply view them as a decorative and fascinating addition. Thus, encouraging active engagement (the triangular model).

Furthermore, humans are susceptible to spatial properties (Kaplan & Kaplan 1989). Therefore, the trees and shrubs vary in width and height to emphasise *extent*, and *scale* (Visual energy). The taller trees visually distract users from the buildings in the vicinity and the people inside of them – therefore, those engaged in the space outdoors (*zone 2/3*) can enjoy their activity without feeling gazed upon. While

those inside the buildings can enjoy the trees from height and possibly restore involuntary attention as they indirectly experience nature through windows, *zone 1*.

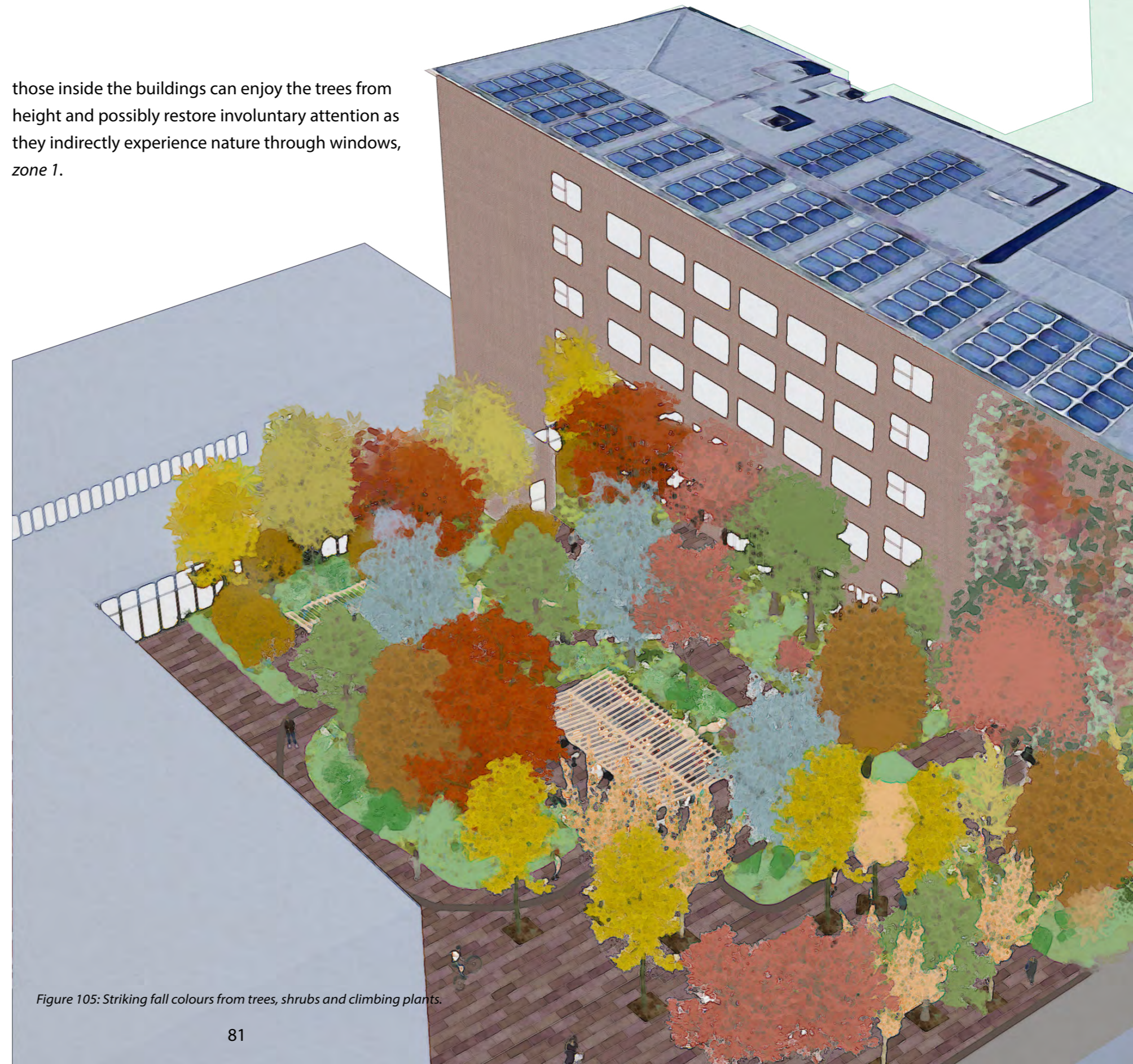


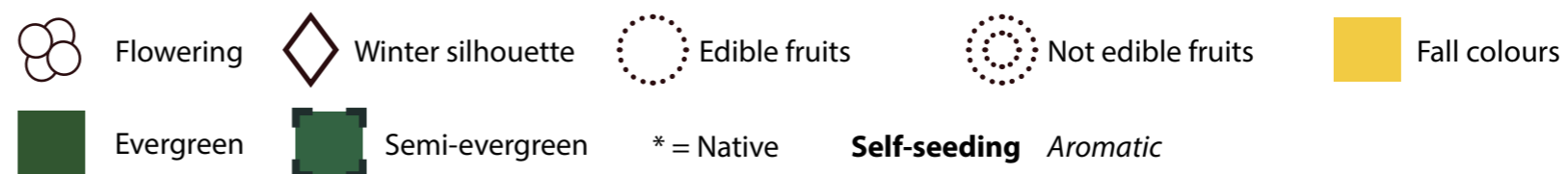
Figure 105: Striking fall colours from trees, shrubs and climbing plants.

## Schematic plant overview

A schematic overview of the characteristics of the chosen vegetation i.e., flowering season, fall foliage and fruits. Winter silhouette refers to intrinsically fascinating qualities that can be seen in winter e.g., habitus of trees and decay of flowers and grass. Native trees and shrubs generally emerge during late April - May, subsequently followed by exotic

species. The earliest perennials are the grasses and Stinking hellebore (P13).

### Trees



Latin names

T1. *Elaeagnus angustifolia*

T2. *Fraxinus angustifolia* 'Raywood'

T3. *Ginkgo biloba*

T4. *Ostrya carpinifolia*

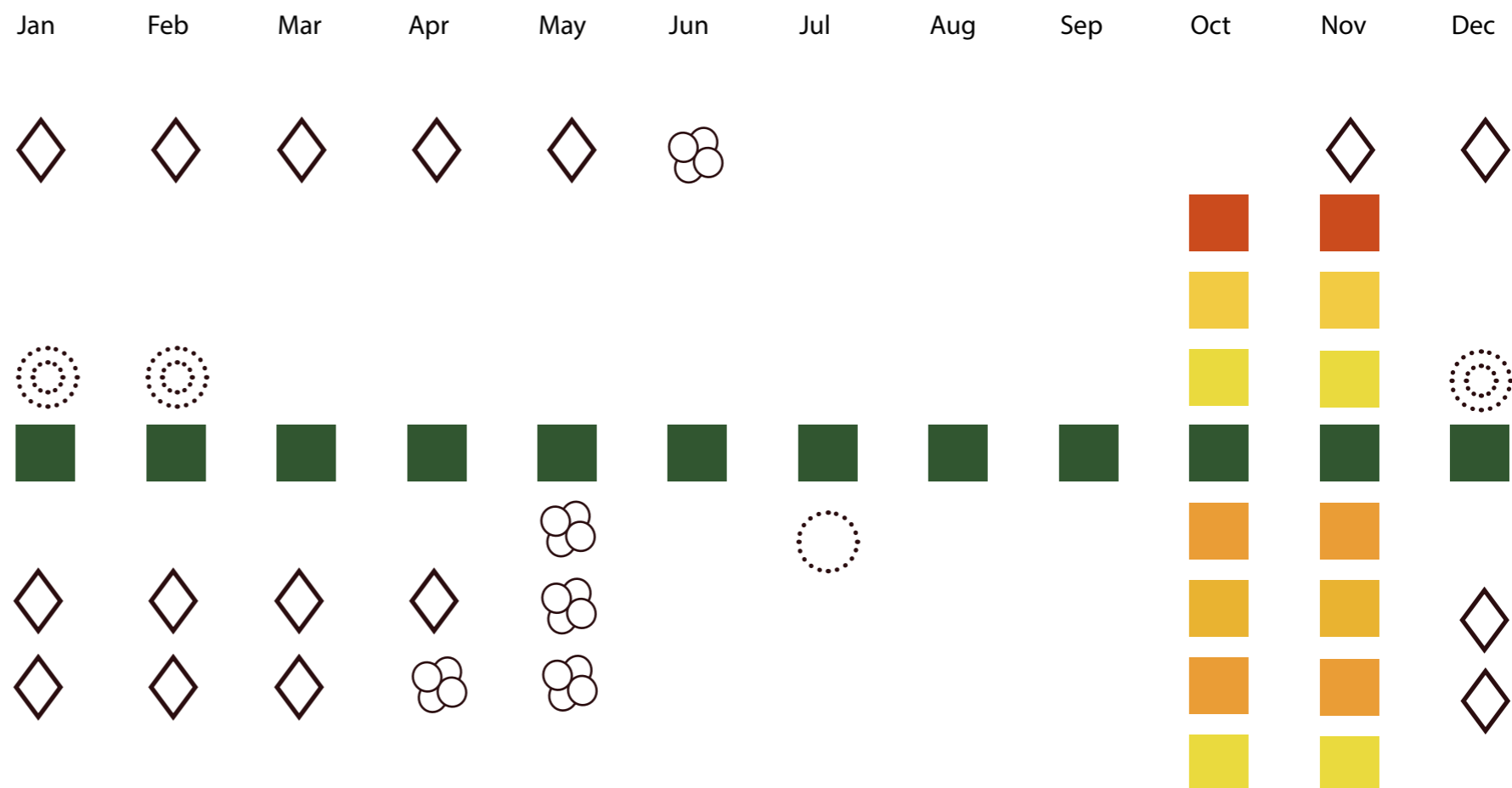
T5. *Pinus nigra*\*

T6. *Prunus avium* Svea E\*

























































T7. *Prunus padus* fk Ultuna E\*

T8. *Prunus x schmittii*

T9. *Zelkova serrata* 'Green Vase'



**Shrubs**

Latin names	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
S1. <i>Cornus mas</i> *												
S2. <i>Euonymus planipes</i>												
S3. <i>Hamamelis x intermedia</i>												
S4. <i>Lonicera nitida</i> 'Maigrün'												
S5. <i>Pinus mugo</i> ssp. <i>Mops</i>												
S6. <i>Sorbus frutescens</i> Fk Ås E												
S7. <i>Viburnum bodnantense</i> 'Dawn'												
S8. <i>Viburnum burkwoodii</i>												

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## Perennials

The perennials comprise of three mixes that are adapted to the local climate: the sun mix, the half-shade mix, and the shade mix (p. 85-87).

The flowering is primarily concentrated in spring and fall as per the academic calendar. While the colour palette primarily entails calming colours to create a calming experience - mostly white, blue, purple, and pink. Similarly to the trees and shrubs does this also have hints of yellow, primarily in the sun and half-shade mix to induce uplifting emotions, although they are modestly sized species. The composition of the perennials differs throughout the season to further emphasise the seasonal changes with the other species. The species presents cloudlike, bushy, or upright forms, differing in texture, *contrasting the harmony* and *balance* in the composition. While bushy species were chosen for their foliage thickness, cloud-like species would provide transparency for safety, and upright would contrast roundness and softness of the former.

There is a mix of evergreen and deciduous perennial species. Although the evergreen perennial is scarce, the decay of the perennials is to remain in the plantation until the spring pruning. The decay of plants is a sign of less human intervention; likewise, could it also symbolise the passing of time and enhance both wilderness and seasons changing (QET tab. 3: n & r). Whilst all perennials do not decay in an appropriate manner, several offers elegant decay – i.e., *Achillea millefolium*, *Agastache 'Black Adder'*, and all the grasses (schematic plant overview for perennials p. 88-89). Additionally, many deciduous species can keep their foliage throughout winter. Moreover, several species are self-seeding and are supposed to move and spread in the plantation as it enhances the wild characteristics and portrays less human intervention.



Figure 106: Round and cloudlike perennials providing a softer contrast against trees and shrubs with more prominent features.

# Mix 1 (Sun)

The plants are arranged by size. This is the largest mix for the sunny parts of Betonggården. Betonggården is receive an adequate amount of sun throughout the year, hence, this mix embodies the microclimate.



Figure 107: Figure illustrating the distribution of the mix 1.

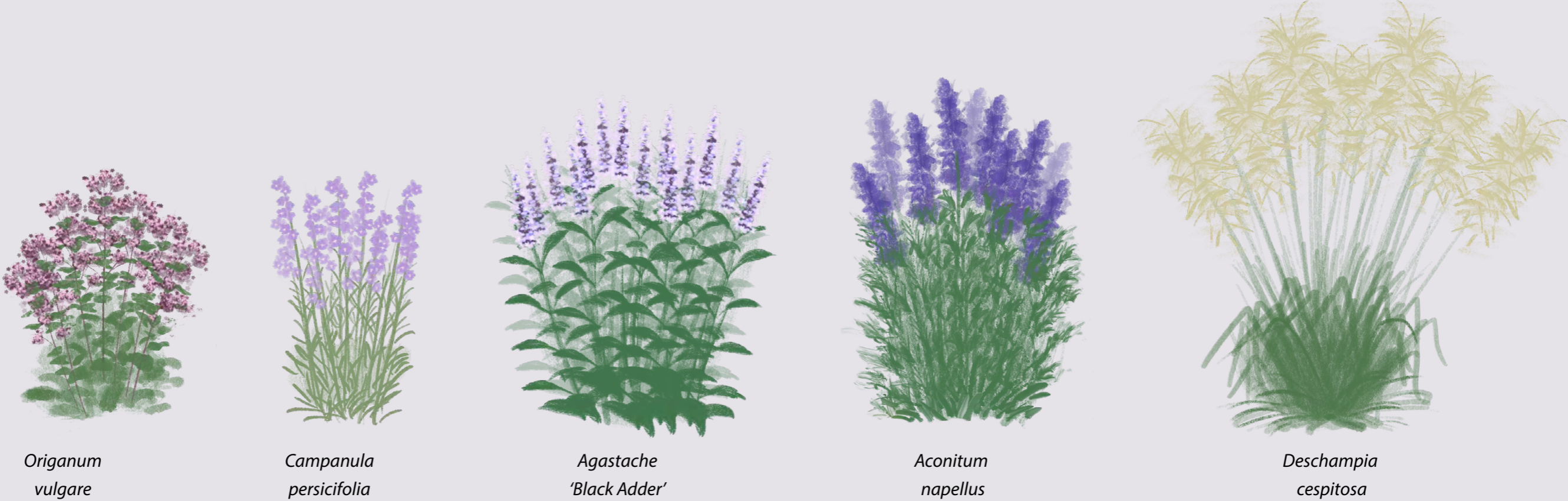
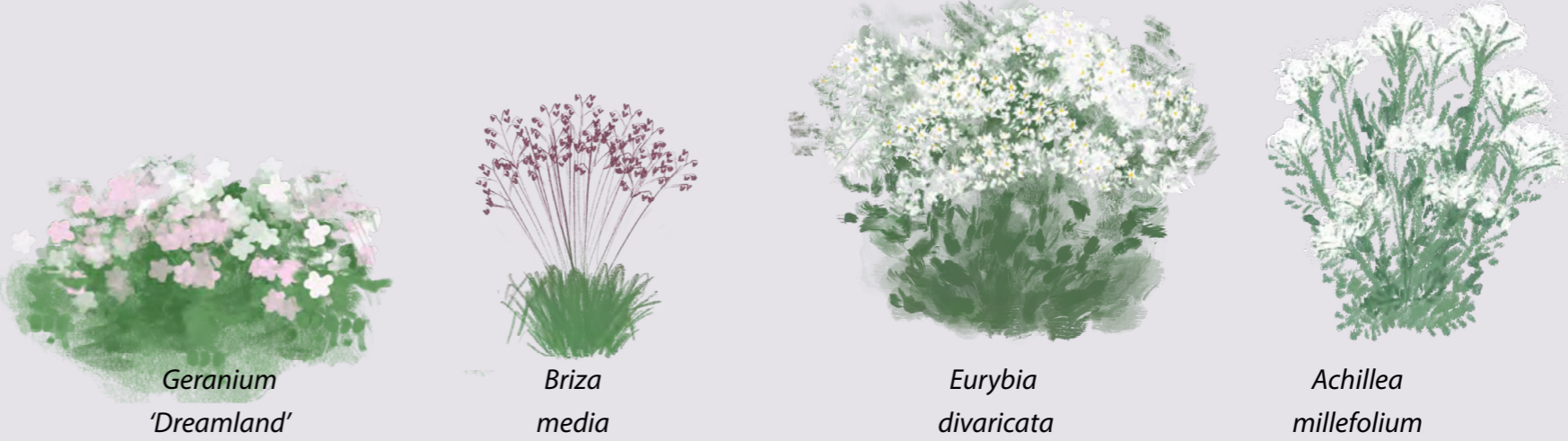
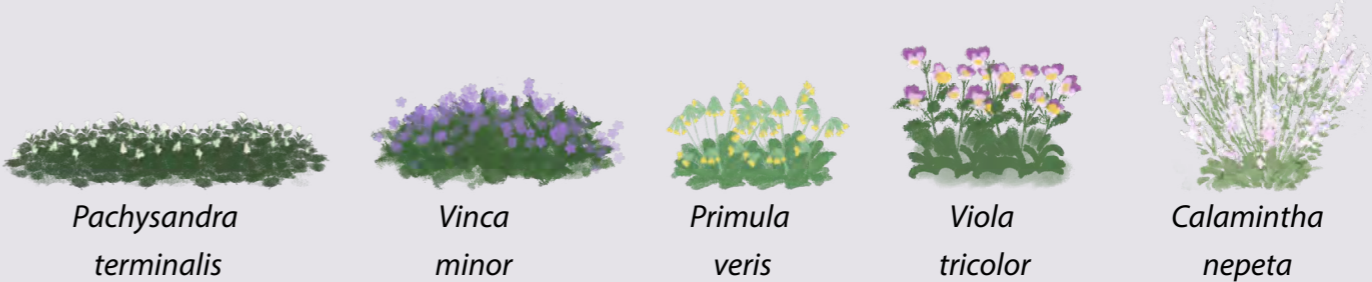


Figure 108: Figure potraying the perennials in mix 1.

## Mix 2 (Half-shade)

The plants are arranged by size. This mix is concentrated in the centre and is a mix of the mix 1 and 3. This mix is placed under several trees that tend to expand as they age, likewise does it create an overall cohesiveness throughout the plantation by including the sun and shade mix.

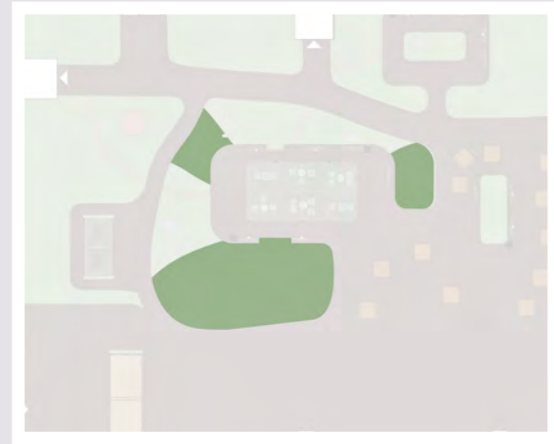


Figure 109: Figure illustrating the distribution of the mix 1.



Figure 110: Figure portraying the perennials in mix 2.

## Mix 3 (Shade)

The plants are arranged by size. This mix is concentrated towards the facade of the SB-building with the large windows. This area has the highest concentration of trees and shrubs compared to the other plantations. Hence, there are less perennials in this mix as some of the centre pieces are the shrubs.



Figure 111: Figure illustrating the distribution of the mix 3.

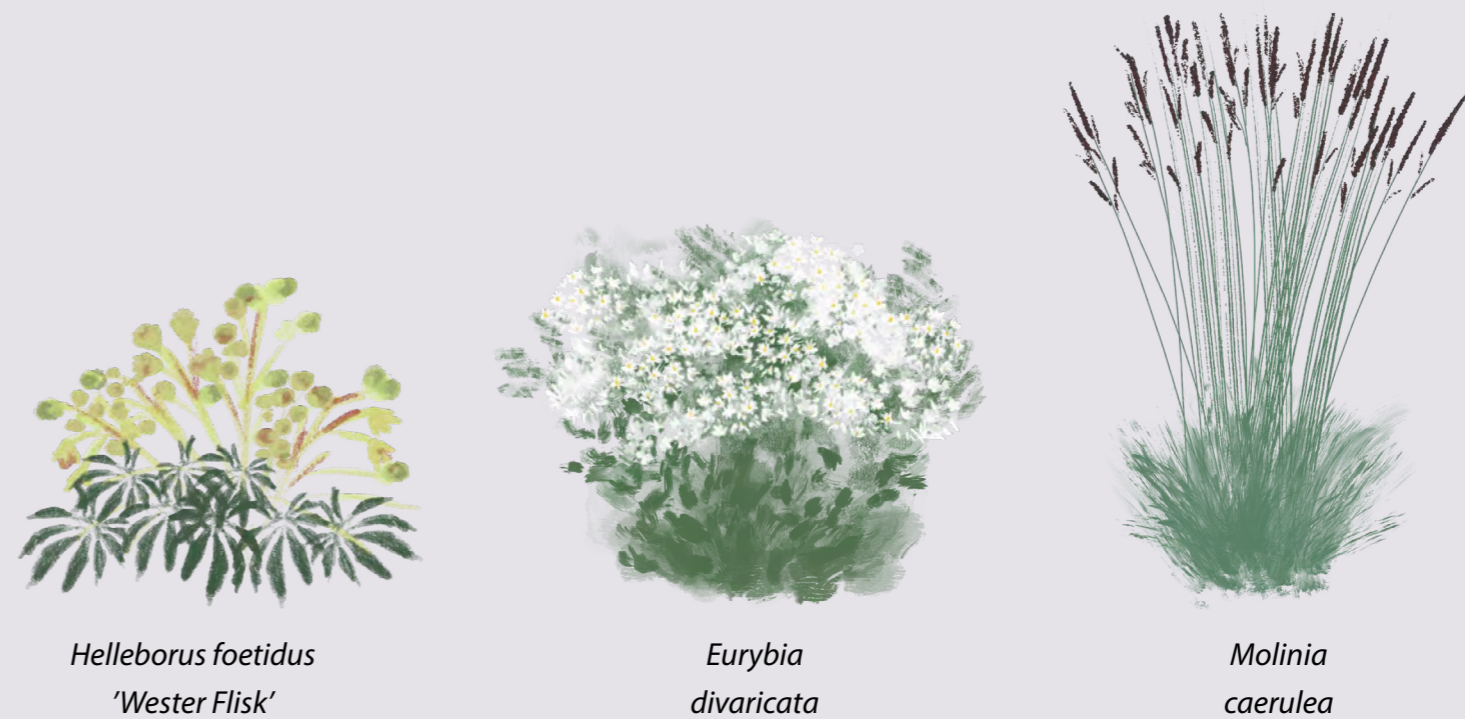
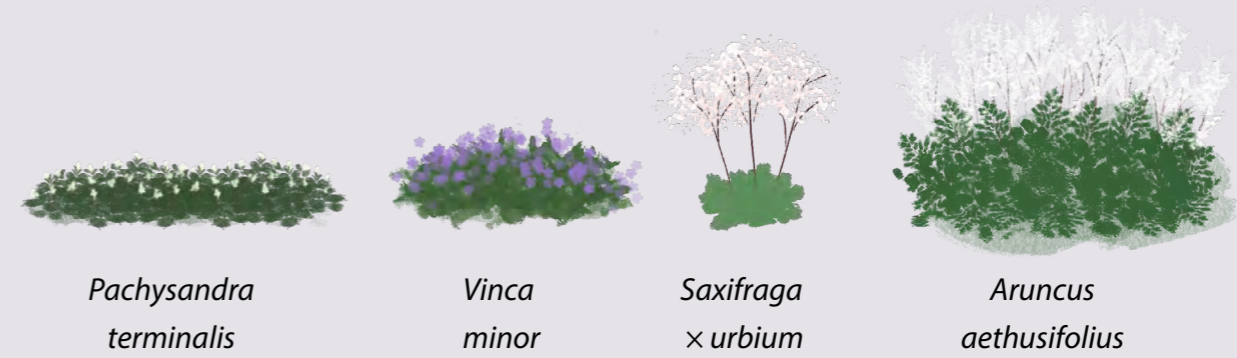






























































































Figure 112: Figure potraying the perennials in mix 3.

Perennials

 Flowering 
  Winter silhouette 
  Fall colours 
  Evergreen 
  Semi-evergreen 
 \* = Native

**Self-seeding** *Aromatic*























































Latin names

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
P1. <b>Achillea millefolium*</b>												
P2. <b>Aconitum napellus</b>												
P3. <b>Agastache 'Black Adder'</b>												
P4. <b>Aruncus aethusifolius</b>												
P5. <b>Briza media*</b>												
P6. <b>Brunnera macrophylla</b>												
P7. <i>Calamintha nepeta</i>												
P8. <b>Campanula persicifolia*</b>												
P9. <b>Deschampia cespitosa*</b>												
P10. <b>Eurybia divaricata</b>												
P11. <b>Geranium 'Dreamland'</b>												
P12. <b>Geranium phaeum*</b>												
P13. <b>Helleborus foetidus 'Wester Flisk'</b>												
P14. <b>Luzula sylvatica*</b>												
P15. <b>Molinia caerulea*</b>												



Perennials

Latin names

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
P16. <i>Origanum vulgare</i> *												
P17. <i>Pachysandra terminalis</i>												
P18. <i>Primula veris</i> *												
P19. <i>Saxifraga</i> × <i>urbium</i>												
P20. <i>Vinca minor</i>												
P21. <i>Viola tricolor</i> *												

## Perennials and bulbs throughout the year

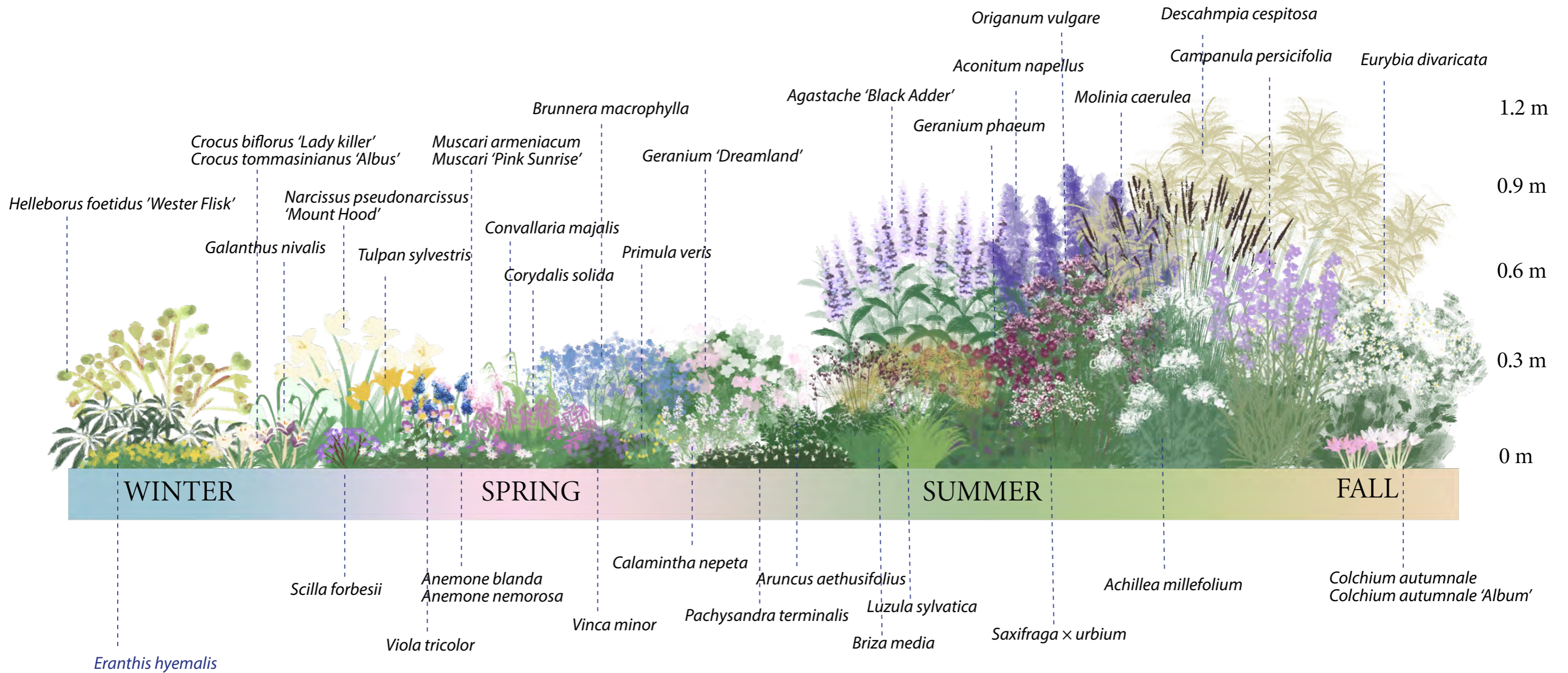


Figure 113: Figure illustrating the perennials and bulbs throughout the season accompanied by their latin names.

## Bulbs and climbing plants


The bulbs compose of two mixes: the sun/half-shade mix and the shade mix. They are an extension of the flowering season that provide flowering from February to October. The bulbs are scattered in clumps of 3-5 and evenly spread out to provide volume in the beginning of the plantation, likewise, allowing them to freely spread in the plantation as it adds to the wild characteristics. Whereas many bulbs are modestly sized (< 20cm), they are essential as provide colours during the grey days that could evoke uplifting

emotions and slowly prepare users for spring. The delicate details of these species could also trigger *soft fascination* and could potentially be an incredible source to convalesce mental fatigue.

Climbing plants have three functions in this plantation: (1) an extension of the walls created by trunks and shrubs, (2) a visual distraction that emphasises the aspect of being away, (3) enhancing the wild characteristics. While the largest display is on the SB2 façade, the climbing plants also

bedecks pergolas, bicycle shed and trunks of several trees. Similarly to the previous layer does this contain evergreen and deciduous species to further enhance seasonal changes and wild characteristics (QET tab. 3 n & r).

Bulbs

 Flowering \* = Native **Self-seeding** *Aromatic*

Latin names

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

B1. **Anemone blanda**



B2. **Anemone nemorosa\***



B3. Colchium autumnale



B4. Colchium autumnale 'Album'



B5. Convallaria majalis\*



B6. Corydalis solida\*




B7. Crocus biflorus 'Lady killer'



B8. **Crocus tommasinianus 'Albus'**



Bulbs

 Flowering \* = Native **Self-seeding** *Aromatic*

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

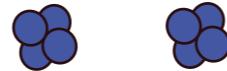
B9. **Eranthis hyemalis\***



B10. **Galanthus nivalis\***



B11. **Muscari armeniacum**



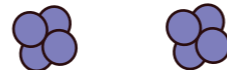
B12. **Muscari 'Pink Sunrise'**



B13. *Narcissus pseudonarcissus* 'Mount Hood'






B14. **Scilla forbesii**



B15. *Tulpan sylvestris*



Climbing plants

 Flowering  Fall colours  Evergreen \* = Native **Self-seeding** *Aromatic*

Latin names

Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

C1. Clematis (Atragene-Gruppen) 'Albina Plena' E



C2. *Euonymus fortunei* var. *vegetus*



C3. *Fallopia baldschuanica*



C4. *Hedera helix*



C5. *Parthenocissus quinquefolia* var. *engelmannii*



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## Timeline – How it evolves

Precedingly mentioned, to achieve compatibility and experienced space would be the ultimate intent of this design as users would achieve their goal of alleviating and convalescing mental strain. Therefore, measures have been considered to facilitate the intent of the design – i.e., a lush multi-layered vegetation that emphasises on the aspects of *being away* and *extent*. Admittedly, there are many trees in the space and leaving decaying plants might not be appreciated by all users. However, plants take time to establish and produce volume – therefore, quantity is required to transform this space. While the perennials and bulbs are allowed to freely move, the trees and shrubs are unable to. Wild characteristics found in nature require time and room for unpredictability, thus, the large plantation beds were created. Therefore, trees in the plantation are allowed to grow into each other as this would further enhance the wild characteristics of the vegetation.

In the earlier stages, the deciduous trees would generate more foliage volume while the thickness varies depending on the species. The succession of these trees is to be evaluated to allow the thriving species to expand. Fast-growing species i.e., Bird cherry (*Prunus padus*), Schmitt's Cherry (*Prunus x schmittii*), and Zelkova (*Zelkova serrata* 'Green Vase') provide volume and emphasises the seasonal changes in the earlier stages of the project. The fast growing species can be pruned to provide more light for other species and to ensure safety through the ability to overlook the space. However, the Black pine (*Pinus nigra*) should always be prioritised as it has a gradual growth and require sun. The Black pine could ultimately become

the central pieces with its beautiful silhouette that could transform the space and change the prior feeling of entering an undisturbed space.

The perennials, bulbs and climbing plants should also be evaluated although they are allowed to move more freely. Certain species might spread aggressively, i.e., Glory of the snow (*Scilla forbesii*), lesserw periwinkle (*Vinca minor*),

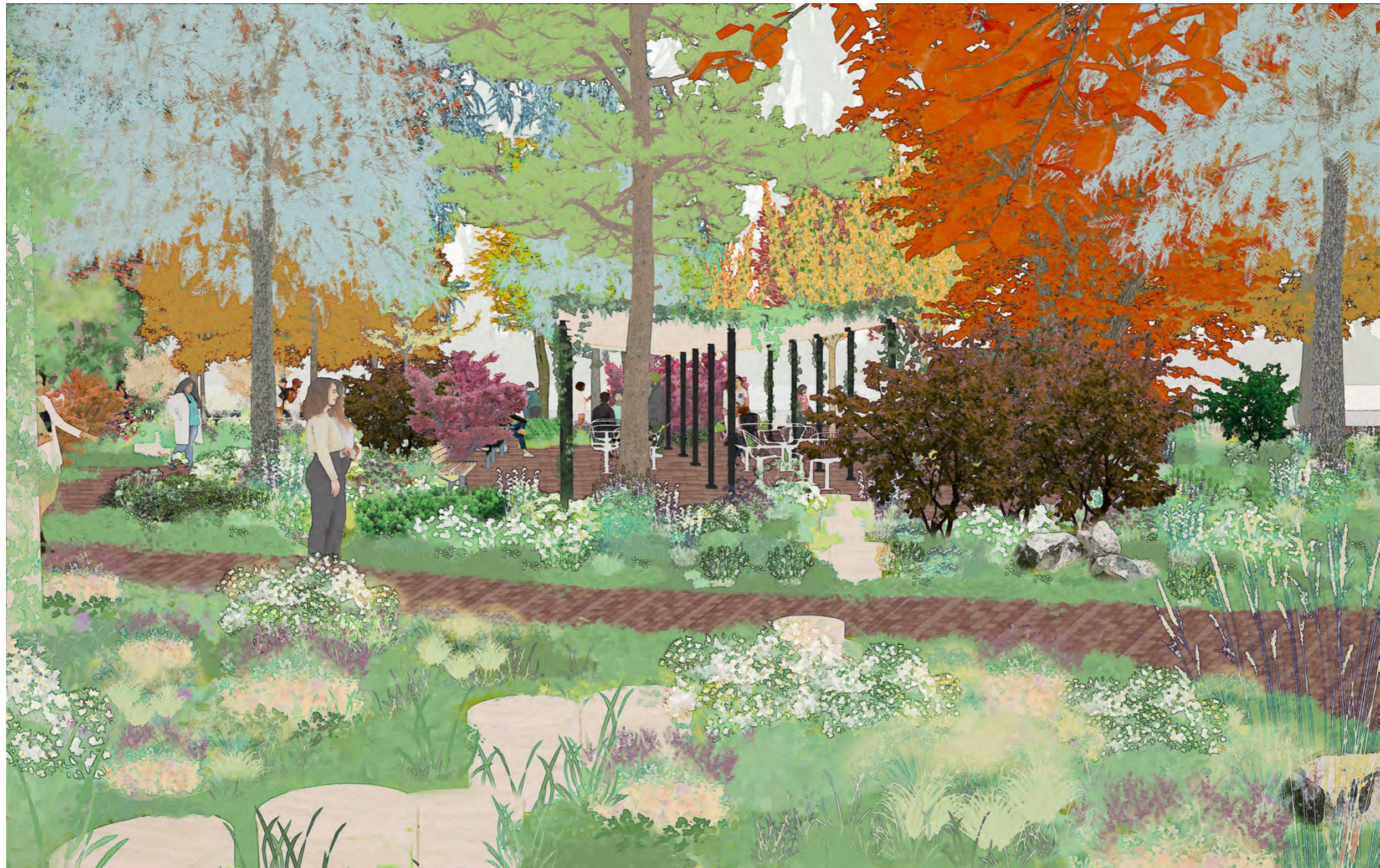
Fumewort (*Corydalis solida*), and grasses. Although wild characteristics are favourable in the design proposal, these species should not outcompete the remaining species as the intent is also to preserve the species diversity.



Figure 114: Tulip (*T. syvestris*), Corydalis (*C. solida*) and Winter windflower (*A. blanda*) forming a carpet under a tree - including other ferns, grasses and bulbs, Leiden, The Netherlands © Kittima Ritthichot (2024).



*Figure 115: View 1 during late May-June. The shortcuts leading to the Trailing Room and the Large Room can be seen on the left and right respectively. Throughout spring and summer the colour palette of Betonggården leans toward a cooler tone.*



*Figure 116: View 2 portraying how the Large Room is seen from one of the short cuts. The striking fall colours contrasts coordinates well with the various shades of green and blueish silver whilst many plants are still in full bloom.*

# DISCUSSION

## SUMMARY

This chapter will discuss the results of certain decisions, compromises and future studies, i.e., the academic environment, vegetation, and predetermined site conditions - resulting the final design proposal. Subsequently, forming conclusions about the design and future of restorative academic greenspaces.



# Discussion

The purpose of this essay was to investigate "How can *Betonggården* promote well-being and varying degrees of restorative qualities in academic greenspaces for students and academic staff?". Therefore, to investigate this we approached the project through an evidence-based design from an environmental psychology perspective. The pre-determined site conditions were accounted for as it is an important factor to create a space that is suitable in its context, at the campus of Johanneberg. The vegetation was used as the main base to achieve the restorative qualities of the design. In the previous chapter the design proposal was presented, thus this chapter will take a closer look at the different aspects and approaches of the design proposal.

## Result discussion

### The academic sphere

Throughout the literature overview, many articles and studies established the importance of having a close proximity to greenspaces of various sizes from the residence. However, there was an inadequacy in the literature; the importance of having access to greenspaces during work and school hours. Many people spend a large amount of time at their work or university, hence, the same health benefits should be applicable to university

environments as in the residence. According to the Public Health Agency of Sweden (2023) a decline in mental well-being is apparent - in the last four years there has been an increase in sickness absence of 29% due to stress-related ailments. The increased number is partially caused by stressful work environments (ibid.). Likewise, was stress and mental health issues prevalent in the preceding literature on well-being in academic environments (Emmertson et al 2024; Foellmer et al 2021; Hunt & Eisenberg 2010; Johansson & Kanerva 2017; Söderberg et al 2017). Consequently, by creating better work environments through restorative environments, the general stress level could diminish. Compared to the residence, there are



Figure 117: Section A-a portraying indirect experience of nature, i.e., from zone 1 (four zones). This allows users to emotionally engage by watching people through windows.

different factors and conditions that interplay in a university environment; the main factor being time. Conventionally, in a university environment the amount of spare time given to spend in greenspaces is not comparable to the spare time outside of work and school. Hence, an area that is approximately 300 meters, equivalent to a 5-minute walk, can be difficult to access due to the limited time. The continuity of visiting restorative environments allows one to recover *direct attention* effectively and to avoid *mental fatigue* (Kaplan & Kaplan 1989; Kaplan 1995). Thus, the value of having restorative greenspaces in close interrelation with university environments emerges. It contributes to staff and students being able to visit greenspaces more frequently, as well as the possibility of getting beneficial effects by gazing through a window out to a greenspace (Koprivec et al 2022; Kaplan & Kaplan 1989; Sun et al 2018). It can also be advantageous for the employer and universities to invest in restorative greenspaces adjacent to the workplace, if not already present, as it can increase the overall performance of staff and students. Additionally, it can reduce the risk of mental fatigue and the need to take sick leave.

## The predetermined site conditions

It is evident from the literature overview and the meta-analyses that each project is on a case-by-case basis – thus, there is not specific and adequate design solution to create a restorative greenspace. However, there are general principles that can be followed depending on the purpose of the design, these principles are required to adapt to

each specific location. For example, Betonggården had several predetermined site conditions (see fig. 118), one being that it is a secluded courtyard. The already protected site enables a base condition for creating a *secluded and protected serene, serene and peaceful greenspace* (QET tab. 3: q, s) and a supportive environment for the lower categories in the triangular model (fig. 25), as it is separated from many surrounding disturbances. To create a place with similar qualities on Johanneberg campus can be less ideal e.g. Geniknölen, where there are different predetermined site conditions. Geniknölen is located adjacent to the main entrance of the SB-buildings (fig. 39) and has busy street next to it, thus making this space demanding for *directed*

*attention* – these conditions could have a negative impact in creating a restorative environment. Whilst the SB3 Entrance, located along the same road (fig. 39), achieved many *low stimulating* and *comfortable* qualities (QET tab. 5) and allows *inward directed engagement* and upward in the triangular model (fig. 66). This shows that it is possible to evoke these qualities even on relatively “open” environments, although the road creates a disadvantage - which is a predetermined site condition that cannot be influenced and in this context counteracts the aspects of *being away* and evokes *directed attention*.

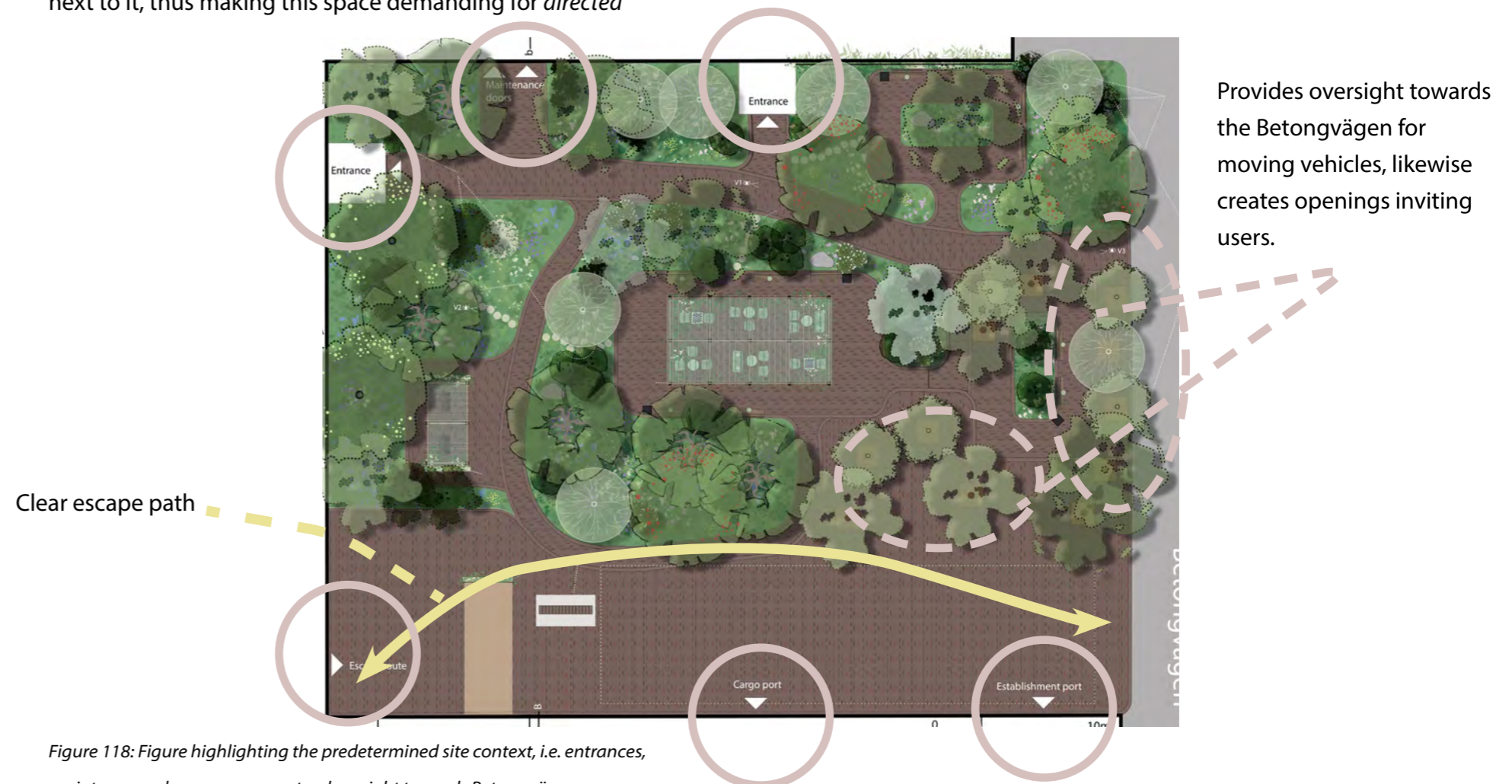


Figure 118: Figure highlighting the predetermined site context, i.e. entrances, maintenance doors, escape route, clear sight towards Betongvägen.

## Absent qualities

From the five different meta-analysis conducted on Johanneberg campus, including Betonggården, it was derived that there is a lack of restorative greenspaces. The majority of the greenspaces allow *highly stimulating* activities (QET), *active participation*, *outwards involvement* (The Triangular model) and *social space* (HAGF). All further confirmed by the campus index (Chalmersfastigheter. 2022; Chalmersfastigheter. 2023). In conclusion, the focus should be on creating a restorative environment as it was concluded scarce from the meta-analyses. The restorative effect would be more tangible if it was allowed to occupy more space, enhancing the feeling of *being away* and *extent*. However, smaller greenspace can still inhibit great qualities that are beneficial for creating a restorative environment (Grahn & Stoltz, 2021). Priorn is a an excellent example of a small space with many restorative qualities. Betonggården have advantageous qualities, i.e., being more secluded, hence it is one of the more advantageous places on campus to create a restorative environment.

## The Balance of Social Engagements

The predetermined site conditions for Betonggården (fig.118), in addition to the aforementioned, that needed to be taken into consideration when designing the space are the following: The main entrances of the courtyard, maintenance entrances, emergency exits, the cylinder, bicycle parking's, the adjacent road, cargo and test area. Betonggården is an area where there will be people passing because of the entrances– making it difficult to create a space mainly focusing on only achieving *inward directed involvement* (The Triangular model). However, being an enclosed courtyard as mentioned before has its

advantages as it is a protected and secluded space. The disadvantage of creating an environment that focuses of the categories in the middle of the triangular model, meaning *emotional participation* and *active participation*, is the balance of creating a space that does not contain to many *high stimulating* qualities, as the space will get more visitors during certain times during the day, e.g. lunchtime. To counteract this and increase the *low stimulating qualities*, the following has been done: by creating smaller rooms, the opportunity it given to sit down and enjoy sedentary activities. Walkways give the opportunity to actively move through the space and take part in nature. The shortcuts through the plantations (fig. 118) allow users to surround themselves in nature and to perceive it up close. The open vegetation provides an overview to see if someone

is already occupying the space. The large room is the area susceptible to larger social engagements, therefore, enhancing *highly stimulating* qualities. To combat this, the seating options are limited to two-four seats per group to create smaller social gatherings (fig.121). Although there are not singular seating options, it is still possible to occupy a seat yourself. An additional measure was to place shrubs between benches surrounding the large pergola. Therefore, allowing users to feel less disturbances (see. fig 121). Furthermore, it is rather an unwritten rule than an exception in Sweden that you do not sit next to someone if there are other available seats, contrarily it would be breaking the norm. Adding furniture with singular seating options was considered, however, it not applicable as it could generate a connotation to feeling deserted and misplaced.



Figure 119: Figure depicting the group seating options in the pergola, benches and shrubs surrounding the pergola, and the hammocks without trees.

## Cargo area

The cargo area and bicycle parking are two other conditions that needed to be taken into consideration (fig. 120). In regard to the cargo area, it is required that a truck is able to reach the loading gate in the middle of the southern building with a truck. This requirement occurs occasionally each year, however it is to be accommodated for. Additionally, the establishment also use the space for material experiments. Therefore, it can become a surface that looks dreary and can feel disconnected to the vicinity. Thus, to create a more cohesive space within the courtyard, it would have been beneficial to be able to extend the plantations closer to the southern buildings or to separate the spaces more distinctively with vegetation. However, in order not to exclude the surface to the south and those working in the establishment, it was decided in the design to open up towards the surface instead. The choice was made instead implicate the opening towards the *Viewing room*, hence, it would be more inviting from establishment port to enter the courtyard. Similarly, the walkway located in the south, closest to the bike shed were not separated with vegetation in order to invite people into the rooms and walkways after dropping off their bike (it is not possible to get into the SB building through the emergency exit in the corner). This enables a smooth passage e.g., after leaving the bike in a hurry to a lecture. Simply separating the surfaces with brick color and soldier course also means that there is more space for trucks to manoeuvre if needed. The issue can be investigated further to evaluate the required space for material experiments and manoeuvring trucks.

The decision to not add vegetation in the south was further strengthened by the fact that experiments are taking place in the cargo area. Throughout the study we could not find out what kind of tests were carried out, however, for safety purposes chose not to have any vegetation along the house. In continued development of the courtyard, if safe and applicable, bedecking the facade in the south with climbing plants that reflect those on the building in the north to enhance the link of the surfaces. Opening the vegetation towards the cargo area also enables visitors to see the various experiments taking place there. The open area also allows the tradition of hosting different events that needs larger areas to accommodate, i.e.,

fraternity activities. Moreover, the bike shed is in located in shadiest parts of the courtyard where it seemed to be most appropriate placement as. This allow the seating options to remain in the sunny parts of the courtyard whilst creating space for the bikes. Additionally, the emergency exit is adjacent to the shed. Therefore, keeping the paths clear besides the bike shed as well as the cargo area, allows many people to get through the area quickly if necessary. Placing the bike shed so close to the exit was concerning, however, the bike shed is currently located in the same space as the previous design of Betonggården. Therefore, it was assumed that it did not violate any safety regulations as Betonggården was recently redesigned (2018-2019). This is subject that can further be investigated.

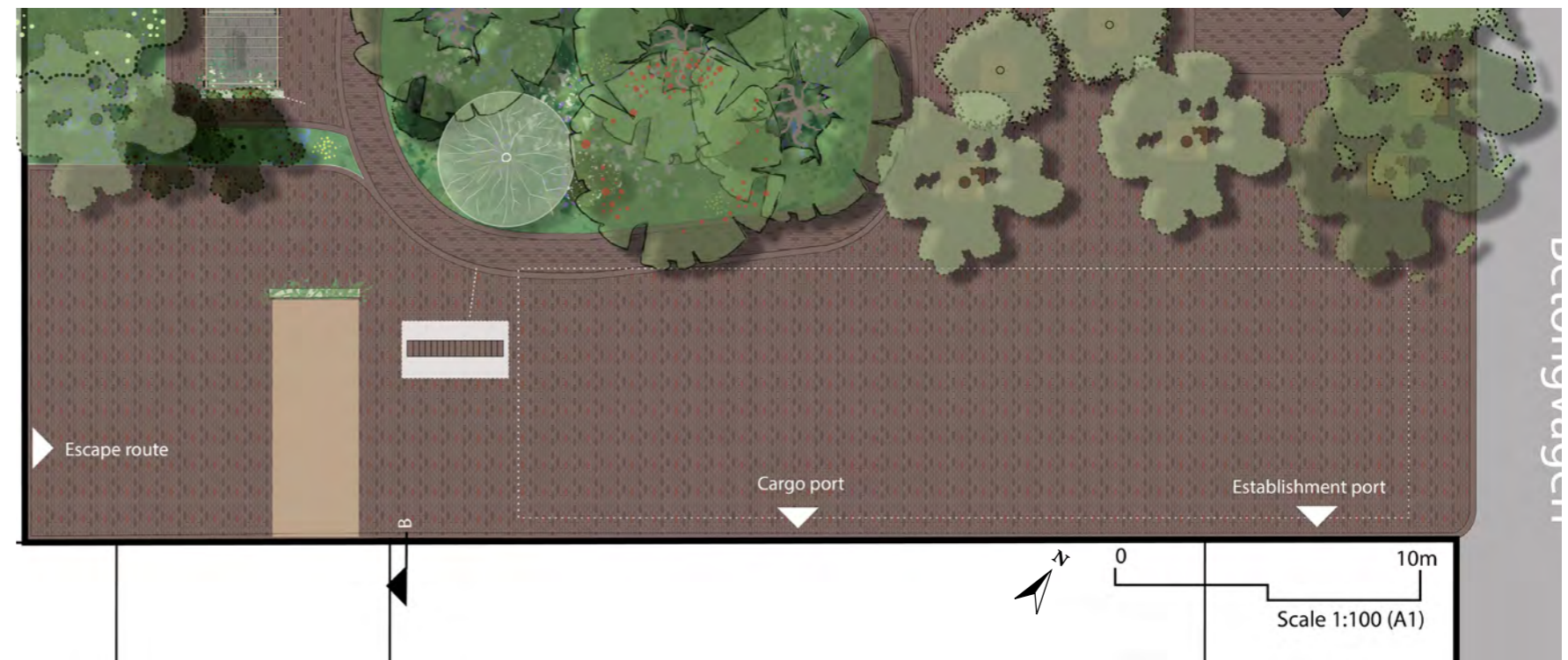


Figure 120: Figure portraying the cargo space in relation to the bike shed and the escape route.

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# Vegetation

## Sucession and spatial properties

Creating a balance between space that is easily oriented and to overlook, whence should also be experienced as having a wild characteristic - absent of experienced neglect is a fine balance. To attain this balance, soft walkways and rooms were created, while still containing a distinct design language. The chosen plants for the design can be considered more ornamental plants as they have prominent features that harmonises well with plants with wild characteristics. Although ornamental plants can be considered as a form human intervention, the intent is to allow them to grow freely without excessive care that could be interpreted as neat. Hence, also creating a balance between ornamental details and wild characteristics. Additionally, allowing plants to grow more freely would enhancing the enclosure of the rooms as plants are allowed to occupy more space. Furthermore, shortcuts through the plantations allow the visitors to experience nature at a closer distance throughout the seasons. Therefore, the decision to retain decay of perennials is further supported as it allow users to follow the life cycles of plants, whence can be intrinsically fascinating to some.

When the site is newly constructed, the site will have a different character than in e.g. 5 years, when most perennials have grown up; in 15 years, when many trees have started to expanded. Suybsequently, it is important to consider the succession of the vegetation, as it is a process varies throughout the different phases. The qualities of the plants can be perceived as an achievement through

the varying phases, each phase has its own expression, i.e., after 5, 15, 25, and 50 years. The advantage of working with many perennials and bulbs is that they grow faster than the trees and shrubs, therefore it provides volume at a faster pace. The place is meant to change over time - plants are meant to move and express varying characteristics, hence, compatible with the wild characteristics that the design strives for. There is an inevitable a risk of throughout the establishment stage as the space could be perceived as open and sparse. Hence, to reduce the experienced sparseness and to elevate the space, larger plant qualities were chosen to prevent this phenomenon to some degree. Although certain trees have larger plant qualities, i.e.

Russian olive (*Elaeagnus angustifolia*), it was not chosen to allow this specie to grow considering the arbitrary growth pattern. Nevertheless, it is arguably an inevitable part of the process - although it could mitigated through certain measures. As previously mentioned, the design strives to emulate a wild characteristic. However, what is considered wild is subjective. By following Robinsons (2016) guidelines regarding *preference and perception* it has given an insight into how different plants are perceived depending on their appearance and were useful and important insights for understanding how the site will be experienced through the plant choices.



Figure 121: Figure illustrating the perennials and bulbs throughout the season

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## Experience and Compromise

Regarding plants choices, the selection of the main flowering season at Betonggården was deliberately placed during spring and fall as per the academic calendar. Thus more users will be able to experience beneficial effects of the restorative qualities. There is a risk of Betonggården feeling open bare during winter but through carefully chosen plants there should be interesting aspect in the vegetation design throughout the whole year. For example, during winter there is a variety of evergreen shrubs and perennials e.g. Box honeysuckle 'Maigrün' (*Lonicera nitida* 'Maigrün'), Dwarf mountain pine (*Pinus mugo* ssp. *Mops*), Lesser periwinkle (*Vinca minor*) and Japanese spurge (*Pachysandra terminalis*). Likewise, does Hybrid witch hazel (*Hamamelis x intermedia*) and the viburnums provide an unusual habitus. As well as perennials with intriguing textures and silhouettes that can be keep throughout the whole of winter - to be cut down in early spring when the cycle begins again - e.g. *Achillea millefolium* and *Briza media*.

Whilst many tree species have a strong character and/or are an exotic tree. This is a conscious decision as they are more suitable for the urban conditions compared to native trees, as well as their striking appearance can lead to triggering *soft fascination*. However, the varying shades of green and hint of blueish silver was also taken into consideration as they offer an intriguing combination throughout fall. Moreover, including a variety of sizes of trees and shrubs was purposefully executed as it allow users to experience the space on a human scale. Larger species lowers the scales of the buildings for those inside the space, whilst providing intrinsically fascinating qualities for those on higher ground, i.e., lecture halls at SB2. Middle sized species

provides coverage and creates volume, whilst smaller species provides details upon closer inspection.

The colour scheme of the vegetation was taken into consideration where the predominant colour theme from early winter to late summer is cool toned, to purposefully achieve calming environment. During fall, striking colours and warm tones was added to enhance seasonal change (QET. tab 2-3: m,n) and uplifting emotions (fig.122). The colours of the vegetation coordinates to create an uplifting experience and cohesive environment as the season moves toward a darker period of the year. In early spring, Hybrid witch hazel (*Hamamelis x intermedia*) and Bodnant viburnum (*Viburnum x bodnantense*) can add a pleasant touch of yellow respectively pink to the winter season to create an uplifting moment, whence is crucial in the early parts of the year as Sweden is relatively grey throughout the winter.

With the limited scope of research of colours in vegetation it is difficult to determine the efficiency and beneficial effects they have on users. Therefore, colour theory and characteristics of vegetation should further be elaborated in future studies to purposefully generate the desired effect from the vegetation. The knowledge would be valuable to future projects as it could enhance the restorative aspects.



Figure 122: Striking colours throughout fall.

## Zones

Zone 1 is within the buildings, perceiving Betonggården from the inside. The building in the south does not have any windows facing the courtyard. Wherefore, the primary focus of the design phase regarding the buildings overlooking Betonggården, considering zone 1, are the SB buildings located in the southwest and northwest. The windows lead to many seminar rooms, corridors, and seating areas. Thus, having the opportunity to overlook the vegetation from zone 1, could have a positive impact on recovering *direct attention*. Betonggården is an intermediate location between zone 2 and 3 (fig. 123 & 124) as it is directly connected to the buildings, which is one of the fundamental prerequisite for a space that can be utilised with limited time throughout the day. Zone 2 is generally considered the transition zone to zone 3, the greenspace. However, in this case the transition becomes vague due to the direct contact with zone 1. The road, Betongvägen and the bank in the east are part of zone 4. Zone 4, acting as the connection to the surrounding environment as it does not depict the connection to the other green infrastructure at campus. Therefore, Betonggården could benefit with a stronger relation to zone 4, and could be further examined to explore how to connect the vicinity to Betonggården. Moreover, interlinking the different greenspaces at campus could further benefit the restorative qualities of the space as it strengthens the feeling of *being away*, *extent* (ART), *space* (QET) and *symbolic space* (HAGF).



Figure 123: Figure portraying four zones of contact with the outdoors in the final design proposal from a top view.



Figure 124: Figure portraying four zones of contact with the outdoors in the final design proposal from section A-a.

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## Method discussion

### Meta-analysis

By creating a meta-analysis based on environmental psychology theories, it enabled an indepth comprehension of present and absent qualities at the Johanneberg campus. Subsequently, the conclusion could be drawn that there was an absence of restorative greenspaces. Additionally, conducting the meta-analyses on the reference sites also provided design solutions of how qualities from HAGF, The Triangular model and QET can be achieved. From the meta-analysis results and the literature overview several design principles could be derived for the design proposal of Betonggården. The advantage of using an intuitive evidence-based model for the design enables the possibility to combine the new knowledge from the research in the pre-study and apply it to present established knowledge and experience. There are no specific guidelines for how a greenspace should be formed, concerning the fundamental theories that the meta-analysis is based upon, working instinctively creates a benefit on how to form the design. However, the disadvantage is the designers to interpretation – e.g. what an individual considers a peaceful environment could be experienced vastly different by another. Therefore, post-evaluation of locations is valuable to learn from the design that has been established. This is an additional topic that could further be investigated as it is the most appropriate solution to enhance restorative greenspaces.

Although, the analysis becomes arduous by creating a meta-analysis, it also generates a comprehensive understanding of different qualities in a greenspace. A correlation between the two of the theories, The Triangular Model and QET (Bengtsson et al. 2024) was established

previously, thus, a substantial foundation readily available. However, HAGF was added to the analysis to elaborate the specific requirements in an academic greenspace environment.

Furthermore, the scoring range of the system was simplified for the purpose of accompanying the summary of the meta-analysis. Hence, the scoring ranged from 1 to 3, although a broader spectrum could have generate a nuanced comprehension of the locations it was not applicable to this study within the limited time frame of the work. Likewise, was intention to focus finding present and absent qualities, therefore, by limiting the spectrum of scores the qualities can be interpreted straightforwardly. Therefore, motivations for each scoring was summarised and attached at the end of the thesis for further exploration. This scoring system can be investigated further to examine whether a range of 1 to 3 is adequately nuanced for the purpose of the meta-analysis.

### Reference locations

The reference locations were all based in Sweden. Whereas it would be valuable to use a diverse range of locations for a comprehensive approach. However, the decision was established for the accuracy of the meta-analysis as the authors would have the ability to observe the location in person. Observing locations and the how space is used solely from photos and maps can be quite challenging as certain details is discovered at in person visitations. Hence, in person visitations was prioritised.

Additionally, while it was evident that the design of Priorn and Albano emanated from environmental psychology, Ulls hus did not. It can be argued that the locations are not comparable due to the fact that Ulls hus did not emerge from environmental psychology. However, the context of Ulls hus as an academic greenspace is arguably suitable, i.e., the courtyard can be perceived from zone 1 and elements that evoke fascination.



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## Conclusions

Environmental psychology tackles innumerable issues - to incorporate the theories to landscape architecture was challenging and complex, yet intriguing. Environmental psychology entails a considerable amount of comprehension as the perception of users' is subjective.

Being near nature should be a prerequisite when designing working environments, in this regard universities, as the time spent is a considerable amount. With the increase of mental health issues, being near nature should not be a luxury as our mental health should be prioritised.

It has previously been established that it is possible to cater to varying degrees of mental fatigue in spaces. Although, it is difficult to execute due to specific site conditions that differs at each location. Public spaces are common spaces for the public to utilise, while the chosen location is a nearly enclosed academic greenspace it is also a public space. Therefore, it is susceptible to a flow of people - whence is counterproductive for recovery of mental fatigue. The movement of people might disturb those with low well-being and making the space less suitable for that purpose. However, the recovery process varies and it is possible to achieve recovery to a certain extent considering the site context. Hence, we hope that this proposal will encourage other practitioners to reimagine academic greenspaces that solely serves social engagement as it is crucial to cherish our mental health.

## Future research questions

It has previously been mentioned that locations with less human intervention are favourable in the preceding literature overview. Hence, it would be compelling to explore the extent of considered "wild" plant characteristics as most of these designs emerge in a human intervened location. Likewise, would it be fascinating to investigate how colours and characteristics of vegetation could enhance the restorative experience for those with low well-being.



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# ATTACHMENTS

Geniknölen					
Character	Qualities	Action required*			
<b>COMFORTABLE</b>					
a	Closeness and easy access	-	3		
b	Entrance and enclosure		-		1 = Inadequate
c	Safety and security	Small risk for either of psychological and physical discomfort	3		2 = Moderat
d	Familiarity	The place feels like an integrated part of the campus and is easy to navigate.	3		3 = Good
e	Orientation and wayfinding	Is easily oriented and has clear walkways.	3		- = Absent
f	Different options in different kinds of weather	-	-		
<b>HIGHLY STIMULATING QUALITIES</b>					
g	Contact with surrounding life	A good meeting place with a lot of movement.	3		
h	Social opportunities (social*)	A good meeting place with a lot of movement.	3		
i	Joyful and meaningful activities	A place for Room for sedentary, social and physical activities. Good meeting place, place to hang out, have a coffee or lunch. Various union activities are held here.	3		
j	Culture and connection to past times (cultural*)	Emil and Emilia: According to a student at Chalmers, the statue represents the two people Emil and Emilia. Which is the name for male and female students at Chalmers. Train car: Functions as a social and sedentary area.	3		
k	Openness (open*)	Open and easy to overlook.	3		
l	Species richness and variety (diverse*)	-	-		
m	Sensory experiences of nature	-	-		
n	Seasons changing in nature	The trees show the different seasons, flowering during spring and fall foliage.	1		
<b>LOW STIMULATING QUALITIES</b>					
o	Symbolism and reflection	The tram, Emil and Emilia.	3		
p	Space (cohesive*)	-	-		
q	Serene and peaceful (serene*)	-	-		
r	Wildness and nature (natural*)	-	-		
s	Secluded and protected (shelter*)	Partially secluded because of the buildings.	1		

Kemigården					
Character	Qualities	Action required*			
<b>COMFORTABLE</b>					
a	Closeness and easy access	Easy to find and easily oriented around Kemigården but not within. No clear paths and inaccessible ground material.	1		
b	Entrance and enclosure	No clear entrance because of lack of consistency of ground material. The surrounding buildings and lowered elevation of Kemigården makes the place more enclosed from the surrounding.	2		1 = Inadequate
c	Safety and security	Kemigården is open and easy to overview therefore feels safe and secure. Physical the ground covering can be an obstacle	2		2 = Moderat
d	Familiarity	Orientation is not clear within the site; walkways that lead nowhere.	1		3 = Good
e	Orientation and wayfinding	Easily oriented but no clear paths.	1		- = Absent
f	Different options in different kinds of weather	-	-		
<b>HIGHLY STIMULATING QUALITIES</b>					
g	Contact with surrounding life	Well integrated into the campus, works well as a passage/shortcut.	3		
h	Social opportunities (social*)	There are sitting and barbecue areas, there are eye-catching flowers in spring and summer.	3		
i	Joyful and meaningful activities	Room for sedentary and social activities, such as barbecuing and sitting areas.	2		
j	Culture and connection to past times (cultural*)	-	-		
k	Openness (open*)	Easy to overlook, modestly sunken.	3		
l	Species richness and variety (diverse*)	Green qualities are more prominent in summer and autumn in form of bushes and trees. There is a cluster of evergreen shrubs that gives green qualities throughout the winter.	1		
m	Sensory experiences of nature	The sound when the leaves rustle and flower petals falling.	1		
n	Seasons changing in nature	The sound when the leaves rustle and flower petals falling.	2		
<b>LOW STIMULATING QUALITIES</b>					
o	Symbolism and reflection	-	-		
p	Space (cohesive*)	-	-		
q	Serene and peaceful (serene*)	-	-		
r	Wildness and nature (natural*)	-	-		
s	Secluded and protected (shelter*)	The benches next to granite walls are protected by the wall.	2		

SB3 Entrance					
Character	Qualities	Action required*			
<b>COMFORTABLE</b>					
a	Closeness and easy access	Close and easy to access.	3		
b	Entrance and enclosure	Clear pathways. Shrubs and plantations create a form of enclosure.	3		1 = Inadequate
c	Safety and security	Good visibility. Both physiological or psychologically comfortable.	3		2 = Moderat
d	Familiarity	-	-		3 = Good
e	Orientation and wayfinding	Clear pathways.	3		- = Absent
f	Different options in different kinds of weather	-	-		
<b>HIGHLY STIMULATING QUALITIES</b>					
g	Contact with surrounding life	Good contact with the surrounding environment.	3		
h	Social opportunities (social*)	On one half of the site, there is plenty of seating and a more open space than the remaining parts.	3		
i	Joyful and meaningful activities	Place for sedentary, social and physical activities. Seating for sunbathing, sitting, coffee, reading. Walkways for leisurely walks.	3		
j	Culture and connection to past times (cultural*)	Baroque inspired style.	2		
k	Openness (open*)	Open and easy to overlook.	3		
l	Species richness and variety (diverse*)	A variety of perennials, shrubs and trees.	3		
m	Sensory experiences of nature	Opportunity to experience biodiversity up close. see the seasons change through the plants.	2		
n	Seasons changing in nature	Experience the diverse changes of plants throughout the seasons.	3		
<b>LOW STIMULATING QUALITIES</b>					
o	Symbolism and reflection	-	-		
p	Space (cohesive*)	Does give the feeling of entering an undisturbed world, although the openness and the adjacent road works contraproductively.	2		
q	Serene and peaceful (serene*)	-	-		
r	Wildness and nature (natural*)	-	-		
s	Secluded and protected (shelter*)	Somewhat secluded seating options where users can be left alone, although they are placed adjacent to the main path of the pocket park.	2		

The Library Hill					
Character	Qualities	Action required*			
<b>COMFORTABLE</b>					
a	Closeness and easy access	Biblioteks backen is easy to access, find and welcoming but not available from an accessibility perspective because of the hill.	2		
b	Entrance and enclosure	There are clear entrances to the building and walkways. It is not enclosed and is open to the different elements of the weather.	2		1 = Inadequate
c	Safety and security	Is psychological pleasant but not physically because it is located on a hill and there is adjacent roads.	2		2 = Moderat
d	Familiarity	Applicable with the rest of the campus, feels integrated with the surrounding green areas.	3		3 = Good
e	Orientation and wayfinding	Easily oriented with clear walkways.	3		- = Absent
f	Different options in different kinds of weather	-	-		
<b>HIGHLY STIMULATING QUALITIES</b>					
g	Contact with surrounding life	There is an opportunity to see or make contact with other people.	3		
h	Social opportunities (social*)	Lots of movement because of the library and seating areas which create potential for social gatherings.	3		
i	Joyful and meaningful activities	Joyful activities can take place here, e.g. sitting on the grass or benches for coffee/reading/lunch.	2		
j	Culture and connection to past times (cultural*)	There are buildings that tell about the history of the place; brick houses, new houses, the church, and million program houses.	2		
k	Openness (open*)	Very open, good view of the surroundings due to the location on the hill.	3		
l	Species richness and variety (diverse*)	-	-		
m	Sensory experiences of nature	-	-		
n	Seasons changing in nature	Autumn foliage.	1		
<b>LOW STIMULATING QUALITIES</b>					
o	Symbolism and reflection	The hill/height is a symbol of the place and creates a space for reflection as one overlooks the city and church.	3		
p	Space (cohesive*)	-	-		
q	Serene and peaceful (serene*)	-	-		
r	Wildness and nature (natural*)	-	-		
s	Secluded and protected (shelter*)	-	-		

Albano					
Character	Qualities	Action required*			
<b>COMFORTABLE</b>					
a	Closeness and easy access	Easy to access and spot, welcoming.	3		
b	Entrance and enclosure	Clear and welcoming entrances, some enclosure by buildings.	2		1 = Inadequate
c	Safety and security	Small risk of physical and psychological discomfort near the canal.	3		2 = Moderat
d	Familiarity	Well integrated in the environment and have elements that are easy to comprehend.	3		3 = Good
e	Orientation and wayfinding	Clear paths and a landmark (large stairs) that helps users to navigate.	3		- = Absent
f	Different options in different kinds of weather	Some shelter from the roof of the adjacent buildings and under the bridge.	2		
<b>HIGHLY STIMULATING QUALITIES</b>					
g	Contact with surrounding life	Experiencing lots of movements from people, overly stimulating.	3		
h	Social opportunities (social*)	Many opportunities to meet other people and various seating options encouraging social opportunities.	3		
i	Joyful and meaningful activities	Various options for sedetary activities, social activities and physical activities with leisurely paths near the canal.	3		
j	Culture and connection to past times (cultural*)	The canal and the adjacent environment provide strong characteristics for this location.	2		
k	Openness (open*)	Open and provides opportunities to overlook the adjacent greenspaces.	3		
l	Species richness and variety (diverse*)	Species diverse, various of plants found.	3		
m	Sensory experiences of nature	Possible to see and experience nature and animals, although hearing might not be optimal due to the noise pollution of the adjacent road.	2		
n	Seasons changing in nature	Possible to follow the changes in nature but also through the activities in the outdoor environment.	3		
<b>LOW STIMULATING QUALITIES</b>					
o	Symbolism and reflection	The canal offers a great place for contemplation.	2		
p	Space (cohesive*)	Coherent but not undisturbed.	2		
q	Serene and peaceful (serene*)	-	-		
r	Wildness and nature (natural*)	The nature near the canal appear more wild and could appear to have been developed freely.	1		
s	Secluded and protected (shelter*)	Somewhat secluded near the canal, although the location itself is overly stimulating.	1		

Prion	Character	Qualities	Action required*			
<b>COMFORTABLE</b>						
a	Closeness and easy access	Not accessible to the public.	-			1 = Inadequate
b	Entrance and enclosure	Clear entrances, generally good overview, Railing.	3			2 = Moderate
c	Safety and security	Good visibility, some accessible paths. Small risk for either of psychological and physical discomfort if one suffers from acrophobia (fear of heights).	2			3 = Good
d	Familiarity	Elements and activities are easy to comprehend.	2			- = Absent
e	Orientation and wayfinding	Easy to orientate, clear paths and varying ground material that applies different rooms.	3			
f	Different options in different kinds of weather	There is a conservatory that can be used all year round.	3			
<b>HIGHLY STIMULATING QUALITIES</b>						
g	Contact with surrounding life	-	-			
h	Social opportunities (social*)	There are opportunities for social encounters.	3			
i	Joyful and meaningful activities	Place for sedentary activities. Opportunities for individuals to interact with the outdoor environment, e.g., water, different types of furniture, wooden bridge, artificial grass.	3			
j	Culture and connection to past times (cultural*)	Plants and paving material with cultural connection.	2			
k	Openness (open*)	Open and generally easy to overlook for adults, some tall plants and shrubs.	2			
l	Species richness and variety (diverse*)	Species diverse, different types of plants. Has a lower layer, shrub layer and a canopy layer.	3			
m	Sensory experiences of nature	Sound of water, beautiful foliage and fall colours, enclosure with plants, ability to experience different weather conditions on high ground (inside and outside).	3			
n	Seasons changing in nature	Experience the plants through the seasons.	3			
<b>LOW STIMULATING QUALITIES</b>						
o	Symbolism and reflection	Being on a high ground, feeling the wind, one could feel quite free. Many iconic and cultural buildings are also visible. The space could also offer the feeling of solitude, left alone to contemplate.	3			
p	Space (cohesive*)	Several areas are enclosed with plants and offer the feeling of entering an undisturbed world.	3			
q	Serene and peaceful (serene*)	The space has many serene and peaceful qualities, e.g. pleasant sound of water, flexible grass area (sun bathing, yoga, activity space), different types of greenery.	3			
r	Wildness and nature (natural*)	-	-			
s	Secluded and protected (shelter*)	Several secluded and protected areas.	3			



Ulls hus					
Character	Qualities	Action required*			
<b>COMFORTABLE</b>					
a	Closeness and easy access	Easy to access, not easy to spot.	3		
b	Entrance and enclosure	Several clear entrances, embedded between two buildings offering enclosure.	3		1 = Inadequate
c	Safety and security	Good visibility, some accessible paths. Small risk for either of psychological and physical discomfort, light gravel.	3		2 = Moderat
d	Familiarity	Coherent with adjacent buildings. The various elements are easy to comprehend and use.	3		3 = Good
e	Orientation and wayfinding	Easy to orientate, clear paths.	3		- = Absent
f	Different options in different kinds of weather	-	-		
<b>HIGHLY STIMULATING QUALITIES</b>					
g	Contact with surrounding life	Good contact with the surrounding environment.	3		
h	Social opportunities (social*)	Plenty of space for social encounters.	3		
i	Joyful and meaningful activities	Place for seditary activities. Opportunities for individuals to interact with the outdoor environment, e.g., water fountain and furniture.	3		
j	Culture and connection to past times (cultural*)	Characteristic trees, strict geometrical paths.	1		
k	Openness (open*)	Open and easy to overlook.	3		
l	Species richness and variety (diverse*)	-	-		
m	Sensory experiences of nature	Sound of water, beautiful foliage and fall colours, gentle breeze, sun.	2		
n	Seasons changing in nature	Experience the trees through the seasons. Crocus during spring.	1		
<b>LOW STIMULATING QUALITIES</b>					
o	Symbolism and reflection	-	-		
p	Space (cohesive*)	The enclosure from adjacent buildings creates a large undisturbed area for contemplation, dark tinted windows that make the eyes of those inside the building less intrusive.	2		
q	Serene and peaceful (serene*)	The moveable and remaining furnitures allows the users to create their "own" space. Pleasant sound of water and a gentle breeze can also be experienced.	2		
r	Wildness and nature (natural*)	-	-		
s	Secluded and protected (shelter*)	-	-		