



# FROM GREY TO GREEN

The Value of Green Schoolyards for  
Children's Health and Well-being

LOUISE EMILSON

Independent project • 30 credits  
Swedish University of Agricultural Sciences, SLU  
Faculty of Natural Resources and Agricultural Sciences  
Landscape Architecture Programme – Uppsala  
Uppsala, 2024



## From Grey to Green - The Value of Green Schoolyards for Children's Health and Well-being

*Från grått till grönt - Betydelsen av gröna skolgårdar för barns hälsa och välbefinnande*

**Author:** © Louise Emilson  
**Supervisor:** Dr. Petter Åkerblom SLU, Department of Urban and Rural Development  
**Assistant supervisor:** Prof. Dr. Udo Weilacher, TUM School of Engineering and Design, Department of Landscape Architecture and Transformation  
**Examiner:** Tomas Eriksson, SLU, Department of Urban and Rural Development  
**Assisant examiner:** Viveka Hoff, SLU, Department of Urban and Rural Development

**Credits:** 30  
**Level:** Advanced level A2E  
**Course title:** Independent Project in Landscape Architecture, A2E - Landscape Architecture Programme - Uppsala  
**Course code:** EX0860  
**Programme/education:** Landscape Architecture Programme - Uppsala  
**Course coordinating dept:** Department of Urban and Rural Development  
**Place of publication:** Uppsala  
**Year of publication:** 2024  
**Cover picture:** Paul-und-Charlotte-Kniese-Schule, Berlin. ©2024 Louise Emilson  
**Copyright:** All featured images are used with permission from the copyright's owner.  
**Original Form:** A3  
**Electronic publishing:** <https://stud.epsilon.slu.se>

**Keywords:** *Multisensory, urban childhood, biophilia, sensation, perception, place attachment, schoolyard, loose-part play, risky play*

# ACKNOWLEDGEMENT

This work would not have achieved its final form without several individual's help, support, and guidance. I want to start by thanking my supervisor **Dr. Petter Åkerblom**, who has long been dedicated to advocating for children's right to play and learn in outdoor environments.

I extend my dear thanks to my secondary advisor, **Dr. Prof. Udo Weilacher**, who welcomed me as an Erasmus Practical Project Student at TUM and provided invaluable guidance and assistance during my time in Munich.

Thank you to **Ulrike Wolf**, who kindly hosted me at her home in Berlin and took her valuable time to show me schoolyard projects in which Grün Macht Schule had been involved. My work would not have reached the same level without your openness and generosity.

I also want to thank **Martina Strehler**, a teacher at the primary school where I conducted my case study. Without your help, I would not have gained the same comprehensive understanding and details about the chosen schoolyard.

Lastly, I thank my dear and loved ones for your endless support and encouragement.

# PREFACE

On my first day of the landscape architecture program in September 2019, we had an introductory lecture. During the presentation, a professor instructed us to close our eyes. He then asked us to think of a place that made us happy and where we loved to spend our free time. He said, "*Stay there for a while.*"

After a few moments, he resumed, "*...continue to keep your eyes closed. Now I want everyone who is outdoors to raise their hand.*". My mind had transported me to our summer cottage in Høga Kusten in northern Sweden, where I had spent every summer since I was born. The towering pine trees, the nearby deep lake, and the midnight sun. All that, right there in front of me. He said, "*Now I want everyone by body of water to raise their hand, and if you are both outdoors and near water, raise both hands.*" I complied.

"*Now,*" he continued, "*open your eyes.*" As my eyes adjusted to the light, I noticed that nearly everyone in the large lecture hall had either one or both arms raised. One shouldn't have been so surprised, but I was.

This seemingly simple and almost childlike exercise marked the beginning of my journey in landscape architecture. If that many individuals consider an outdoor place their favorite, why is there no more emphasis on creating such spaces within our society? I thought to myself: for a place to become one's favorite, it necessitates the formation of memories, experiences, and an emotional connection—something often cultivated during childhood. Children today spend more time in school, including the schoolyard, than anywhere else. As an aspiring landscape architect, I can have a tangible impact by contributing to planning, designing, and creating the greenest and most stimulating schoolyards possible.

For the final year of my landscape architecture program, I had the opportunity to participate as an Erasmus Practical Project Student at the Technical University of Munich in Germany. Driven by a curiosity about the world and a sense of wanderlust, I applied for an Erasmus exchange through my home university, the Swedish University of Agricultural Sciences, and was accepted. Initially, I anticipated that Sweden and Germany would share many similarities; however, this experience challenged and confirmed some of my preconceptions. Spending the final months of my landscape architecture studies in Munich was an enlightening experience. It gave me a broader perspective on how schoolyards can be designed and planned across Europe. This experience significantly enriched my understanding and was a crucial component in shaping the direction of my work.

To conclude, while the future remains uncertain and full of unknowns, as a landscape architect, I can strive to ensure that today's children and future generations grow up with joyful memories of playing in beautiful, dynamic green schoolyards. I undertake this master's thesis driven by a genuine passion for children's play, development, and their right to green spaces. Moreover, I hope to ensure that people will continue to raise their hands when asked if their favorite place is an outdoor spot in nature.



# ABSTRACT

The rapid pace of urbanization and increasing city densification are coming at the expense of green spaces, significantly impacting children's lives and daily experiences. Urban environments have a growing influence on children's development, making it crucial to create outdoor spaces that are not only safe and accessible but also green and multisensory. Landscape architects and urban planners are tasked with designing environments that engage all the senses—beyond mere visual appeal.

Green schoolyards are particularly beneficial, offering a range of advantages such as enhancing physical health, reducing disease rates, improving academic performance, and providing essential shade. They also contribute to environmental sustainability and offer significant educational benefits by integrating natural elements as green schoolyards support sensory integration, foster environmental awareness, and create engaging learning environments. This study explores nature's positive impacts on children's physical and mental health. It examines how these benefits can be effectively incorporated into schoolyard design through a multisensory approach.

Employing the Research Through Design methodology, this study facilitates the exploration of theoretical insights alongside practical design solutions, allowing for a dynamic and iterative process that informs and refines both the design approach and outcomes. The research incorporates a literature review, a research trip to Berlin with Grün Macht Schule, and a case study of Grundschule an der Schwanthalerstraße 87 in Munich. The case study applied knowledge from the literature review, evaluated several schools from the research trip and used data from observations, interviews, and documentation to develop a conceptual program proposal to enhance the schoolyard with multisensory elements to support children's health and development.

The project contributes to the understanding and implementing of multisensory design principles in urban schoolyards. The conclusions indicate that the most straightforward and effective way to create multisensory experiences in schoolyards is by using nature as a model in the planning and design process. A health-promoting schoolyard is inherently multisensory, and by aiming for this, landscape architects can support the broader global movement that works towards healthy urban childhoods.

# SAMMANFATTNING

## Betydelsen av gröna skolgårdar

Detta arbete som genomfördes i München, Tyskland, under vår och sommar 2024, utforskar betydelsen av gröna skolgårdar, särskilt mot bakgrund av klimatförändringarna och den växande urbaniseringen. Det förväntas att den andel av jordens befolkning som bor i urbana miljöer kommer att öka från 50% år 2010 till nästan 70% år 2050 (Haaland & Konijnendijk van den Bosch 2015). Dessutom beräknas omkring 60% av världens barn bo i städer år 2025 (Christensen & O'Brien 2003). Det finns därmed ett akut behov av hållbar stadsutveckling, vilket är särskilt viktigt för barn, vars möjligheter till utomhuslek minskar på grund av städer som förtätas och grönytor som minskar.

Minskningen av grönområden i städer har en betydande inverkan på barns psykiska och fysiska välbefinnande och utveckling. Att integrera mer natur i stadsplaneringen, framför allt på skolgårdar, kan främja förbättrad sensorisk integration, förbättrat fysiskt och mentalt välmående samt skapa en starkare känsla av samhörighet för barn. Forskning visar att utevistelse i naturen är kopplad till lägre sjukdomsfrekvenser, inklusive depression, och bättre betyg och skolresultat (Faskunger et al. 2018). Utformningen av skolgårdar är avgörande för att forma barns upplevelser och långsiktiga förhållningssätt till natur och samhälle.

Studier indikerar att expanderad tillgång till gröna zoner leder till ökad fysisk aktivitet som i sin tur leder till förbättrad fysisk och psykisk hälsa och snabbare återhämtning från stress (Chawla 2015). Faskunger et al. (2018) visar att barn med högre fysisk aktivitet generellt presterar bättre i skolan som i sin tur är kopplat till bättre hälsa senare i livet. Skolgårdar rikligt med grönska spelar en central roll för att ge daglig kontakt med naturen och förbättra kvaliteten på raster och utomhusundervisning, vilket bidrar till ökat intresse för lek och lärande som ju är skolan främsta syfte. Den omgivande miljön under barndomen har en betydande och långvarig inverkan på en individs identitet och självbild. Skolan fungerar inte bara som en plats för lärande, utan också som viktiga sociala, kulturella och fysiska

miljöer. I dagens samhälle, där barn spenderar mer tid i skolmiljöer än någonsin tidigare, är det avgörande att dessa miljöer främjar trygga känslor och positiva hälsoeffekter (Rieh 2020).

Forskning pekar på att barns emotionella anknytning till sin omgivning bidrar till deras utveckling och framtida förståelse för omvärlden. Enligt Rieh (2020) blir skolan ett andra hem där barn utvecklar kognitiva färdigheter och bygger en självbild. Personer som knutit band till naturen och sin skolmiljö under barndomen tenderar att ha en bredare uppfattning och djupare förståelse för den omgivande miljö som vuxna (Rieh 2020).

Minnen från barndomen sitter djupt inpräglade i vuxnas tankemönster och känsleregister och påverkar hur de uppfattar och interagerar med världen. Rieh (2020) belyser vikten av varför just skolgården har sådan särskild betydelse är eftersom barn är enligt lag förpliktade att vara där och har inte möjlighet att välja något annat. Med dagens snabba urbanisering och förändringar som sker i skolmiljöer är det därför viktigt att noga överväga hur dessa platser utformas. Genom att skapa skolmiljöer som främjar anknytning till skolan och positiva minnen kan landskapsarkitekter, stadsplanerare och professioner inom utbildningsfältet stödja barns utveckling och välmående. I sin tur påverkar det vi deras framtida relation till det omgivande landskapet så att kommande generation växer upp och värnar och engagerar sig i bevarandet av vår planets natur och grönområden.

## Syfte och frågeställningar

Syftet med denna masteruppsats är att bidra med kunskap om hur och varför landskapsarkitekter ska planera och gestalta naturlika och multisensoriska upplevelser på skolgårdar i täta urbana miljöer. Studien utforskar hur skolgårdar i täta stadsområden, med sina specifika utmaningar och möjligheter, kan förbättras genom att integrera naturliga och multisensoriska inslag i planering- och gestaltungsprocesserna.

Arbetet är förankrat i följande två frågeställningar:

- 1. Vilken roll spelar multisensoriska upplevelser i utformning och gestaltning av skolgårdar, och hur stödjer de barns hälsa och utveckling?*
- 2. Vilka specifika element och strategier kan föreslås i en konceptuell programplan för att förbättra skolgården vid Grundschule an der Schwanthalerstraße 87 i München för att skapa hälsofrämjande och multisensoriska upplevelser för barn?*

## Avgränsning

Studien riktade sig främst till yrkesverksamma och studenter inom landskapsarkitektur, stadsplanering och utbildningssektorn. Fokus låg på skolgårdar i tätbebyggda områden där behovet av grönska är stort. Med utgångspunkt i min erfarenhet från svenska skolgårdar tog jag under ett Erasmusutbyte på Tekniska Universitetet i München (TUM), tillfället i akt att öka kunskapen kring utformning och gestaltning av skolgårdar i andra delar av Europa än Sverige.

Studien avgränsades geografiskt till München där fallstudien jobbade med Grundschule an der Schwanthalerstraße 87 som var belägen i en mycket central del av staden. Arbetet fokuserade på barn i åldern 6-12 år, eftersom dessa formativa år har en så betydande inverkan på barns utveckling. På grund av begränsad tid inkluderar den slutgiltiga presentationen inte ett omfattande gestaltungsförslag för skolgården, utan ett konceptuellt program som innehöll förbättringsförslag med tillhörande text, bilder, illustrationer och sektioner. Materialet är avsedda att fungera som inspiration för andra skolgårdsprojekt och urbana platser där barn vistas.

## Metod

Denna studie använde metoden Forskning genom design, som är en icke-linjär process där problemanalys och lösningsförslag sker genom förståelse, analys, syntes och utvärdering (Deming & Swaffield 2011). Metoden bygger på kriterier som syfte, trovärdighet, konsistens, transparens och användbarhet, och syftar till att bidra både till designpraktisk och akademisk kunskap. Arbetet tillämpade utöver det en litteraturöversikt, studieresa och fallstudie.

## Litteraturöversikt

Litteraturöversikten fungerade för att samla kunskap inför studieresan och fallstudien. Den fokuserade på tidigare forskning om naturens positiva effekter på barns utveckling, multisensorisk design och vikten av skolgården som plats. Översikten behandlade även teorier som Biofile, konceptet "Risky Play" ur ett evolutionärt perspektiv, samt betydelsen av platsanknytning för barn.

## Studieresa till referensprojekt

En inspirerad del av arbetet var studieresan till Berlin, där fem olika skolgårdar som var influerade, planerade och gestaltade av organisationen Grün Macht Schule besöktes och undersöktes. Under resan genomfördes även samtal med organisationens och medverkande Ulrike Wolf, för att fördjupa förståelsen av de besökta skolgårdarna.

## Fallstudie

Fallstudien blev essensen i arbetet, där insamlad kunskap och teorier applicerades och testades. I detta projekt valdes Grundschule an der Schwanthalerstraße 87 i München som studieobjekt. Data samlades in genom observationer, samtal och dokumentation, och användes för att utveckla ett konceptuellt programförslag för hur skolgården kan förbättras för att stödja barnens hälsa och utveckling. Det låg ett stort fokus på att få in multisensoriska element i designen.

## Multisensoriskt tillvägagångssätt

Multisensorik är ett koncept och en praxis som involverar användningen av flera sinnen samtidigt för att förbättra upplevelser och förståelser av en händelse eller miljö (Roley Smith 2020). Det handlar om att integrera sinnesintryck som syn, hörsel, lukt, smak och känsel, samt ibland även inre sinnen som *interoception* (uppfattningen av inre kroppsliga tillstånd, exempelvis känslan av hunger, mättnad, illamående och kroppstemperatur) och *proprioception* (känslan av kroppens position och rörelse, exempelvis att stå på ett ben med stängda ögon eller att balansera fyllda glas på en bricka), (ibid).

År 1971 introducerade arkitekten Simon Nicholson konceptet "Loose Parts" i sin artikel "The Theory of Loose Parts." (Casey & Robertson 2016). Nicholson beskrev lösa flyttbara delar som variabler som omfattar sensoriska upplevelser, såsom dofter, känsel och hörsel etc.. Därmed är flyttbara delar en multisensorisk upplevelse, eftersom den engagerar flera sinnen på ett dynamiskt och interaktivt sätt, vilket lämpar sig väl att integrera vid planering och gestaltning av skolgårdar.

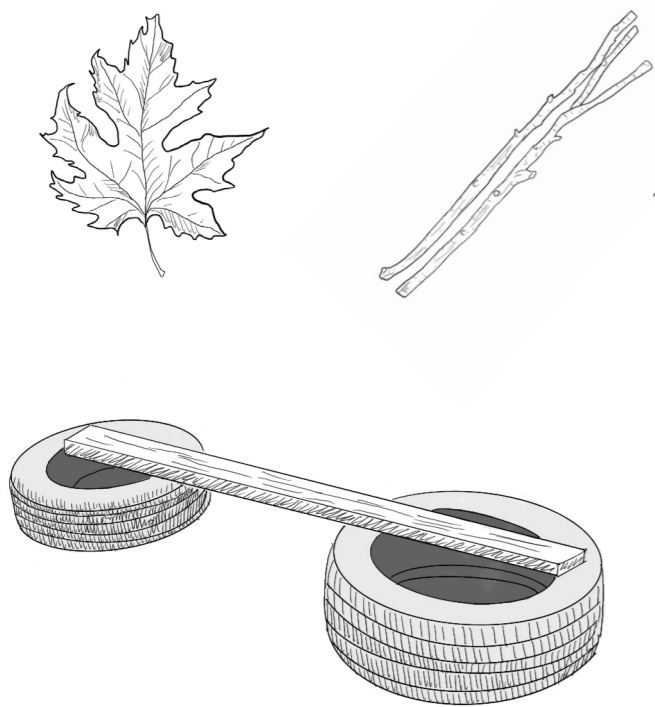


Fig. 7. Handritade illustrationer av olika lösa flyttbara delar att leka med: däck med en bräda för att skapa en balansgång, ett löv och grenar.

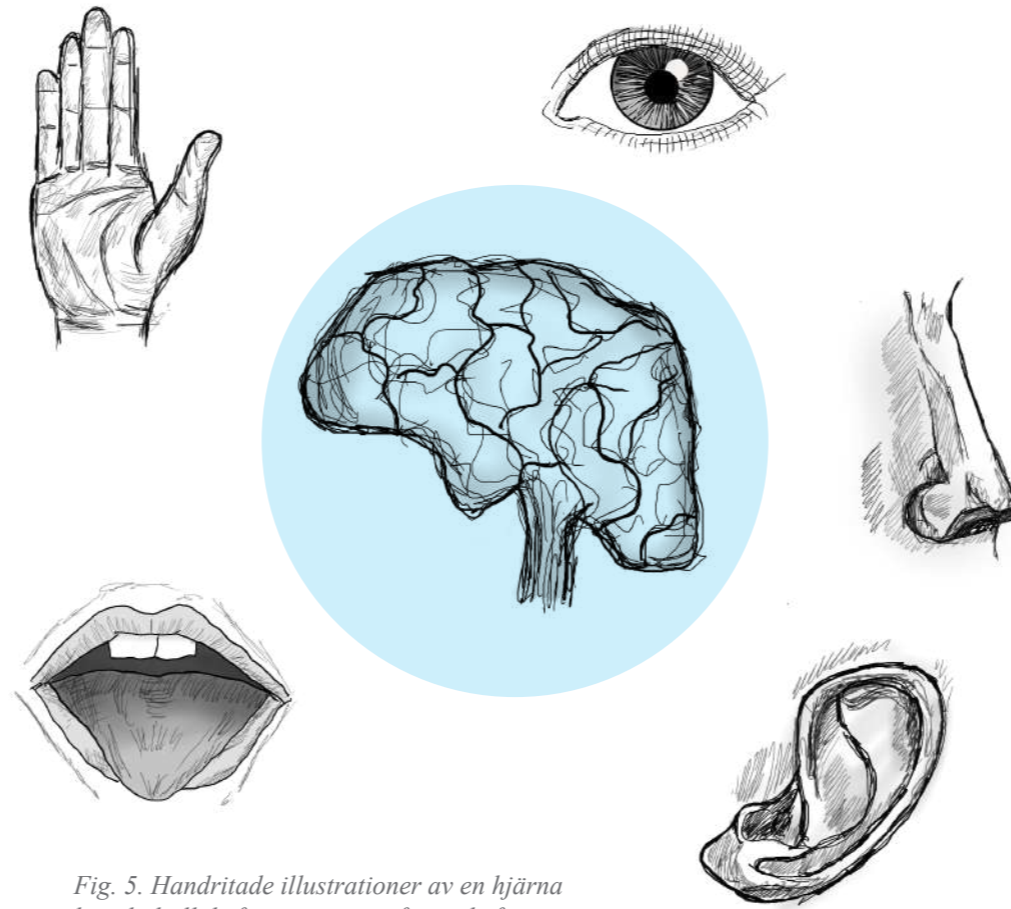


Fig. 5. Handritade illustrationer av en hjärna kopplad till de fem sinnen, utformade för att demonstrera och förklara dess funktioner.

## Evolutionära synsätt och Riskfylld Lek

För att belysa vikten av naturens betydelse för människans hälsa tog litteraturöversikten också upp hur vi formats av evolutionära processer. Begreppet "Environment of Evolutionary Adaptedness" (EEA), som är kopplat till den brittiske psykologen John Bowlbys arbete, betecknar de miljömässiga förhållanden som människor är biologiskt anpassade till (Grinde & Grindal Patil 2009). Historiskt sätt var människor mycket mer integrerade i naturen än vad vi är idag.

För att ta reda på konkreta tillvägagångssätt kopplat till evolutionens utveckling, tog litteraturöversikten även upp Ellen Hansen Sandseter och Leif Kennair (2011) artikel "Children's Risky Play from an Evolutionary Perspective: The Anti-Phobic Effects of Thrilling Experiences". Författarna menar att riskfylld lek kan förbättra barnens motriska förmåga och bli bättre på att hantera motgångar och utmaningar. De identifierar sex kategorier av riskfylld lek som fallstudien tog inspiration av i gestaltungsförslaget:

- 1. Lek med höga höjder:** Aktiviteter som klättring och balansering på högre nivåer förbättrar motoriska färdigheter och rumslig uppfattning.
- 2. Lek med hög hastighet:** Aktiviteter som innefattar hastighet och rörelse främjar perceptionsförmåga och fysisk kondition.
- 3. Lek med farliga verktyg:** Lek där barn utforskar och manipulerar verktyg är viktigt för att utveckla kompetens och förståelse för omgivningen.
- 4. Lek nära farliga element:** Lek i närheten av farliga objekt som klippor eller vatten kan förbättra barnens förmåga att hantera risker.
- 5. Bråk- och bus lek:** Fysiska lekar som brottning, vilket ger fördelar i fysisk träning och social kompetens.
- 6. Lek där barn kan "försvinna":** Utforskande aktiviteter som kan leda till att barn rör sig bort från vuxen tillsyn, bidrar till att utveckla färdigheter i rumsuppfattning och självständighet.

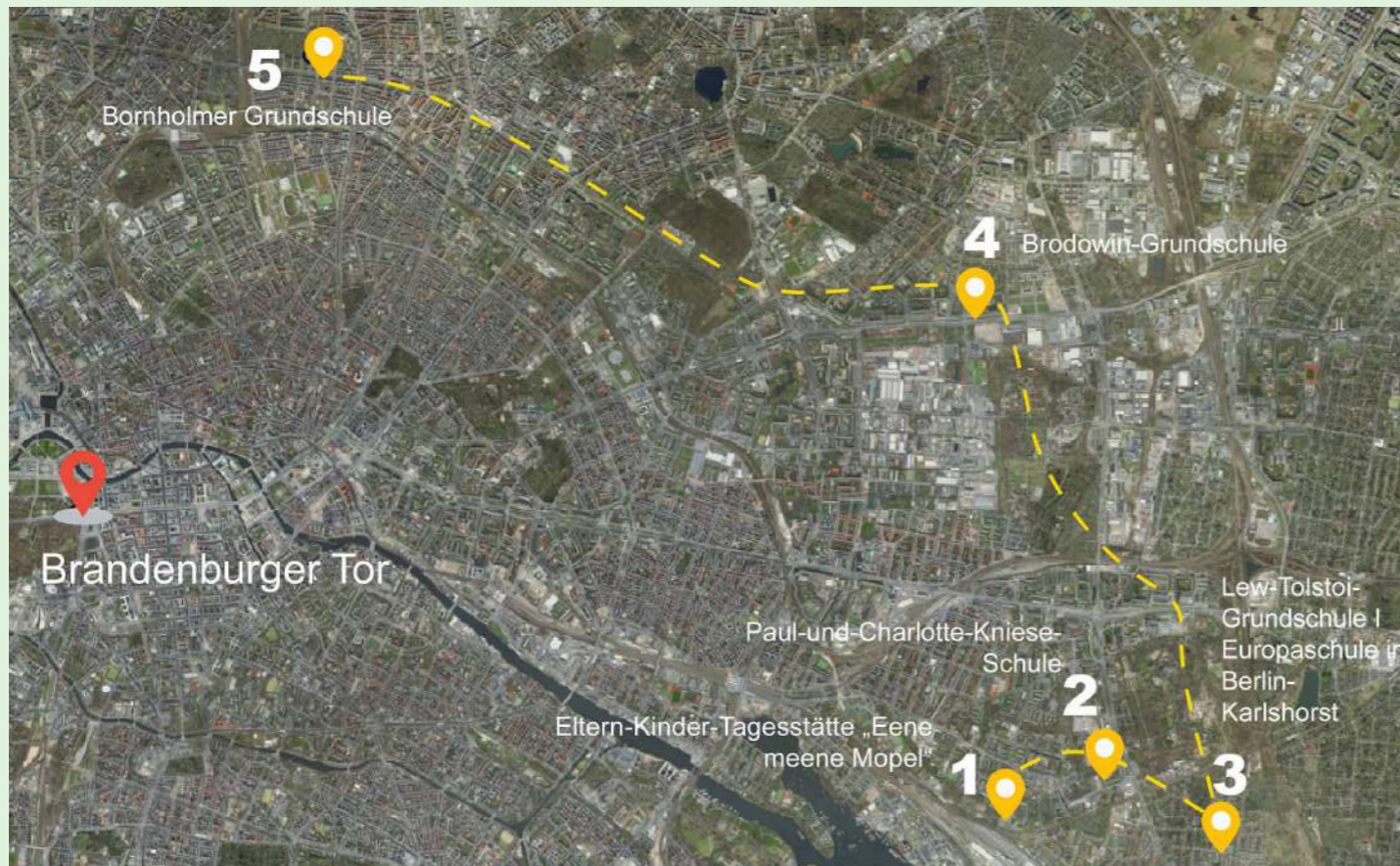


Fig. 13. Karta över Berlin som visar cykelvägen som Ulrike och jag tog när vi besökte referesprojekten. Brandenburger Tor är inkluderat som ett landmärke för orientering. Karta hämtad från ©Geoportal Berlin och senare bearbetad i Illustrator. Skala 1: 70 000



Bild på Ulrike i Berlin under vår cykeltur mellan de olika skolgårdarna.

3. Lew-Tolstoi-Grundschule I Europaschule in Berlin-Karlshorst



4. Brodowin-Grundschule



Beratungsstelle für ökologische und kindgerechte Schulhofgestaltung

Fig. 13. GMS logga (Grün Macht Schule 2024).

## Studieresa till Berlin

Under studieresan till Berlin besöktes fem olika skolgårdar. Innan studieresan läste jag på om organisationens syfte och värdegrund. Under cykelturen i Berlin genomfördes även samtal med en av Grün Macht Schules anställda; Ulrike Wolf, för att fördjupa förståelse, samt samla kunskap och inspiration av de besökta skolgårdarna. De viktigaste slutsatserna som studieresan resulterade i var: Barncentrerad gestaltning, integrera naturliga element, erbjuda multisensorisk och utmanande lek, samt främja kreativa möjligheter.

1. Eltern-Kinder-Tagesstätte „Eene meene Mopel“



2. Paul-und-Charlotte-Kneise-Schule



5. Bornholmer Grundschule





## Fallstudie

För fallstudien valdes Grundschule an der Schwanthalerstraße 87 i München som studieobjekt. Data samlades in genom observationer, samtal och dokumentation, och användes för att utveckla ett konceptuellt principförslag för hur skolgården kan förbättras för att stödja barnens hälsa och utveckling. Det låg ett stort fokus på att få in multisensoriska element i designen.

Den valda skolan, Grundschule an der Schwanthalerstraße 87 ligger i centrala München, cirka fem minuter från stadens centralstation. Runt skolan finns tunnelbanor, restauranger och en mycket trafikerad bilväg. Det var viktigt att få in mycket grönska i den konceptuella designen på grund av den bristen av närliggande grönområden intill. Den konceptuella programplanen delades in i sex olika zoner som representerade varsin karaktär.

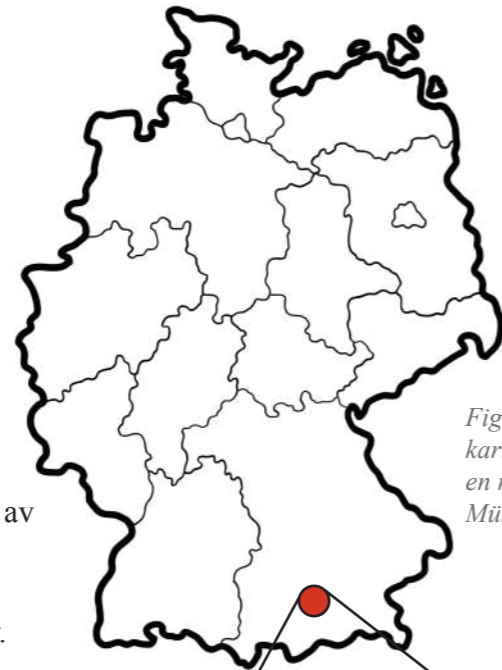


Fig. 56. En illustrerad karta över Tyskland med en röd punkt som markerar München (Vecteezy, u.å.).



Bild på Grundschule an der Schwanthalerstraße 87 med St. Paul Kyrkan i bakgrunden.

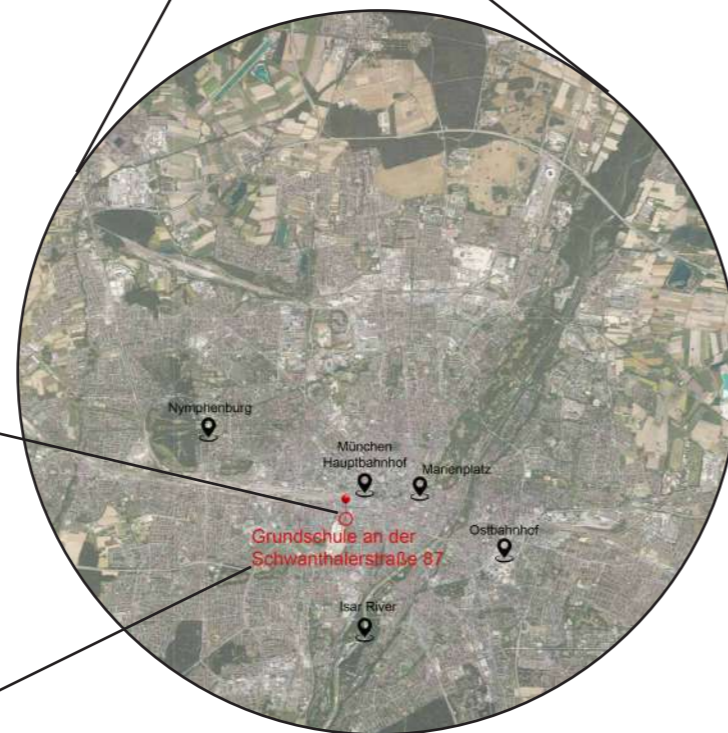


Fig. 55. En karta över München som visar Grundschule an der Schwanthalerstraße 87, och dess plats inom staden, samt viktiga landmärken för att ge kontext och orientering. Karta hämtad från © Bayern Atlas 2024.

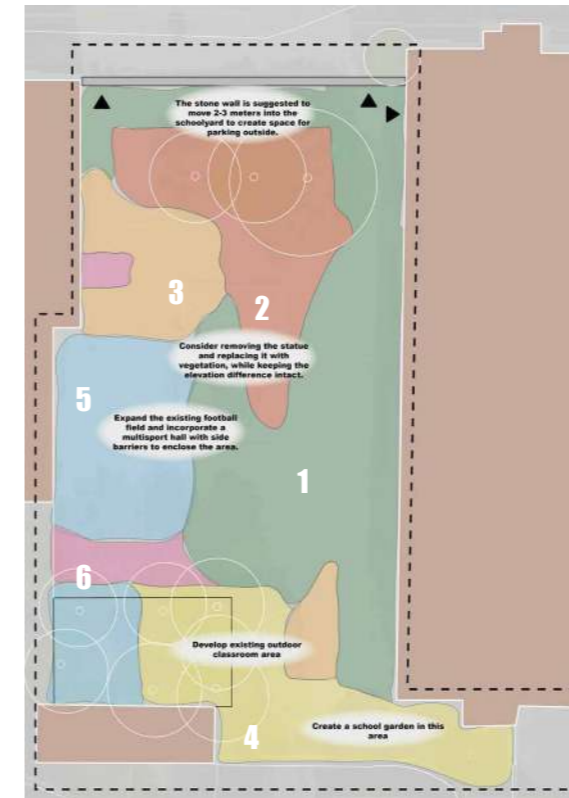


Fig. 80. Konceptuell programplan över Grundschule an der Schwanthalerstraße 87. Skala 1:800.

### 1 The Forest

Zonen fokuserar på att föra in naturen i miljön genom att plantera träd, buskar och perenner, samt inkludera naturliga material som träpinnar och stenar. Detta skapar en rik sensorisk upplevelse som inte bara ger estetiskt värde utan också främjar fysisk och mental hälsa. Gröna bubblan är också viktig ur ett klimatperspektiv då den bidrar med skugga och reducerat temperatur i stadsmiljö.

### 2 Sensory Play Space

Här betonas sociala aktiviteter och interaktion genom lek som kräver samarbete och kreativitet, vilket stärker barns sociala och kognitiva förmågor. Lek med lösa delar är en central del i Sensory Play Space. Som Casey och Robertson (2016) har föreslagit, är komponenter som grenar, plankor, rep, kottar och däck, exempel på lösa delar som visat sig ha en positiv inverkan på lekmiljöer.

### 3 Pollinator Paradise

Detta område fokuserar på att skapa platser som gynnar pollinatörer, såsom bin och fjärilar. Målet är att barnen ska lära sig om biologisk mångfald och pollinatörers betydelse samt att främja biodiversitet i stadsmiljön. Att vara nära naturen och observera levande organismer knyter också an till biofilia-konceptet.

### 4 The Classroom

Här kan barnen delta i trädgårdsarbete, vilket engagerar flera sinnen samtidigt genom aktiviteter som att vattna växter, gräva i jorden, plocka bär och smaka på dem. Detta främjar en biofil koppling till naturen och bidrar till minskad stress och förbättrad koncentration (Grindal and Patil 2009). Det finns även utomhusklassrum i The Classroom.

### 5 The Sports Field

Området är inriktat på fysisk aktivitet och taktila upplevelser. Här ingår element som gungor, rutschkanor och möjligheter till riskfylld lek, vilket stöder barnens motoriska utveckling och spatiala medvetenhet. Proprioception, det vill säga kroppens förmåga att uppfatta dess position och rörelse, aktiveras genom dessa aktiviteter, vilket är centralt för barnens fysiska utveckling (Roley Smith 2020).

### 6 Imagination Station

Zonen är dedikerad till kreativa aktiviteter och konst, vilket ger barnen möjlighet att utforska olika texturer, färger och former. Detta stimulerar inte bara deras sinnen, utan skapar också en djupare emotionell koppling till miljön, vilket stärker deras känsla av identitet och tillhörighet.

## Diskussion

Resultatet betonar vikten av att gestalta för multisensoriska element på skolgårdar i urbana miljöer för att stödja barns psykiska och fysiska hälsa och utveckling. Detta presenterades genom en konceptuell programplan där sex zoner med varsin karaktär utvecklades för att främja multisensoriska och naturliga upplevelser för barn.

Resultatet visar att naturen erbjuder en mångfald av multisensoriska upplevelser och hälsofördelar, som minskad stress, ökad fysisk aktivitet och förbättrad koncentration. Många av skolgårdarna i Berlin hade en riklig mängd vegetation, vilket stöder litteraturens slutsatser om att natur på skolgårdar är viktigt. I fallstudien beslutades det därför att avsätta en stor del av skolgården för ny vegetation och natur. Dessutom betonas vikten av att skapa utomhusklassrum och skolträdgårdar för att främja ökad koncentration, minskad stress och stödja praktiskt lärande.

Slutsatserna från arbetet visar att det mest effektiva sättet att skapa multisensoriska upplevelser och värden på skolgårdar är att låta naturen vara en vägledande inspiration i utformningen. En skolgård som rymmer riklig vegetation och naturliga inslag erbjuder en multisensorisk upplevelse. Genom att sträva mot detta kan landskapsarkitekter aktivt bidra till att främja en hälsosam barndom i urbana miljöer, både idag och i framtiden.

## Key Terms

### Design

The term "*design*" is frequently used throughout this work. In Swedish, the word has a different connotation in landscape architecture compared to its English counterpart. In Swedish, the term "*gestaltning*" is more commonly used for the design of outdoor environments, while in English, "*design*" is used more broadly. In this work, "*design*" is used in English but is intended to convey the same meaning as the Swedish term "*gestaltning*" throughout the study.

### Multisensory Design

In this work, multisensory design refers to planning and creating environments that offer experiences that engage multiple senses simultaneously. This can include all senses: sight, hearing, smell, taste, and touch. In this study, it is considered multisensory if the design engages two or more senses.

### Nature

This work addresses the concept of nature broadly. For this study, nature is primarily defined from a North and Central European perspective, where the expected nature to be included is that which fits the local plant zones. Nature in this work does not include desert, tundra, plain, or mountainous landscapes. In other contexts, such environments might be included if appropriate for the setting.

### Integration

In this work, the term "integration" is frequently used. It does not imply that integration will occur, but rather that it is planned to be possible. It has a more conceptual meaning and is used in many hypothetical contexts.

### Physical Activity

In this work, the term "physical activity" refers to engaging in movement such as running, walking, jumping, or climbing. This study specifically pertains to activities typical for primary school-age children in a schoolyard.

# TABLE OF CONTENTS

## CHAPTER 1 - INTRODUCTION

The Loss of Green Spaces in Growing Cities .....	14
Green Schoolyards Shaping Children's Play and Learning Environments .....	14
Physical Activity .....	15
Integrating Multisensory Elements .....	15
Purpose & Questions .....	15
Limitations .....	15

## CHAPTER 2 - METHOD AND MATERIAL

Research Through Design .....	17
Literature Review .....	17
Research Trip to Referential Projects .....	17
Conversation in the field .....	17
Case Study .....	18
Presentation .....	18

## CHAPTER 3 - LITERATURE REVIEW

Nature's Impact on Human Health .....	20
The Psychoevolutionary Theory .....	20
Attention Restorative Theory .....	20
How Play in Green Spaces Enhance Child Well-Being .....	21
Risky Play from an Evolutionary Perspective .....	21
The Brain and the Senses .....	22
The Multisensory Experience: The Key to Inclusive Design .....	22
The Five Senses .....	23
Defining a Sense of Place .....	24
Loose Parts as Design Elements .....	25
Conclusions: Applying New Knowledge on Schoolyard Design .....	26

## CHAPTER 4 - RESEARCH TRIP TO BERLIN

Grün Macht Schule and Their Principles .....	28
Travel to Berlin .....	29
Stop 1: Eltern- Kinder- Tagesstätte .....	30
Stop 2: Paul- und- Charlotte- Kneise- Schule .....	31
Stop 3: Lew- Tolstoi- Grundschule .....	32
Stop 4: Brodowin- Grundschule .....	33
Stop 5: Bornholmer Grundschule .....	34
Conclusions .....	36
Designing Schoolyards: Lessons from Grün Macht Schule .....	36

## CHAPTER 5 - RESULT

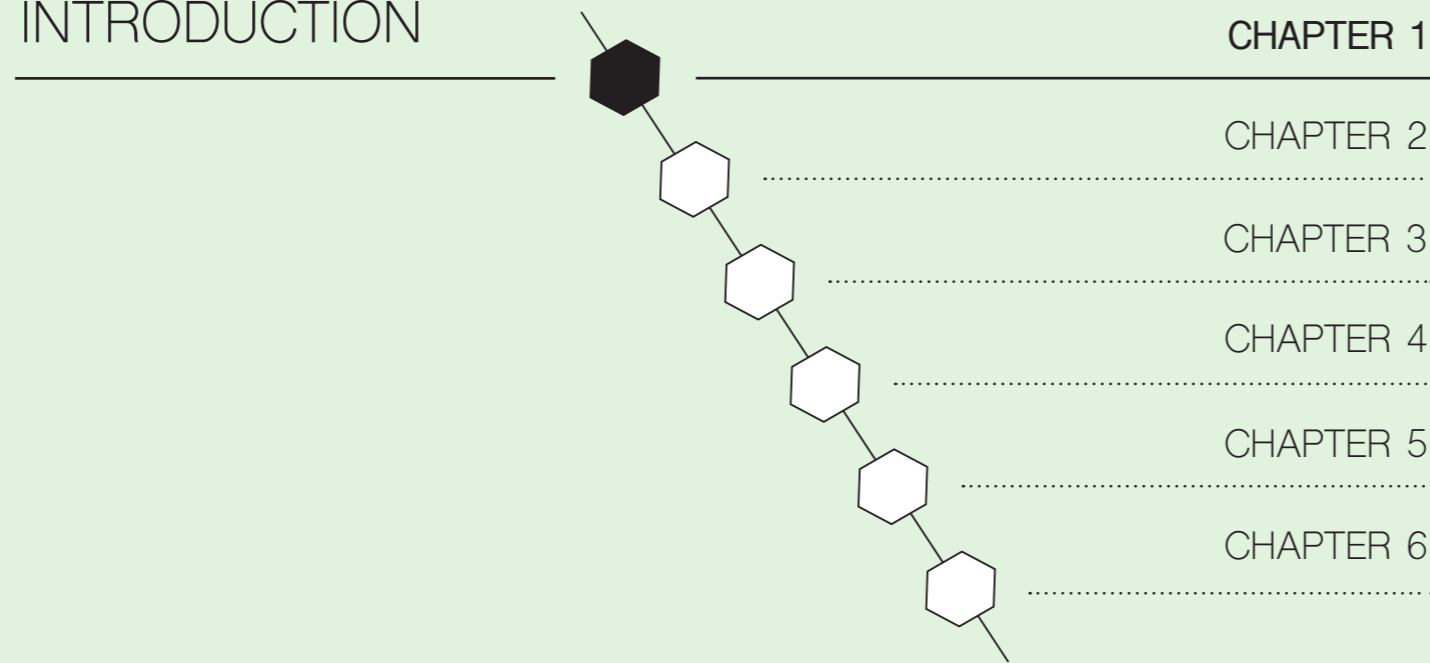
Munich Overview .....	38
Grundschule an der Schwanthalerstraße 87 .....	39
Site Visit .....	39
Inventory .....	41
Place Analysis .....	42
Analysis Plan: Functional Aspects .....	43
Environmental Features .....	44
Programming .....	45
Conceptual Program Plan .....	46
Implementation .....	46
Removal of Statue .....	46
Reconstruction of Stone Wall .....	48
The Characters .....	49
The Forest .....	49
Sensory Play Space .....	50
Pollinator Paradise .....	50
The Classroom .....	51
The Sports Field .....	52
Imagination Station .....	52
Multisensory Table .....	53

## CHAPTER 6 - DISCUSSION

Result Discussion .....	55
Method Discussion .....	56
Research Through Design .....	56
Literature Review .....	56
Research Trip .....	56
Case Study .....	57
Wider Impact .....	57
Future Directions .....	57
Closing Remarks .....	58

REFERENCES .....	59
List of figures .....	60

INTRODUCTION



CHAPTER 1

CHAPTER 2

CHAPTER 3

CHAPTER 4

CHAPTER 5

CHAPTER 6



Fig. 1. The logo of The International School Ground Alliance (ISGA, 2024).

This master's thesis was conducted in Munich, Germany, during the spring and summer months of April to August 2024. My experience during the summer made me acutely aware of the importance of shade and green spaces in urban environments. As a Swede, used to and accustomed to a cooler climate, I anticipated a warmer climate in Germany. However, I didn't expect the intensity of the heat, which made it nearly unbearable to be outside unless I was near water or shade. The lack of greenery and the prevalence of paved surfaces like asphalt highlighted the urgent need for more thoughtful urban planning, particularly in spaces designed for children, such as schoolyards.

## The Loss of Green Spaces in Growing Cities

Climate change and urban densification are reducing green spaces in cities, limiting children's opportunities for outdoor play and contact with nature. This loss of green outdoor space risks having negative long-term consequences on children's health and development.

According to the United Nations, the proportion of people residing in cities is projected to rise from 50% in 2010 to nearly 70% by 2050 (Haaland & Konijnendijk van den Bosch 2015). By 2025, 60% of children will live in cities (Christensen & O'Brien, 2003). This shift will lead to expansion and densification of urban areas, and children's opportunities for outdoor play and learning in nature are diminishing due to poorly designed cities, over-scheduled childhoods, and growing fears around safety and liability (ISGA 2024). As migration to cities continues worldwide, the imperative for sustainable urban development is becoming more critical (Haaland & Konijnendijk van den Bosch, 2015).

Fredrika Mårtensson (2011) argues that the current trend of urbanization represents a cultural paradigm shift in our relationship with nature, particularly affecting children. Louise Nyström (2003, cited in Mårtensson 2011) asserts that children's spontaneous and daily outdoor activities in urban settings have diminished due to various factors. Two reasons are the decreased density of children in residential areas and the rarity of stay-at-home parents. Consequently, local environments are less lively and socially monitored, while schools are concentrated in fewer locations. As a result, very few children today can, want to, or are allowed to engage in activities that were commonplace in the 1960s, such as playing outside, climbing trees, cycling on secret paths, damming streams, and fishing. Opportunities for spontaneous outings in green areas and parks have significantly declined (Nyström 2003, cited in Mårtensson 2011).

## Green Schoolyards Shaping Children's Play and Learning Environments

The International School Grounds Alliance (ISGA) is a global non-profit network of organizations and professionals dedicated to improving the design and use of school grounds to enhance children's

learning and play. ISGA promotes the idea that school grounds are vital for children as places where they spend significant time. For many children, these areas are the primary space where they experience outdoor play. What they encounter on the school grounds can profoundly shape their development and sense of identity. Many countries are at the forefront of this movement, creating innovative outdoor spaces that reflect their unique cultural and environmental contexts. Two organizations that are part of the ISGA are the OASIS project in Paris and Grün Macht Schule in Berlin.

The OASIS project aligns with other long-term Parisian plans like the Paris Climate Plan and the Biodiversity Plan. One key project initiative focuses on transforming schoolyards in Parisian preschools, elementary, and middle schools into "cool islands" by incorporating nature-based solutions to manage heat and stormwater (Ferrer et al. 2022).

Grün Macht Schule is a Berlin-based organization that translates to "Green Makes School." It significantly enhances school environments through sustainable, green design and education. It supports schools in creating natural, engaging outdoor spaces that promote ecological awareness and hands-on learning for their pupils (Grün Macht Schule 2024).

A green schoolyard fulfills several essential functions. Grün Macht Schule (GMS) addresses this, meaning a vibrant and natural schoolyard improves well-being and relaxation during breaks. Nature allows children to discover, feel, smell, and use. GMS also emphasizes that involving children in the care of plants conveys essential knowledge and strengthens personal responsibility. Having nature in the schoolyard is beneficial not only for the children themselves but also for the whole city. Additionally, integrating greenery, such as tall plants and trees, into schoolyards enables children to play outside with reduced UV exposure (Strålsäkerhetsmyndigheten, 2024). Young children's skin is susceptible and cannot produce protective pigmentation as effectively as adults.

Excessive sun exposure in early childhood can lead to skin changes and an increased risk of skin cancer in adulthood. Strålsäkerhetsmyndigheten stresses the importance of promoting good sun habits from a young age by designing children's outdoor areas with a mix of

# INTRODUCTION

the schoolyard can all contribute to this and should be considered in schoolyard design. Once the vegetation is established, it will provide more shade each year with proper care.

## Physical Activity

Faskunger et al. (2018) indicate proximity and access to nature increase physical activity and establish that students with higher physical activity generally exhibit better grades than those with lower activity levels (ibid). The design, quality, and size of school grounds influence pupil's levels of physical activity and the quality of outdoor education. Additionally, studies demonstrate that health and learning are closely interconnected; students in good health perform better academically, which in turn is strongly linked to better health later in life. Therefore, encouraging physical activity during school is essential for achieving positive outcomes (Faskunger et al. 2018).

School grounds with abundant greenery can consequently be considered a central element in providing daily contact with nature for students and a vital component for improving the quality of recess and supporting the school's efforts in outdoor education. Through educational design, schoolyards can significantly contribute to increased interest in play and learning, which Faskunger et al. (2018) mean aligns with the school's primary purpose – to educate and create the possible conditions for teaching.

## Integrating Multisensory Elements

There is a strong correlation between sensory experiences and how environments are perceived. When recalling rich memories, especially those with positive associations, sensory details are often a main aspect (Rieh, 2020). For children, the environment is primarily experienced through the senses, shaping their understanding of the world (Rieh, 2020). Elements and environments that stimulate different senses—such as textured surfaces, varied physical challenges, and natural features like plants and water—can foster sensory development, promote well-being, and encourage more active

and engaged learning. According to Smith Roley et al. (2015), designing schoolyards that offer multisensory experiences can help children develop better sensory integration, leading to improved relaxation, communication, physical activity, and a stronger connection to their school community.

## Purpose & Questions:

The purpose of this master's thesis is to contribute knowledge of how landscape architects can play a vital role in enhancing urban environments for children, by incorporating greenery and multisensory experiences. The study explores how schoolyards in dense urban settings, with their specific problems and potential, can be improved by integrating natural and multisensory features into the planning and development processes.

*1. What role do multisensory experiences and the integration of greenery play in designing schoolyards that effectively support children's health and development?*

*2. What specific design elements and strategies can be proposed in a conceptual program plan for enhancing the schoolyard at Grundschule an der Schwanthalerstraße 87 in Munich to create health-promoting and multisensory experiences for children?*

## Limitations

This master's thesis analyzes the impact of schoolyards on children's mental and physical development, health, and well-being through the lens of landscape architecture and environmental psychology. It primarily targets students and professionals in landscape architecture and urban planning and positions in the education sector.

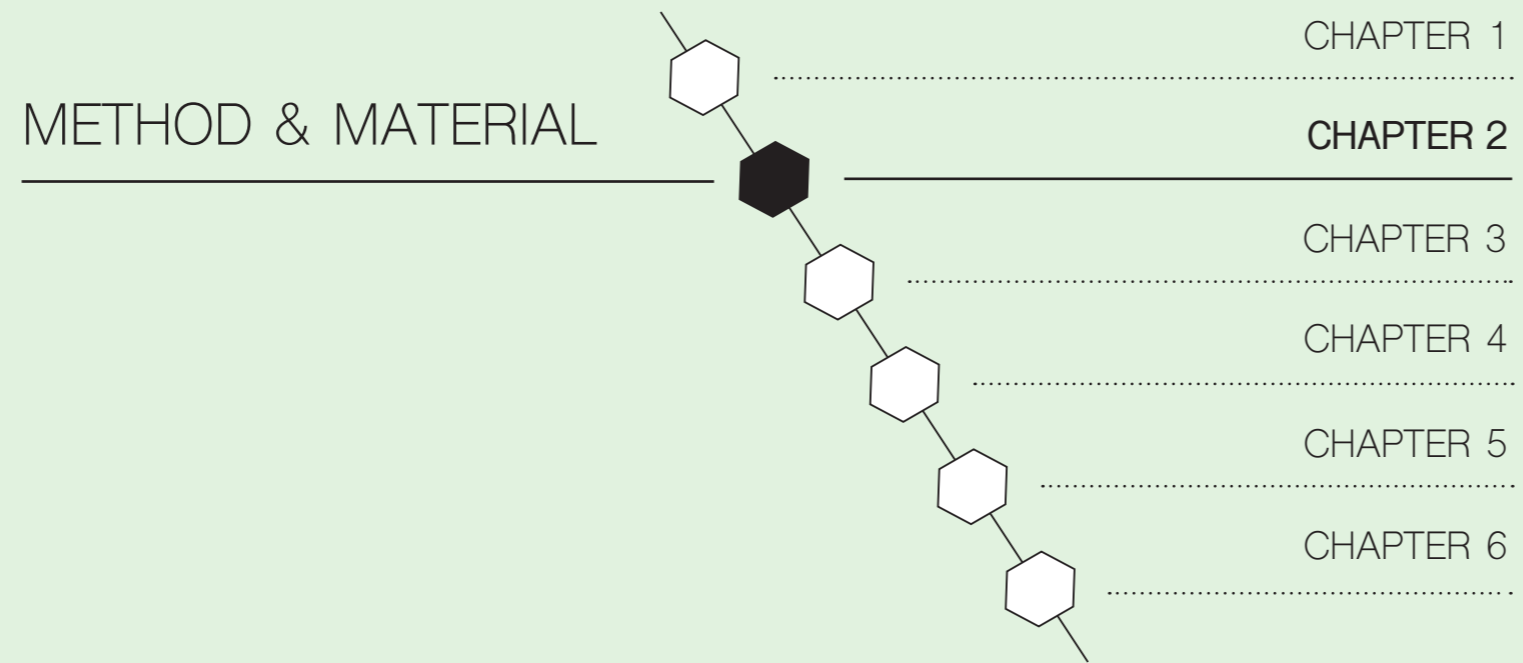
Schoolyards are in focus for this research, especially in densely populated urban areas where improvements are critically needed. Drawing from my background in Sweden and familiarity with its

I took the opportunity during my Erasmus internship in Munich to gain broader insights into the design of schoolyards in other parts of Europe. Due to time constraints, it was not feasible to compare multiple schoolyards, which would have provided a more nuanced understanding and the potential to identify patterns. Consequently, the geographical scope of this study was limited to Munich, allowing for a more concentrated and in-depth examination. A case study was conducted on a specific schoolyard in a densely populated Munich area.

For the same reason, the research trip only included the five projects in Berlin since there was no time for more research trips.

The study focus on primary schools catering to children aged 6-12. This age was chosen because these formative years of childhood significantly impact children's development.

Due to limited time, the final presentation is based on an early stage program plan based on the literature review, the research trip and place analysis and inventory on the site. The presentation shows principal illustrations and suggestions for improving multisensory elements, physical activity and how to plan and design for more greenery at the chosen schoolyard. The suggestions and illustrations are intended to serve as inspiration that could be applied to other projects or urban areas frequented by children.





## Research Through Design

In this thesis, the Research Through Design (RTD) method was applied by using design as a tool to explore and test new ways to create health-promoting, multisensory schoolyards. I started by defining the challenge of limited green spaces in urban environments and their impact on children's health. From there I developed a conceptual program of the schoolyard at Grundschule an der Schwanthalerstraße 87 in Munich to try different strategies.

Through the design process, I reflected on how each character, represented by a color in the conceptual program, fulfilled the goal of creating a multisensory environment and made adjustments based on the feedback from each iteration. This iterative process allowed me to learn which elements (e.g., vegetation, elevation changes, loose materials) best supported children's play and well-being. In this way, RTD helped bridge the gap between theoretical ideas and practical solutions, providing new knowledge to inform future schoolyard designs.

The results from the conceptual program for the schoolyard were evaluated against the research questions and purpose. It reflected on that the outcome could be applied to other contexts, contributing to both design practice and the academic body of knowledge (Deming & Swaffield, 2011).

By following parts of the RTD framework, I ensured that my thesis not only addressed a specific design problem but also contributed to broader discussions about the role of nature and multisensory elements in schoolyards.

Furthermore, the following research methods were used: Literature review, a research trip to referential projects and a case study.

## Literature review

The literature review served as a guiding component in the work, aimed at gathering knowledge in preparation for the study trip and subsequently applying found theories and knowledge on the chosen schoolyard in Munich. This effort was undertaken to establish what previous research had concluded regarding the positive impacts of nature on children's development and health,

multisensory design, and why the schoolyard as a place is of such great importance.

### The main objects of the literature review were...

1... To delve into nature's influence on human health. It discussed Roger Ulrich's (1991) Psychoevolutionary Theory and Rachel and Stephen Kaplan's (1989) Attention Restoration Theory to underscore the significance of nature's presence on human well-being.

2... To investigate Ellen Hansen Sandseter and Leif Kennair's views on risky play from an evolutionary perspective, highlighting the lessons we can learn from our adaptation.

3... To emphasize the role of our senses and significance and explore how multisensory design can enhance children's health and development. It drew on insights from landscape architect, professor, and author Daniel Roehr, particularly from his book *Multisensory Landscape Design: A Designer's Guide for Seeing*, to illustrate how this knowledge can guide the planning and design of future urban landscapes. Additionally, the review incorporated Jean Ayres' Sensory Integration Theory, highlighting her view that humans have more than just the traditional five senses. Under the multisensory umbrella, the chapter also discussed the importance of incorporating loose parts as design elements, explaining how they engage the senses and positively impact children's cognitive and social development.

4... To explain the meaning and importance of place attachment and a sense of place during childhood and why it is crucial to consider when planning and designing a schoolyard.

Both printed and electronic sources were used. The literature was drawn from previous course materials, oral recommendations, and searches in electronic databases such as Google Scholar and Scopus.

## Research Trip to Referential Projects

A significant component of this thesis was the research trip to Berlin, which aimed at gaining knowledge and inspiration from schoolyards designed and influenced by the German organization Grün Macht Schule (GMS). Since my work was set in Munich, and GMS is a part of the International School Ground Alliance (ISGA), it was a natural choice for me to seek inspiration from them for this master thesis. The referential projects included schoolyards that prominently featured greenery as a central element. Among these, one was a preschool, while the remaining were primary schools. The objective was to analyze schoolyards that could serve as an inspiration for the selected schoolyard in Munich.

### The schools that were visited in Berlin:

1. Eltern-Kinder-Tagesstätte „Eene meene Mopel“  
[Sewanstraße 120, 10319 Berlin]

2. Paul-und-Charlotte-Kniese-Schule  
[Erich-Kurz-Straße 6-10, 10319 Berlin]

3. Lew-Tolstoi-Grundschule I Europaschule in Berlin-Karlshorst  
[Römerweg 120, 10318 Berlin]

4. Brodowin-Grundschule  
[Liebenwalder Str. 20-22, 13055 Berlin]

5. Bornholmer Grundschule  
[Ibsenstraße 17, 10439 Berlin]

## Conversation in the field

During the research trip, I had the privilege to be guided by Ulrike Wolf, a member and employee at GMS. This opportunity allowed me to engage in discussions and interview her about the organization's journey. Therefore, I could incorporate the interview method into my research. However, I adopted a "conversation in the field" approach with Ulrike, welcoming new and spontaneous topics aside from my already chosen ones along the ride. To provide a more vivid and engaging spirit, I wrote it with a phenomenological focus to make the reader feel like they

were with us on the ride.

Phenomenology is an approach that emphasizes understanding and describing an individual's experiences and perceptions of a phenomenon (Martiny et al. 2021). Two perspectives from the technique that were utilized for this thesis were:

**Rich description:** The goal is to create a detailed and nuanced description of the phenomenon, incorporating various perspectives in the participant's experiences. This involved using their own words and quotes to illustrate these descriptions (Martiny et al. 2021).

**Experience as a Focus:** The primary aim is to understand how participants experience the situation. This involves carefully listening to their descriptions and striving to capture the essence of these experiences (Martiny et al. 2021).

The objective of using a phenomenological approach for the research trip was to create a more dynamic chapter that immerses the reader, making them feel like they are a part of the journey,

## Case Study

The result of this thesis was the case study. Everything previous culminated in this phase, where all knowledge and theories were applied and tested.

Case studies in landscape architecture has a dynamic nature, allowing the acquired knowledge to become more relevant and practical. Most importantly, it demonstrates how the design proposal can be utilized, created, and implied within the architectural field. Case studies are widely utilized in organizational research and various social sciences, such as sociology, psychology, anthropology, employment relations, and architecture (Hartley 2004). The purpose of a case study is to offer an analysis of the context and processes that shed light on the theoretical issues under investigation. As Hartley (2004) notes, a case study is not merely a method but a comprehensive research strategy.

The search for a suitable school for the case study began early on. With guidance from my advisor, Dr. Prof. Udo Weilacher, I received recommendations on potential areas and schools of interest. The criteria included that it had to be a primary school, centrally located, and not already fulfilling too many health-promoting and natural-like criteria. After further discussion with Prof. Dr. Weilacher, I contacted the city administration on Munich Town Hall's website [[www.muenchen.de](http://www.muenchen.de)]. I was directed to their Department of School Construction in the School Administration Office. On their website, Munich's Geoportal [<https://geoportal.muenchen.de/portal/bildung/#>] lists all kindergartens, primary schools, and gymnasiums that have been renovated, are planned to be built or are scheduled for demolition as part of Munich's school building initiative approved in 2014. The geoportal provided detailed information on these projects, making it a valuable resource for identifying schools needing upgrades. The goal was to find a school scheduled for renovation. Newly renovated schools did not require further improvement, but those slated for updates provided a relevant focus for my study. From the geoportal, I selected nine primary schools within central Munich and spent a day visiting and assessing them. Due to safety regulations, I could not enter all schools, which influenced my final choice. Ultimately, I chose Grundschule an der Schwanthalerstraße 87. Once the primary school was chosen, I contacted their administration to request an educational visit to observe the schoolyard. I also spoke with one of the teachers, Mrs. Martina Strehler, who proved helpful and inspiring. Additionally, I took many pictures and videos during my site visits to gain foundational insights into this school. This information guided my efforts to enhance their schoolyard.

## Presentation

The work consist of a combination of text, photographs, and illustrations on A3 sheets. The design includes a conceptual program plan and conceptual illustrations and sections in various scales, all aimed at making the content as straightforward as possible for the reader. The programs used include InDesign, Illustrator, Photoshop, AutoCAD, and Procreate.

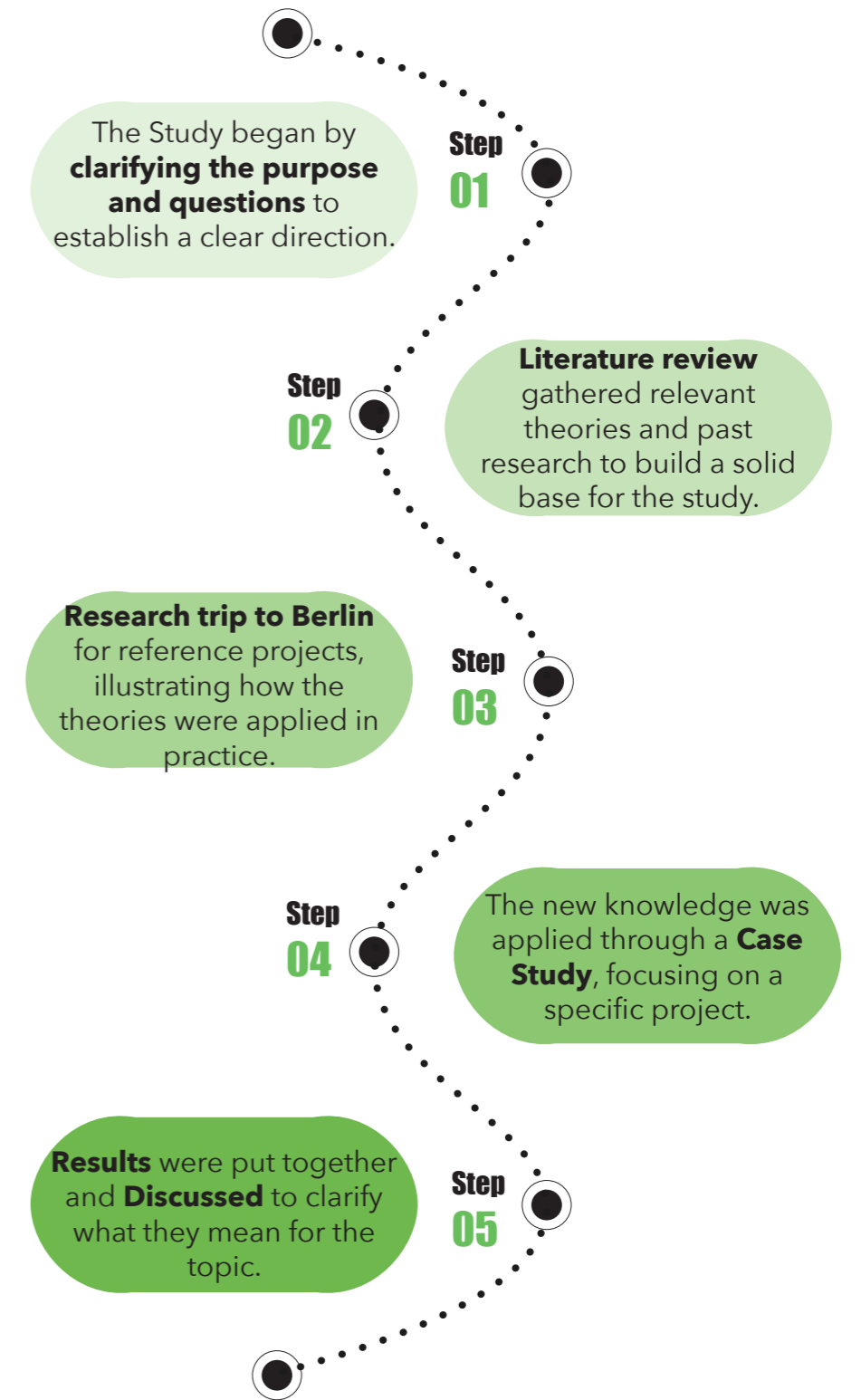
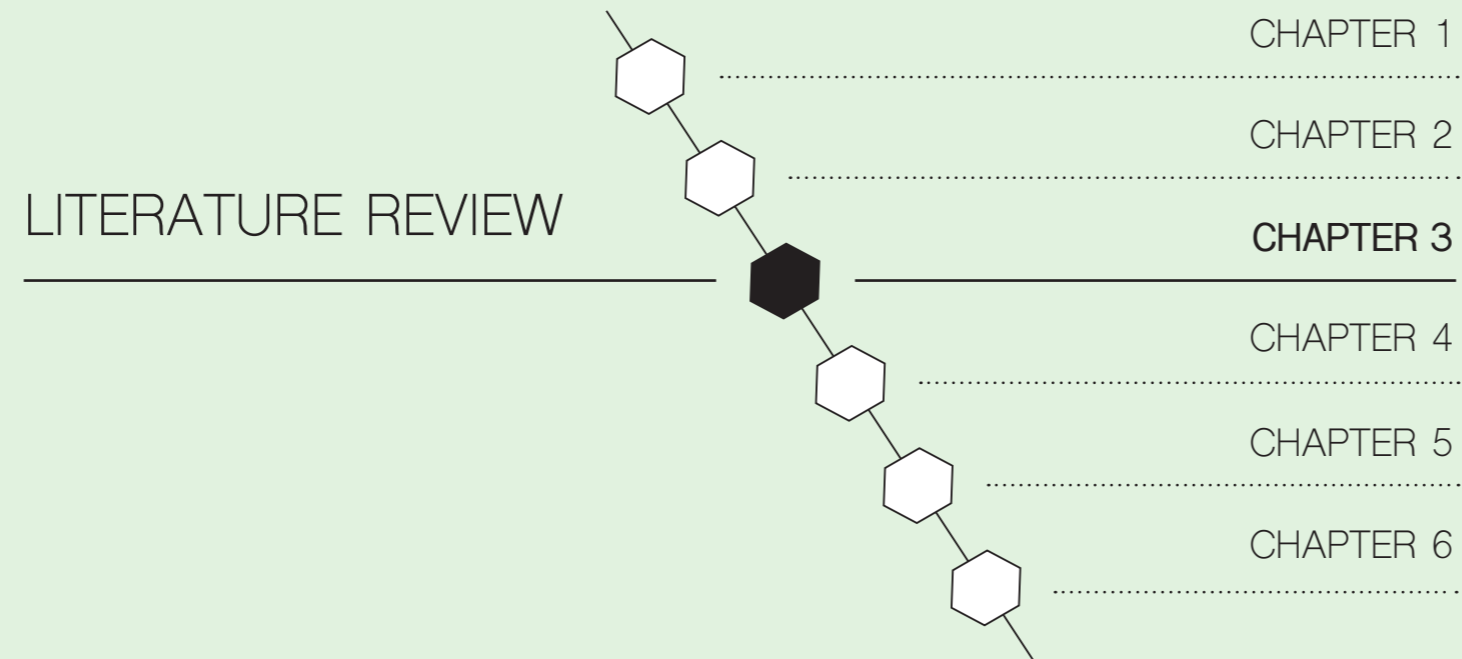


Fig. 2. A conceptual framework illustrating the structure and organization of the study.



## Nature's Impact on Human Health

Humans, like all other species, have been shaped by evolutionary forces. The term “Environment of Evolutionary Adaption” (EEA), associated with the work of British psychologist John Bowlby, denotes the environmental conditions to which humans are biologically adapted (Grinde & Grindal Patil 2009). Historically, humans were far more immersed in nature than they are today. Throughout our evolutionary history, plants played a crucial role in survival, serving as food, shelter, water, and even medicine sources. Theoretically, the presence of plants, integral to the human EEA, likely influenced brain evolution, in which Grinde and Grindal Patil (2009) point out that humans are adapted to live in verdant environments.

Biophilia refers to human's innate love and affinity for plants and other living organisms in their environment (Grinde & Grindal Patil 2009). Historical evidence from ancient Egypt and the ruins of Pompeii show there has been a persistent admiration for nature, where plants were incorporated into homes and gardens over 2000 years ago, exemplifying this enduring relationship with nature (ibid). A report by the Health Council of the Netherlands comprehensively reviews this issue and concludes there is a positive correlation between health indicators and proximity to nature (Grinde & Grindal Patil 2009). Psychological benefits from contact with nature have been documented, including stress reduction, improved attention enhanced mental restoration, and better coping with attention deficits (ibid). These benefits are associated with various nature experiences, ranging from true wilderness to neighborhood parks, gardens, and natural features around residences.

### The Psychoevolutionary Theory

Roger Ulrich's Psychoevolutionary Theory, based on his research on human experiences in built versus natural environments highlights the connection between physical and mental health, well-being, and stress (Ulrich et al. 1991). The researcher gained significant attention for his article “*View Through a Window May Influence Recovery from Surgery,*” which documented that hospital patients with views of green landscapes recovered more quickly than those with views of walls or other sterile environments. Ulrich (1991) identifies four potential advantages of nature:

- 1. Physical activity:** Being in nature often encourages physical activity, which promotes health.
- 2. Social interaction:** Nature activities frequently involve socializing, such as walking together, sitting in the park with friends, or playing, which helps build social networks with well-documented health benefits.
- 3. Escape from Routine:** Nature offers a temporary escape from everyday routines and demands.
- 4. Direct Psychological Impact:** Nature itself positively escapes the mind. Beyond the physical and social advantages alone, performing tasks in a natural environment may have additional benefits (Ulrich et al. 1991).

### Attention Restorative Theory

Rachel and Stephen Kaplan notably discuss Attention Restorative Theory (ART), which argues that specific environments inherently appeal to humans more than others and create a positive feeling, known as an aesthetic reaction (Kaplan & Kaplan 1989). Kaplan (1989) posits that this reaction is an unconscious survival instinct, helping us understand and sort our surroundings to identify and avoid threats. The authors suggest that we employ two types of attention, directed and involuntary, which form the foundation of ART. Kaplan's theory asserts that natural environments have a unique ability to restore our mental attention and cognitive skills after they have been drained by long periods of focus and effort. The theory is based on the idea that our attention can become fatigued and that exposure to natural settings can help us recover. Directed attention requires effort and concentration, like when solving mathematical problems or reading texts in foreign languages, leading to eventual mental exhaustion. In contrast, effortless attention, also known as fascination, arises spontaneously and without exertion, often in engaging and aesthetically pleasing environments, particularly in nature (ibid). ART suggests that spending time in places that encourage involuntary attention can help us recover from mental fatigue and improve our cognitive function and overall well-being.

Another researcher who refers to ART is Swedish psychiatrist and author Anders Hansen. He suggests that natural environments help restore our mental attention and cognitive abilities after they have been depleted by prolonged periods of focus and effort. Hansen (2021) discusses the influence of nature on the brain and mental health, highlighting several key points that align with previous authors.

Hansen explains that nature helps reduce the stress hormone cortisol, decreasing heart rate and blood pressure. Time in nature can alleviate feelings of anxiety and depression while enhancing feelings of happiness and well-being. The author points out that nature can improve cognitive functions such as attention and concentration, and research indicates that people who spend time in a natural setting have better working memory and attentional capacities. Hansen argues that time in nature can also foster social interactions and strengthen social bonds.



Fig. 3. Illustration of a brain with leaves growing out of it. A metaphorical representation of the term Biophilia.

## How Play in Green Spaces Enhance Child Well-being

Outdoor play has become an exception rather than the norm, and the role of parents has shifted. Given the perception of traffic as dangerous in Western cultures, a direct consequence of the densification of cities, more children are driven by car (Mårtensson 2011). Consequently, indoor activities like video games, phones, and television – collectively known as screen time – have quickly become a central part of their everyday life, creating mental health issues among children (Rieh, 2020). Spending many hours indoors poses a considerable risk of a lack of physical activity, which is crucial for maintaining good health. Faskunger et al. (2018) spotlight that a sedentary lifestyle often persists into childhood, significantly elevating the risk of various diseases such as cardiovascular diseases, osteoporosis, diabetes, certain forms of cancer, depression, and premature death as an adult. Obesity poses significant health and economic burdens in countries like the US and the UK, impacting individuals and healthcare systems due to associated diseases (Chawla 2015). Fredrika Mårtensson (2011) notes the spontaneous formation of peer relationships is also weakened due to children’s mobile lifestyles, individualized school schedules, and separated parents.

Chawlas’ (2015) research reveals that proximity to green spaces predicts better mental health and emotional adjustments in children, although the effect may vary depending on family income and education level. The correlation between proximity to green spaces and levels of physical activity stands out as one of the most frequently explored advantages of nearby nature for children (ibid). Her research also targets landscape features conducive to physical activity, predominantly on school grounds. Children tend to sustain moderate activity levels in school environments featuring natural elements like trees, shrubs, rocks, water, and combinations of built equipment and vegetation (Chawla 2015).

Increased green space is associated with a significantly lower rate of 15 out of 24 diseases, and according to Chawla (2015), in children, the most significant effect was seen in lower rates of depression. The author underscores mental well-being being linked to greenery levels. Measures such as children’s self-assessments, parental perceptions, and professional diagnoses suggest that access to nature act as a protective buffer (ibid).

## Risky Play from an Evolutionary Perspective

Ellen Hansen Sandseter and Leif Kennair (2011) explore children’s play from an evolutionary perspective in their article “*Children’s Risky Play from an Evolutionary Perspective: The Anti-Phobic Effects of Thrilling Experiences.*” They examine the evolutionary functions of risky play, focusing on how it can mitigate phobias. According to the non-associative theory, a modern approach to understanding the origins of anxiety, children naturally develop fears of situations they are not yet mature enough to handle during early childhood. Risky Play encompasses a range of motivated behaviors that provide children with thrilling positive emotions and expose them to previously feared stimuli. As children’s coping skills improve, they can master these situations and stimuli, leading to reeducation in fear (Hansen Sandseter and Kennair 2011). The authors hypothesize that through play, children reduce anxiety related to situations that were once perceived as dangerous during earlier stages of their development. A study aimed at categorizing risky play through observations and interviews with children and preschool staff identified six categories:

**1. Play with Great Heights:** The risk here is the danger of falling, with activities such as climbing, jumping from stable or flexible surfaces, balancing on high objects, and swinging at significant heights. Positive outcomes include familiarizing oneself with the environment and improving motor and physical skills like muscle strength, endurance, and skeletal development. Additionally, playing at great heights enhances perceptual competencies such as depth, form, shape, size, and movement perception, which are crucial for survival in childhood and adulthood (Hansen Sandseter and Kennair 2011).

**2. Play with High Speed:** This involves activities where uncontrolled speed and pace could lead to collisions, such as swinging, sliding, sledding, running, biking, or skating at high speed. The most evident evolutionary function of high-speed play is the enhancement of perception—particularly depth and movement perception, as well as the perception of size and shape. Activities like swinging and sliding also train spatial orientation abilities. High-speed play affects physical fitness and motor skills, helping children develop general physical competence (Sandseter & Kennair 2011).



Fig. 4. An illustration of a child swinging on a tire swing, serving as an example of 'Risky Play' (Pinterest, n.d.).

**3. Play with Dangerous Tools:** The positive aspects of this type of play relate to object play, where children manipulate objects in various ways, such as hitting or throwing them. Pellegrini and Bjorklund (2004, cited in Hansen Sandseter and Kennair 2011) argue that the significant amount of time children spend playing with and manipulating objects highlights this activity's importance and adaptive relevance for developing competence both in childhood and later life. Engaging with objects and loose parts allows children to explore and understand the properties and functions of their environment, which can contribute to the development of essential skills, including tool use.

**4. Play Near Dangerous Elements:** This could involve playing near deep cliffs, deep or icy water, or fire pits. This type of play allows children to explore their environment and understand its possibilities and limitations. Research shows that children may only sometimes be fully aware of the dangers, as they are often engrossed in their activities, such as role-playing or chasing games. Hansen Sandseter and Kennair (2011) suggest that the function of playing near dangerous elements may be indirect, as the danger itself is not central to the play but still influences how children learn to handle environmental features like water, cliffs, and fire. Given that children have historically played near dangerous ecological features, it is likely that evolutionary selection has improved their ability to recognize real risks.

**5. Rough-and-tumble play:** Involves activities where children might harm each other, such as wrestling, stick-fencing, or play-fighting. Research indicates that boys engage in rough-and-tumble play more often than girls, with roughness increasing with age. This type of play is considered an evolutionary adaptation, providing immediate and long-term benefits, including physical training, social competence, aggression regulation, and physical health (Sandseter & Kennair 2011).

**6. Play where children can "disappear / get lost":** This could be situations where children might wander away from adult supervision or explore unfamiliar environments alone. Research shows that exploration is a significant part of children's play, with boys more likely than girls, to explore more significant areas. This tendency is

connected to what Bowlby termed the environment of evolutionary adeptness (EEA), where males were required to navigate diverse and expansive areas while hunting. Playing in an exploratory way helps kids develop skills like understanding depth, shapes, sizes, and movement. Sandseter and Kennair (2011) suggest that this type of play, especially when it involves pretending, helps children learn about their environment in a fun and engaging way.

## The Brain and the Senses

The brain is the central organ of the nervous system in most animals, including humans. It serves as a command center for the body, responsible for processing sensory information, regulating emotions and behaviors, and handling higher cognitive processes such as thinking, reasoning, and decision-making (Goldstein 2009). A great deal of brain research is about the cerebral cortex. This two-millimeter-thick layer protects the brain's surface and contains the mechanisms responsible for perception, language, memory, cognitive processes, etc. (Mather 2011). It contains about ten billion brain cells (ibid). Special functions at the surface of the cerebral cortex serve specific purposes. One of these areas is the frontal lobe. This one receives signals from all the senses and plays a vital part in perceptions involving coordinating information received through two or more senses (Goldstein 2009).

The human senses comprise the big five: sight, hearing, touch, smell, and taste. Each of these senses produces a sensation. Sensation is a fundamental experience provoked through stimulation from a sense organ, such as brightness, sound, and saltiness. We can get a perception from sensations, meaning a complex and meaningful experience from an external event created by a combination of many different sensations and emotions (Mather 2011). The source of perception is the information sent to the brain through sensation (Steg 2019). Thus, our senses act as the gateway to experiencing life; nothing enters our brain without passing through them first.

## The Multisensory Experience: The Key to Inclusive Design

Daniel Roehr (2022, p. 8) writes this in his book *Multisensory Landscape Design A Designer's Guide for Seeing*: *"Us as designers need to recognize that our bodies, particularly our senses, are recording mechanisms that can help us as we absorb and create. Therefore, educators must develop more opportunities for this mindful design education"*.

As landscape architects, we can change the future by influencing the urban environment and becoming more inclusive. Architecture and the external environment usually focus on the visual (Roehr 2022). The lack of the other senses in urban development creates exclusive spaces and barriers for everyone to connect. Roehr (2022) claims multisensory design has the opportunity to make changes.

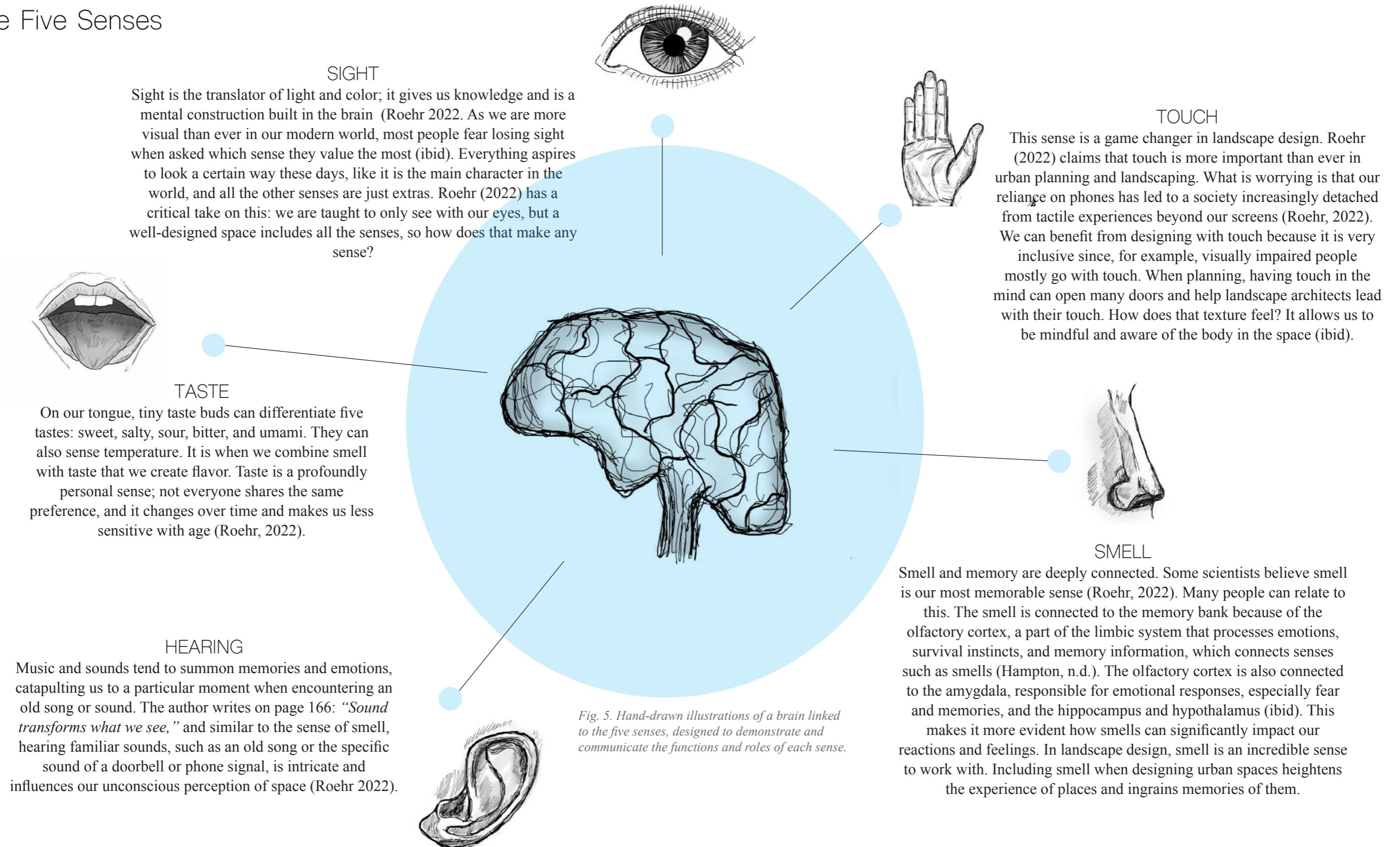
Dr. Jean Ayres, an occupational therapist with advanced training in neuroscience and educational therapy in the USA, championed the idea that humans possess more than the traditional five senses (Roley Smith 2020). She identified additional sensations that provide crucial information about the body's internal state. According to Ayres, all sensations fall within three primary categories: interoception, proprioception, and exteroception. Combined, these sensations provide an individual with essential information about themselves and their environment (ibid).

**1. Interoception:** Sensations originating within the body, perceived through internal organs or viscera.  
Example: The feeling of hunger or fullness in the stomach.

**2. Proprioception:** Sensations related to body position and movement, perceived through the vestibular, proprioceptive, and kinesthetic sensory systems.  
Example: The sensation of the head-turning or muscles contracting.

**3. Exteroception:** Sensations originating from outside the body, perceived through taste, smell, touch, hearing, or vision.  
Example: Seeing a friend and hearing your name being called (Roley Smith 2020).

## The Five Senses



## Defining a Sense of Place

What is a place, and what is a space? What is the difference between these two? Maria Vittoria Giuliani (2003) explains that when a space is given emotional value, it becomes a place. Further, to explain place bonding a bit deeper, the term refers to people's emotional strings to a geographic location. Mazo and Devine-Wright (2020) talk about how social bonding and social capital have a significant influence when an emotional tie is being made. Place attachment can be physically rooted in a community, which relates to place identity and dependence (Mazo & Devine-Wright 2020). From that point of view, it is easier to understand the process: when someone feels safe and accepted by their surroundings, it is easier to form an attachment. An adolescent study showed that place attachment is significantly related to social capital and feelings of safety (Mazo & Devine-Wright, 2020). Place identity is a cognitive mechanism of self-concept and personal identity about the place one belongs to (Mazo & Devine-Wright 2020, p.165). Thus, relating this to a child's ability to form place attachments, it is essential to know which places children usually spend the most time. In many cases, the difference between home and school is equal. A child forming an attachment to their home is natural; it is where their family or caregivers live, and they also have an interpersonal attachment (Mazo & Devine-Wright 2020). What becomes interesting is diving deeper into a child's place attachment to their school.

Childhood represents a unique phase marked by increasing self-awareness and the pursuit of individual identity. As adults, we often reminisce about childhood, piecing together memories of places and events, as abstract concepts of time can be challenging to grasp. The French philosopher Gaston Bachelard observed that childhood memories are often anchored to specific physical spaces within a house, such as cozy nooks or unique corners, rather than an abstract notion of space (Rieh 2020). He suggests that architecture, rooted in bodily experience, can evoke a profound sense of reality, engaging our senses and imagination. When recalling a place from childhood, our memories may not be captured physically, but rather the emotions, scents, smells, and textures associated with those experiences (Rieh 2020).

Rieh (2020) explained that their attachments transition from individuals to locations as children grow. Large settings may hold

significance for children, as they lack mobility and are not directly associated with their comfort and support. Therefore, it takes time for children to recognize the aesthetic value of places that may not directly address their immediate needs. This underscores the importance of considering the aesthetic value of environments in the arms of children's cognitive development and level of maturity (Rieh 2020).

When adults reflect on their childhood memories, they are often laden with emotional height and a tendency to idealize the past. Clare Cooper Marcy's long-term research on memory sketches, mainly focusing on architecture- and landscape architecture students at the University of California, Berkley, shows this (Rieh 2020). She tasked them to draw and reflect on their most cherished childhood environments. Interestingly, she found a correlation between their memory sketches and the spatial designs they created in their studio projects (ibid). This phenomenon, which she termed "environmental autobiography," emphasizes the intimate connection between one's sense of self and one's environment, which takes root in childhood (Rieh 2020).

Physical factors appear to be the most consistent attributes when cultivating a sense of place, unlike social and personal factors, which vary depending on individual circumstances (Rieh 2020). An adult survey regarding remembering places in school settings revealed a clear trend: outdoor spaces overwhelmingly dominated (ibid). Over 80% of respondents cited an outdoor location as their memory place, with classrooms, libraries, and cafeterias being rarely mentioned. This preference for outdoor spaces aligned with research highlighting the significance of nature in childhood environments (Rieh 2020). The therapeutic effects of nature are widely acknowledged in environmental psychology. Even among adults who grew up in urban environments, memories often revolve around natural elements like ground surfaces, trees, and water (Rieh 2020). These experiences of the natural world play a pivotal role, providing a sense of grounding in childhood memories.

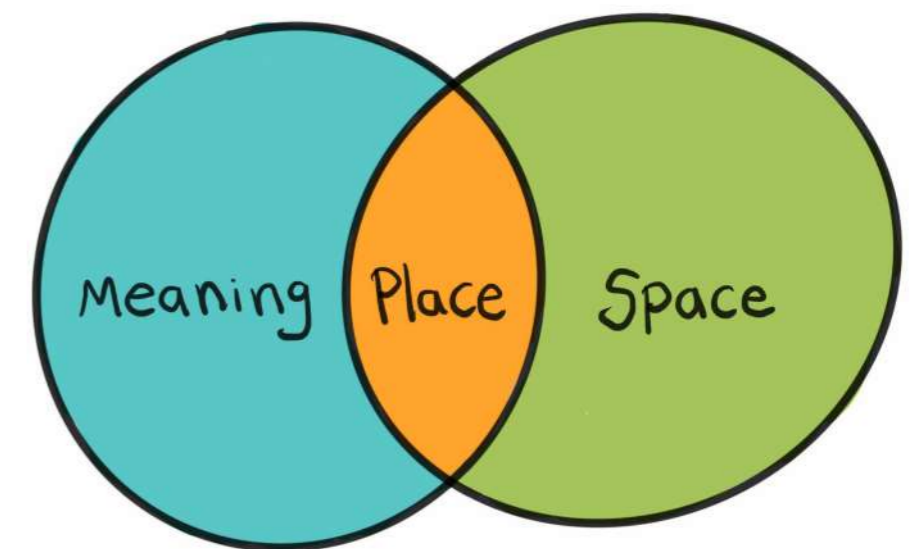


Fig. 6. Three hand-drawn, color-coded bubbles representing the process and transition from a mere space to a meaningful place, illustrating the concept that *Meaning + Space = Place*.



## Loose Parts as Design Elements

Architect Simon Nicholson introduced the “Loose Parts” concept in his 1971 paper *“The Theory of Loose Parts.”* Nicholson characterized loose parts as variables encompassing sensory experiences like smells and other physical phenomena, including electricity, magnetism, and gravity (Casey & Robertson 2016). Thus, playing with loose parts is a multisensory experience because it engages multiple senses dynamically and interactively.

Hyndman et al. (2014, cited in Casey & Robertson 2016) found that loose-parts play significantly boosts creative and imaginative play among children. Hyndman’s study indicates that children who engage in loose-parts play tend to play cooperatively and socialize more effectively. According to the researchers, loose-part play promotes higher physical activity levels among children. By integrating loose parts into play environments, children experience many developmental benefits that support physical, social, cognitive, and emotional growth (Syft et al. 2016).

According to the *“Loose Parts Toolkit”* report by Creative STAR Learning, loose-parts play is integral to real-world learning for children and young people. Loose parts present endless possibilities. For instance, a stick can transform into a fishing rod close to real or imaginary water, a spurtle in a mud kitchen, or a tool to reach a football stuck in a tree. Natural environments, such as mature woodlands or beaches, often provide a greater abundance of loose parts with higher levels of affordance than artificial play spaces like asphalt school playgrounds or tidy urban parks (Casey & Robertson, 2016). In fixed play spaces, it is akin to painting with a limited palette of colors. Introducing and engaging with loose parts fosters collaboration, according to Casey and Robertson (2016), such as shared thinking, problem-solving, and decision-making, culminating in enhanced play experiences. Facilitating quality loose parts significantly impacts health and well-being, initiating a positive development cycle.

Hyndman et al. (2014, cited in Casey & Robertson 2016) found that loose parts play a significant role in creative and imaginative play among children. The study indicates that children who engage in loose-parts play tend to play cooperatively and socialize more effectively. According to Hyndman et al. (2014), loose-part play promotes higher physical activity levels among children.

By integrating loose parts into play environments, children experience many developmental benefits that support physical, social, cognitive, and emotional growth (Casey & Robertson 2016).

Research indicates that inexpensive items such as crates and buckets stimulate more excellent physical activity and creativity among children than costly play equipment (Casey & Robertson 2016). These conclusions stem from a comprehensive study evaluating the play behaviors of primary school children across varied playground environments. Introducing simple, everyday objects during recess and lunch breaks has been shown to halve sedentary behavior, enhance creativity, and promote social interaction and problem-solving skills (ibid).

Industrially inspired components like tires, wheels, and trolleys have also proven beneficial in play settings (Casey & Robertson 2016). These items symbolize adventure, encouraging exploration into the unknown, testing boundaries, and the experience of calculated risks leading to discovery. Casey and Robertson (2016) also mean that they facilitate a sense of belonging by providing spaces for shelter, security, and personal exploration, thereby defining territories and offering places of refuge.

Essential loose parts identified for effective play include rubber inner tubes, ropes, fabrics, cardboard, bulky containers like suitcases and large tires, wooden planks, bins, life jackets, saddles, and logs (Casey & Robertson 2016). These elements offer diverse play opportunities and embody an environmentally conscious and sustainable approach through principles of reuse and recycling. They are notably free from gender, social, and cognitive biases, promoting inclusive play experiences (ibid).

By offering such diverse and versatile materials, loose parts play supports creativity, physical activity, and social interaction, contributing to holistic development and improved well-being for children and adolescents.

Examples of loose parts include:

- 1. Natural resources:** Items like straw, mud, and pine cones.
- 2. Building Materials and Tools:** Objects such as planks, nails, and hammers.
- 3. Scrap Materials:** Old tires and off-cuts of guttering.
- 4. Random found objects:** Miscellaneous items were discovered during play (Casey & Robertson 2016).

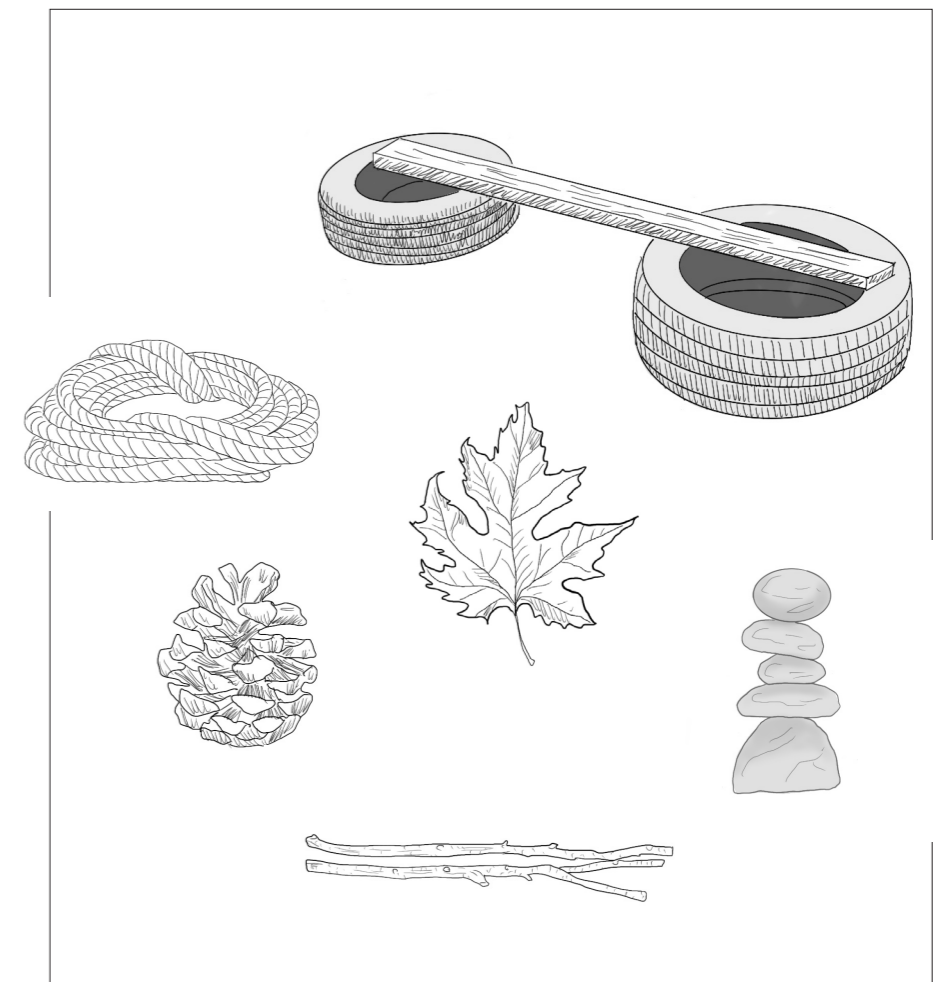


Fig. 7. Hand-drawn illustrations of different loose parts: tires with a plank on to create a balance path, a rope, a pine cone, a leaf, stones and sticks.

## Conclusions: Applying New Knowledge on Schoolyard Design

Based on the literature review, several key conclusions have been drawn. These conclusions inform five practical recommendations for integrating these findings into schoolyard design, focusing on spatial awareness and creating distinct "rooms" within the space.

### 1. Natural Walls and Ceilings

Drawing on the concept of Biophilia and the restorative effects of greenery, the schoolyard's spatial layout can incorporate living plants, shrubs, and trees to create natural walls, ceilings, and floors. Green walls can form cozy nooks where children can retreat for quiet play or reflection, supporting Kaplan's Attention Restoration Theory by offering spaces for "effortless attention." Trees with large canopies can serve as natural ceilings, immersing children in greenery, which has proven psychological benefits, as noted in Ulrich's research. Natural materials like grass, earth, or sand as flooring can further encourage exploration and multisensory experiences.

### 2. Elevated Surfaces and Natural Nooks

To create opportunities for risky play, incorporating elevation changes and sloped surfaces, ideally in open areas, could encourage high-speed play as Hansen Sandseter and Kennair (2011) underscore. Varying the flooring material—such as soft grass, gravel, or sand—would support different speeds and types of movement. It's also important to keep some large open spaces to accommodate this kind of activity. For exploration play, nature can be used to design hidden corners, tunnels, or sheltered spaces where children can hide and explore. Dense shrubs or small trees can form natural walls that offer a sense of privacy, creating nooks that provide safety and stimulate curiosity.

### 3. Multisensory Corners

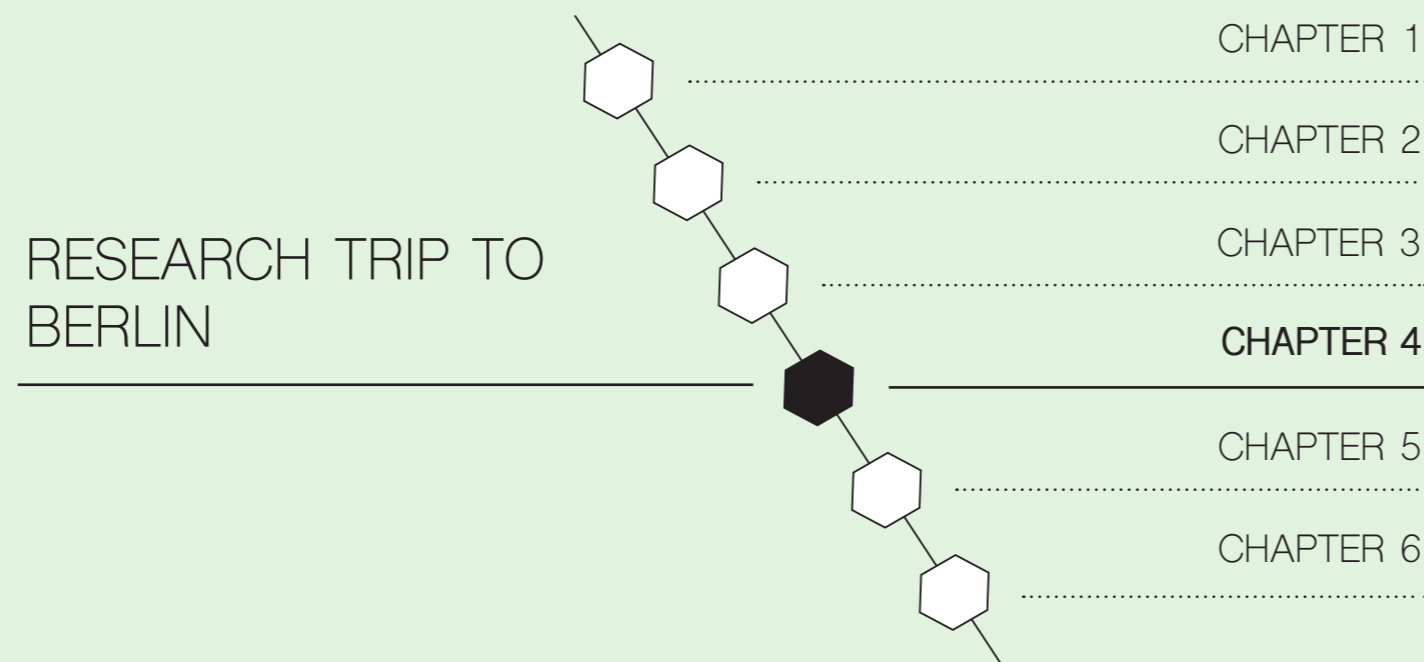
From a multisensory perspective, the spatial design of a schoolyard can enhance auditory experiences in several ways. Nooks and corners can be designed to vary acoustic properties, creating both quiet zones and areas where sound is amplified. For instance, spaces with distinct corners can increase sound intensity, while barriers can reduce noise levels for greater privacy. Additionally, covered areas or canopies can amplify the sounds of rain or wind, adding to the sensory experience. Walls or barriers can also protect from wind or stray balls, further contributing to a well-rounded sensory environment.

### 4. Creating Flexible Spaces with Loose Parts

To foster sensory-rich play with loose parts, consider incorporating sandboxes, water features, or areas with manipulable materials such as gravel, sand, or mud. These elements offer children the chance to experiment with natural tools and materials, giving them a multisensory experience as Casey & Robertson (2016) draw attention to. Larger loose parts, like a large rock or substantial shrub, can act as boundaries between areas. Additionally, materials like sticks, logs, or planks allow children to construct their play structures, such as walls and ceilings, adding a sense of flexibility and creativity to the play environment.

### 5. Strengthening Place Attachment with Safe Rooms

From a place attachment perspective, spatial awareness is key. Transforming a space into a meaningful place involves incorporating elements like nooks and sheltered areas where children feel safe and secure. Such features can strengthen their emotional connection to the space and enhance place attachment by engaging the senses and evoking the emotions, scents, and textures that make the space meaningful, as Rieh (2020) suggests.





**Beratungsstelle für ökologische und kindgerechte Schulhofgestaltung**

Fig. 8. The logo of GMS (Grün Macht Schule 2024).

## Grün Macht Schule and Their Principles

At the end of 1983, the Berlin Nature Conservation Foundation established the Grün Macht Schule (GMS) working group as a project. This group, which included teachers, parents, architects, and landscape architects, met monthly to gather information and address issues related to schoolyard use and design. The initiative quickly gained recognition and popularity.

The core principles of GMS include fostering self-confidence and actively involving teachers, students, parents, and the broader school community in all phases of schoolyard design. Additionally, it emphasizes integrating these green projects into student's everyday learning and lives (Grün Macht Schule 2024).

GMS is part of the Berlin School Building Initiative, a comprehensive program addressing the significant need for school construction and renovation in Berlin (Grün Macht Schule 2024). GMS supports Berlin schools in transforming conventional, uninspired schoolyards into natural, diverse, and imaginative spaces that offer various play, exercise, nature experiences, and communication opportunities. The initiative informs, advises, and assists schools in planning and implementing child-friendly, natural, and ecological play and learning environments in alignment with the Berlin education program (ibid).

In 2020, GMS released a complete card set, "Schoolyard Habitat," which offering 18 different criteria, suggestions tips, examples, and arguments for how to create the most optimal and excellent schoolyard, as seen in figure 9, 10 and 11 (Wolf et al. 2020).

## Nature instead of concrete

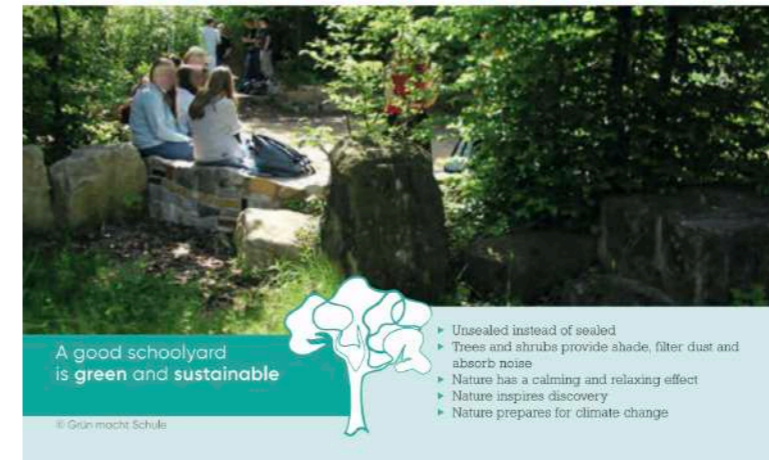


Fig. 9. Card number 2 of the 18 criterias by © Grün Macht Schule (Wolf et al. 2020)

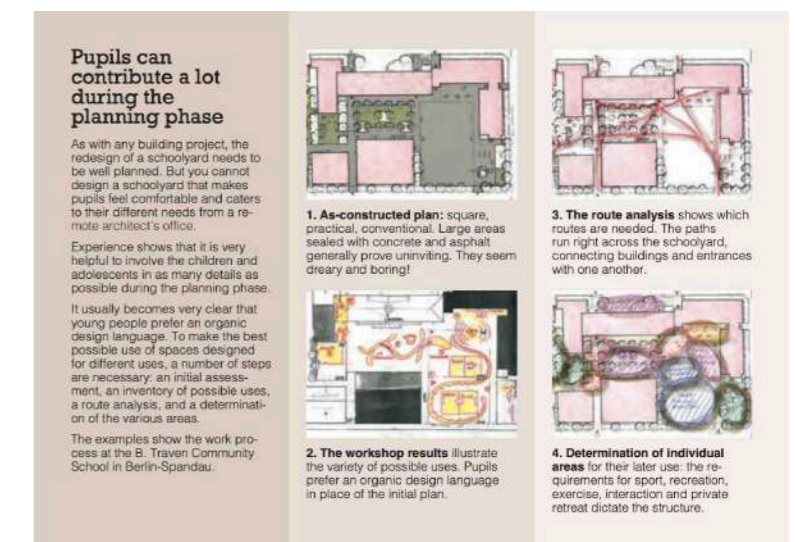


Fig. 10. Card number 13 of the 18 criterias by © Grün Macht Schule (Wolf et al. 2020).

## No risk is itself a risk



Fig. 11. Card number 6 of the 18 criterias by © Grün Macht Schule (Wolf et al. 2020)

# RESEARCH TRIP TO BERLIN



Fig. 12. An illustrated map of Germany with a red dot indicating the location of Berlin (Vecteezy, n.d.)

## Travel to Berlin

June 11th, 2024

I arrived at Berlin Hauptbahnhof at 1 p.m. and had a few hours to kill before meeting my guide and hostess, Ulrike Wolf. I explored notable landmarks such as the Brandenburger Tor and Spree River, feeling excited to be in such a vibrant city. At 8 p.m., I took the S-bahn towards Ulrike's residence, where I received a warm and generous welcome. That evening, over a cup of lemon tea, we began discussing the Grün Macht Schule initiative and its origins.

Ulrike Wolf, a former gymnasium teacher, ceased teaching approximately ten years ago to dedicate herself full-time to Grün Macht Schule. Her background provides her with valuable insights into children's perspectives, which is crucial for designing and planning future schoolyards. Before going to bed, she told me:

*“Many individuals involved in developing future schoolyards approach it from an adult’s perspective rather than a child’s. We do not see the world through the same lens as children, you see. Tomorrow, you will understand this better as we visit the schools.”*

Curious about what she meant by that, we said good night to recharge for an intense and exciting day ahead.

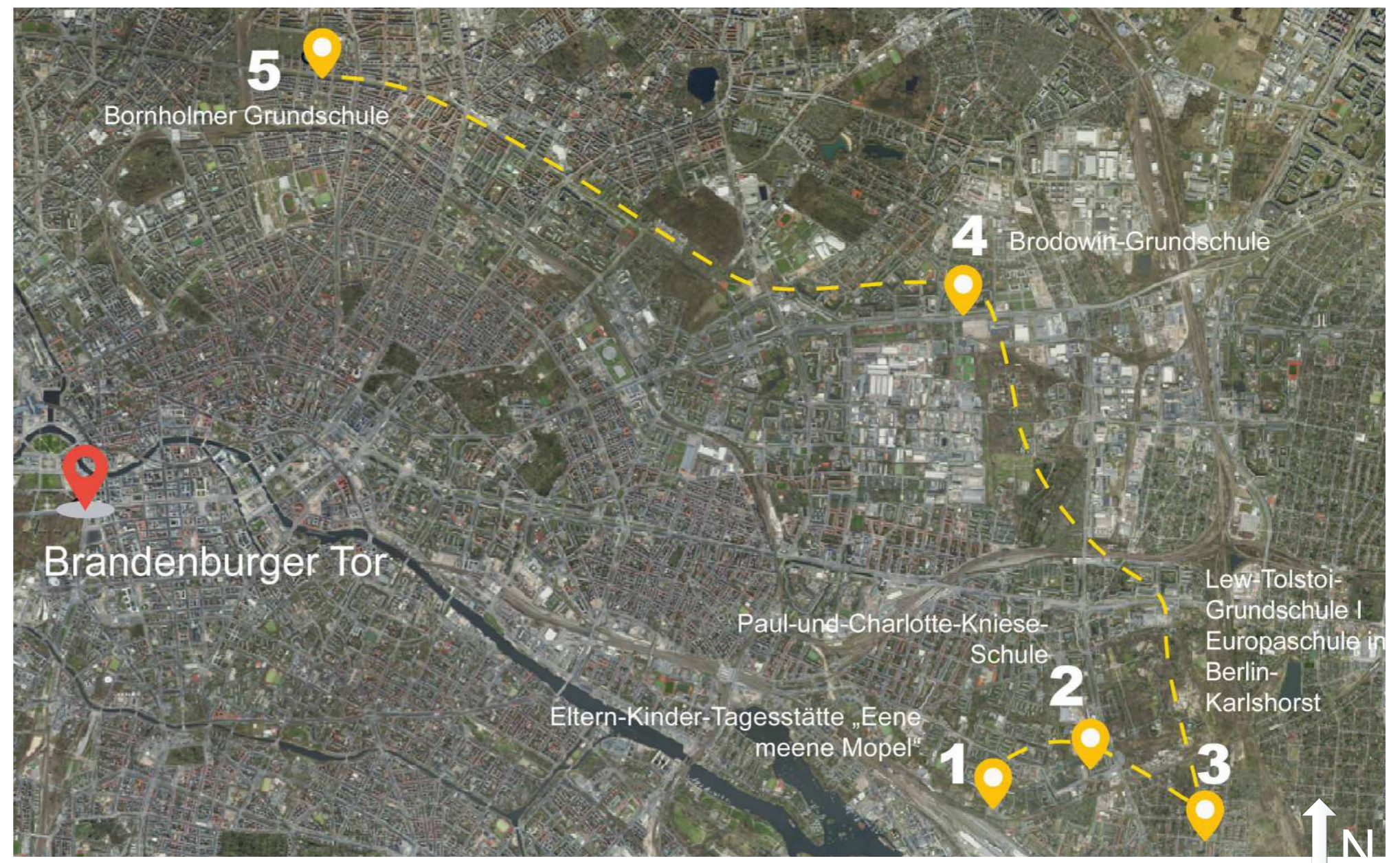


Fig. 13. Map over Berlin that shows the bike route that me and Ulrike took when we visited the referential projects. Brandenburger Tor is included as a landmark to provide orientation. Map sourced from ©Geoportal Berlin. Edited later in Illustrator.

Scale: 1: 50 000

# RESEARCH TRIP TO BERLIN

## Stop 1: Eltern-Kinder-Tagesstätte. „Eene means Mopel.“

June 12th, 2024

The next morning, our route began at Karlholst station, and we set off briskly towards our first stop, kindergarten, Eltern-Kinder-Tagesstätte. „Eene means Mopel.“

We reached our destination around 9:45 a.m. Externally, the school building did not look like something extraordinary. Ulrike informed me that the building dated back to the Cold War era in East Berlin and was characterized by facades with a notably rigid aesthetic. From its exterior, one would anticipate a flat, hardscaped area. However, this assumption could not have been further from reality. After entering the preschool and conversing with the headmaster, we were led to the backyard as seen in figure 17.

The schoolyard was delightfully chaotic, brimming with bushes, trees, and plants that created rooms, nooks and tunnels. It was like stepping into an enchanted garden, where each corner reveals something new. A flat, paved section was outside the building before the garden area commenced.



Fig. 14. Photo of the schoolyard seen from the door on the back of the school building.



Fig. 15. Uneven surface to make it more challenging for the children.



Fig. 16. Play area in natural materials at the preschool.



Fig. 17. Outdoor seating area for the children situated under the foliage of trees.



Fig. 18. The area features hilly terrain, as Ulrike highlighted as a positive aspect, along with a large 'buddy swing'.

Ulrike explained, “New terrain has been laid here to provide the children with a variety of hills, curves, and contours. And here,” she continued, pointing to the stone slabs, “the material is recycled and intentionally arranged in a disordered manner to create an uneven surface for the children to navigate. The ground surface introduces a potential risk of falling, thereby teaching the children how to manage such situations.”

The preschool was remarkably green and lush, evoking the atmosphere of an old cherished garden. The surrounding vegetation created numerous nooks and enclosures in terms of walls and natural ceiling from tree canopies, provided inviting spaces for the children to explore. The preschool was replete with multisensory elements, including various tactile features such as trees, bark, sand, and water. Although the auditory experience was somewhat compromised by external noise, the environment included many balance elements that aided in practice body coordination.

In one corner of the schoolyard was a giant sandbox equipped with a water pump. Ulrike pointed out: “There are water pumps throughout this schoolyard, both standalone and adjacent to the sand. Playing with sand, water, and clay dramatically benefits the children. Unfortunately, such elements are increasingly rare in modern schoolyards.” As I stood there, I took a few more photographs, admiring the garden these German children enjoy daily. It was then time for us to depart, and we resumed our journey on our bikes.

# RESEARCH TRIP TO BERLIN

## Stop 2: Paul-und-Charlotte-Kneise-Schule

The next stop was Paul-and-Charlotte-Knese-Schule, the first primary school we visited. Upon arrival, I noticed the abundance of plantings integrated into benches and along the building façade. There were small islands of vegetation and plant beds throughout the area. Light ropes mark boundaries, yet they were not so restrictive as to inhibit vegetation growth beyond them, a feature Ulrike emphasized as necessary. These small areas contributed to biological diversity, attracting bees, butterflies, and other pollinators while teaching children the importance and value of nature.

A particular surprising moment occurred while Ulrike and I were walking, and she abruptly stopped me to point out:

*“Do you see those rose bushes with thorns?”* I nodded, thinking perhaps they were out of place at a schoolyard. Sensing my thoughts, she continued, *“You might think these shouldn’t be here, but they are intentionally places. We also have stinging nettles on purpose, so the children learn it hurts if they are not careful. No risk is also a risk.”* We were interrupted by the school bell as all the children ran towards the entrances of the surrounding buildings. Ulrike remarked: *“This is an important consideration. When planning a schoolyard, you must anticipate the paths children will take. They will always choose the fastest, most direct route to get inside. Thus, avoid placing asphalt paths beside the main lane; the children will run through the plantings and grass fields if that is the quickest way.”*



Fig. 19. Photo of the schoolyard next to the school building.



Fig. 20. Biodiversity hotspots designed to promote pollinators and ecological benefits.



Fig. 21. The entrance to the school garden.



Fig. 22. A photo of growing tomatoes in the school garden.



Fig. 23. Photo of a running track leading to a sand pit, with a multisport area visible in the background.



Fig. 24. A lavender planting designed to promote biodiversity.



Fig. 25. A planting area for pollinator plants, bordered by a stone wall and a wooden bridge.



Fig. 26. A sanded area featuring natural wooden elements, with a cloth overhead providing shade

She continued: *“The hardscaped path of the side will go unused. You see here, elements are obstructing the direct path, but it’s not fully blocked. The children can still run straight but must zigzag slightly. This created micro obstacles, encouraging physical activity.”*

As we continued walking, we arrived at a sign reading “Herb Garden.” In a separate area of the schoolyard was an enclosed space surrounded by vegetation and a low concrete wall, with cultivation boxes where the children could water and care for the plants or be around them. It was astonishing to see children engaging in gardening during recess. The area was also filled with herbs and aromatic plants such as lesser calaminth and lavender, stimulating the olfactory senses.

There were two long-running lanes, one conventional and one ending in a sandbox, reminiscent of a long jump pit in the Olympics. Ulrike commented,

*“Two running lanes are excessive. It’s a waste of plastic and artificial materials. One lane would have been sufficient, and rather put vegetation where the other lane is.”*

*“Now,”* Ulrike said to me, *“we are going to visit a school that I don’t find particularly impressive.”*



Fig. 27. A photo of the school building seen in front of the main entrance.

## Stop 3: Lew-Tolstoi-Grundschule

We arrived at Lew-Tolstoi-Grundschule, a Europaschule in Berlin-Karlshorst. The building featured a Bauhaus-inspired design with fundamental beige colors and round, small windows as seen in figure 27. In front of the school building was asphalt, some simple plantings, and an astronaut statue. When I inquired if this was a gymnasium, Ulrike responded, *“One might think so. But it is a primary school. “Incredibly boring entrance for a primary school, I must say.”*

We proceeded to the back of the school, where we were met with more asphalt and elevated planting beds containing three small newly planted birches, shown in figure 28. We then moved to a larger sand area with a climbing frame. No trees were in sight in the large open space, putting the area in full sunshine without any source of shade nearby. I asked Ulrike if sand was a preferable surface choice for children’s playgrounds, and she replied negatively.

*“Sand encourages children to play, but if a playground is above, there is a higher risk of children falling onto others playing below. The ideal surface is wood chips. However, they are expensive and need to be replaced periodically.”*

Continuing our tour, Ulrike led me to the better part of the schoolyard: a corner area with more trees and wooden elements, seen in figure 31.

*“This is acceptable,” she said, “but overall, it is laughable from a child’s perspective. What can they do with an artificial cube and three newly planted trees? Unfortunately, this is a recently renovated school, so no changes are likely in the future.”*

I wondered aloud how such situations could occur despite existing research and the influence of Grün Macht Schule.

*“Don’t landscape architects have any say in how the school should be planned? Don’t city planners want to plant more trees or listen to them?”* Ulrike’s response surprised me.

*“The landscape architects are the most difficult to argue with. They believe this design was excellent and valued its simple, structured plan.”*



Fig. 28. Planting beds containing three small newly planted birches, at the back of the schoolyard.



Fig. 29. A photo of the back of the schoolyard, displaying the great area of hard surface.



Fig. 30. Large area of hardscaped area, featured by a ping-pong table, chess board mat and a large Maple tree.



Fig. 31. The better part of the schoolyard, according to Ulrike, with more nature and natural elements, like sand.



## Stop 4: Brodowin-Grundschule

The following primary school was Brodowin-Grundschule, a schoolyard in which Ulrike herself was involved. Upon our arrival, I heard the sound of happy children playing and running around. The schoolyard had an exciting terrain with small hills. I made my way up one of them and stood on a stone block, realizing I had a good view above the schoolyard. There were many natural elements and blocks, with a few traditional playground structures creating numerous outdoor nooks and rooms. Like the first stop at Paul-Und-Charlotte-Kniese-Schule, this school also had an herb garden and vegetation around the school building.

*“Integrating greenery and plantations close to the buildings is important,”* Ulrike said. *“It protects the facades while simultaneously promoting biodiversity.”*

We walked around and headed to the other side of the building. There, I found an outdoor classroom equipped with tables, benches, and a blackboard. On the day we arrived, they had just pruned a tree, so it was a bit messy, but this did not detract from the classroom's usability and appeal as a space for the children.



Fig. 32. An elevated area with natural elements like rocks, wooden stumps and sand.



Fig. 33. The elevated area seen from a wooden stump at the top, giving an overview over the schoolyard.



Fig. 34. Loose parts and pieces from tree logs, promoting a tactile experience.



Fig. 35. A photo of the school garden.



Fig. 36. The outdoor classroom located at the back of the schoolyard.



Fig. 37. Closer look at the blackboard in the outdoor classroom.



Fig. 38. Natural obstacle course-like lane that functions as a bioswale as well.



Fig. 39. Stinging nettles planted on purpose to promote risky play and teach children that they are a bit harmful.

We continued, and Ulrike wanted to show me one of her favorite spots in the schoolyard. It was at the back, between the school building and schoolyard fence. This area featured an obstacle course-like lane that also functioned as a bioswale, presented in figure 38.

*“When it rains heavily, this fills with water for the kids to play in,”* Ulrike explained, *“while also managing stormwater.”* A small bridge led us over the swale, allowing easy movement back and forth.

Much ground material was recycled and laid out unevenly, similar to the preschool, to create a varied surface. At the main entrance was an art installation of a fox among a flock of chickens, shown in figure 96.

*“Incorporating art into schoolyards is important,”* Ulrike emphasized. *“It has a distinctive touch and is a landmark to the school, fostering a sense of attachment.”*



Fig. 40. Photo of Ulrike entering and disappearing into the foliage and the leafy "cave".

## Stop 5: Bornholmer Grundschule

For our final stop at Bornholmer Grundschule, Ulrike and I paused at a local bakery to buy some Berliners, a delightful German pastry, to bring to the school. One of the teachers we were going to meet was an old friend of Ulrike. As it started to drizzle, we quickly made our way to the school.

The school building was a beautiful, historic structure adorned with Virginia creeper covering the façade. Upon entering, we were gated by large, old trees that formed a protective canopy overhead, shielding us from the rain. We continued around the building, and I initially thought the schoolyard ended at a wall to the side. However, Ulrike opened a small gate revealing a literal garden filled with trees, bushes, and flowers.

As we walked further, I noticed a small station with watering cans and an insect hotel behind it. Birdhouses were hidden among them, and the bushes were arranged to create tunnels for the children to explore. We then arrived at a small house.

"Is this a playground house for the kids?" I asked Ulrike. Before she could answer, it became evident that it was a bee farm, with hundreds of bees buzzing around. A staircase gave us a closer look at the bees and provided an overview of the schoolyard.

"This is amazing," I said to Ulrike. "But isn't it dangerous to have a bee farm in a schoolyard?"

"No, no," Ulrike reassured me. "The bees don't roam around the schoolyard, and the children know not to get close to the bee house."

We descended and continued through the bushes, arriving at a small pond. Nearby was a well-maintained box with water inside. The schoolyard had numerous nooks surrounded by greenery and loose materials like sticks, which the children had used to build their huts and shelters.

"They get all these sticks from Christmas trees," Ulrike explained. "After Christmas, when people dispose of their trees, the school collects many of them from the recycle station for the children to play with. As you can see, they are quite useful."

I looked around and saw multiple huts made with the Christmas trees. Ulrike was right.



Fig. 41. Garden tools such as shovels and watering can. Bee hotel is shown in the back.



Fig. 42. Photo presenting old and recycled christmas tree sticks, promoting loose-part play.



Fig. 43. Beehive/Bee house at the back corner of the schoolyard.

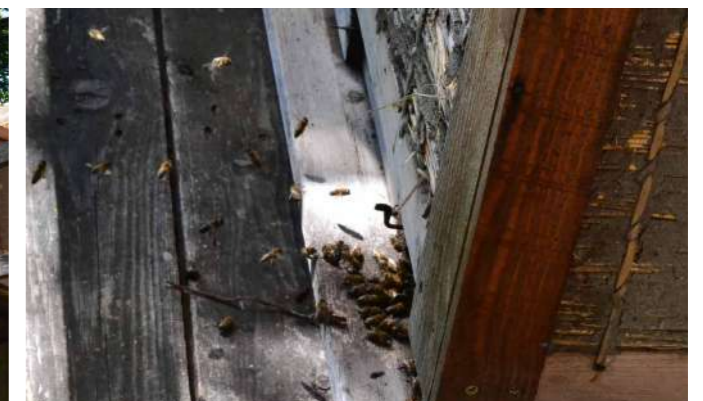


Fig. 44. Zoomed-in photo of the bees.

# RESEARCH TRIP TO BERLIN



Fig. 45. The tiny house where the afterschool teacher has his office.

Bornholmer Grundschule also had an herb garden for the children to tend to and several grilling spots for cooking food. Before leaving, we visited a small workshop house where the afterschool teacher had his “office,” as illustrated in figure 45. It gave an atmosphere that could belong in an H.C. Andersen story.

We sat down to reflect on the day. I took the opportunity to ask Ulrike a question I had been pondering.

*“Ulrike, you have been working with schoolyards for quite some time now. What would you say are the most important elements to include?”* Her answer was immediate and confident.

*“Many things. But if I had to choose a few, I would say as many natural elements and greenery as possible. Use nature and promote biodiversity in the design so that the children can see firsthand what nature does and what it brings. Use loose materials so the children can decide what they want to create. Nothing is boring about old tree sticks, tree stumps, etc. And if possible, make the terrain a little challenging. Create hills.”*

Ulrikes friend then returned from his office carrying two yellow jars.

*“Here you are,”* he said in German. *“This is honey from our bee farm on the schoolyard.”* I expressed my sincere gratitude and astonishment at receiving such a unique gift. It struck me that few students can claim their school produced its own honey.

I turned to Ulrike again and thanked her for the day and the time she had given me. As we prepared to leave the schoolyard and return to our bikes, Ulrike added to my previous question,

*“One more thing. Some might think this is messy, with all these sticks lying around, but it’s not. A schoolyard that isn’t too tidy or ready is perfect. Give the children the opportunity to ‘paint their own canvas’ to influence their schoolyard. After all, they will use it, so let it rest in their hands.”*



Fig. 46. A hut made of the old christmas tree sticks.



Fig. 47. The hut seen from the inside.



Fig. 48. Photo of a fire pit area.



Fig. 49. A table surrounded by chairs in the middle of the foliage.



Fig. 50. Photo showing a well with a water can above.



Fig. 51. A shelter, made for the children to play. It also provides protection from rain.



Fig. 52. Area designated for cultivation and planting. The image shows raised beds with plants and herbs.



Fig. 53. Image of a child playing on a wooden plank functioning as a balance beam.

## Conclusions

The literature review outlined key recommendations for improving schoolyard design, emphasizing spatial awareness and the creation of distinct "rooms" within these areas. These conclusions, formed by both the literature and field trip observations, are reflected in the Grün Macht Schule initiative and the schoolyards visited during the study trip.

The following six principles, along with insights from the literature review, will follow into the next phase of the study.

## Designing Schoolyards: Lessons from Grün Macht Schule

### 1. Integration of Natural Features

The integration of natural elements to define spatial boundaries, as discussed in the literature review, is prominently showcased in the Berlin schoolyards. At Bornholmer Grundschule, vegetation forms natural walls and ceilings, aligning with the recommendation to use living plants, shrubs, and trees. The dense foliage and tree canopies create cozy nooks, while natural flooring materials like sand, gravel, and earth enhance the space. These elements beautify the environment, foster biodiversity, provide rich sensory experiences, and offer opportunities for hands-on learning about nature.

### 2. Elevation and Varied Terrain

The integration of elevation changes and varied ground materials to promote risky play, as emphasized in the literature review, is clearly reflected in the Berlin schoolyards. For example, the Eltern-Kinder-Tagesstätte primary school features uneven surfaces and diverse terrain that facilitate high-speed and exploratory play. This approach aligns with Hansen Sandseter and Kennair's (2011) focus on the role of risk and physical movement in children's play.

### 3. Sensory Elements

The GMS initiative's integration of sensory elements such as water pumps and varied textures supports the creation of auditory variations and tactile experiences. For instance, the sand and water features at the Eltern-Kinder-Tagesstätte not only provide tactile stimulation but also enhance the overall sensory experience through sound amplification and environmental protection.

### 4. Enhancing Creativity and Play Through Loose Parts

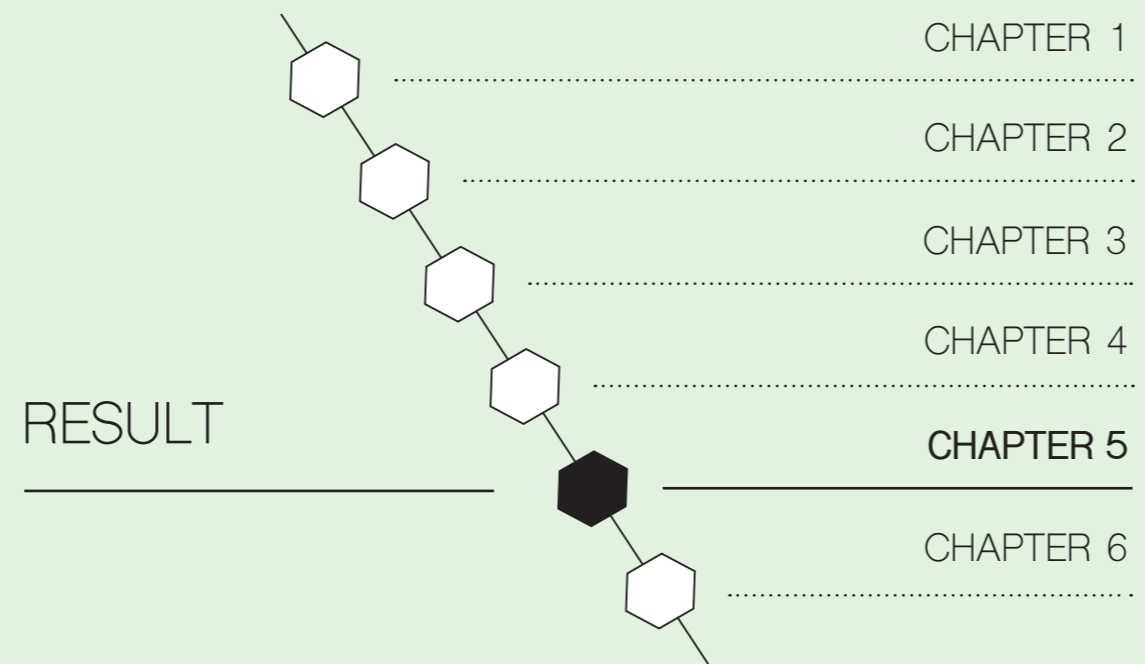
The recommendation to use flexible, manipulable materials in schoolyard design is evident in the GMS approach and were also seen at schoolyards. At Bornholmer Grundschule, sandboxes, water features, and loose materials like sticks and logs provide children with opportunities for creative and sensory-rich play. These elements enable the construction of temporary play structures, reinforcing the importance of flexibility and creativity in schoolyard design. They could by using loose materials create their own space, rooms and nooks which would enhance their creativity and promote social bonds through cooperation with each other.

### 5. Enhancing Place Attachment Through Thoughtful Design

The emphasis on creating meaningful and secure spaces that foster place attachment is evident in the thoughtful design of the schoolyards observed during the trip. The GMS initiative's focus on integrating natural elements and crafting inviting nooks aligns with the principle that spatial design should promote emotional connection and security. Features such as herb gardens and obstacle courses at various schools contribute to a strong sense of place and attachment, reinforcing Rieh's (2020) findings on the role of sensory engagement in fostering place attachment.

### 6. Artistic Landmarks: Fostering School Identity

Art installations, like the fox and chickens at Brodowin-Grundschule (seen in fig. 93), add distinctiveness to schoolyards, serving as landmarks that foster a sense of place and attachment. These artistic elements contribute to a unique school identity and encourage deeper engagement from children with their environment.



## Munich Overview

Grundschule an der Schwanthaleralstraße 87 is located in central Munich's District 2 (Ludwigsvorstadt) behind the prominent St. Paul Church. The school building, which dates back to 1873, underwent renovations in the fall of 2013. The building facades are currently under renovation. The school is approximately five minutes from Munich's central station. The surrounding area features a subway, restaurants, and a heavily trafficked road.

There are a few larger green areas close by as seen in figure 58, but if they want a larger green area, the closest, more extensive park, which is Bavaria Park, is about 1 km away. English Garten is about 2.6 km away, making close green space inaccessible for the children to visit spontaneously.



Fig. 54. Aerial photo of Grundschule an der Schwanthaleralstraße 87 (Grundschule an der Schwanthaleralstraße, 2024).

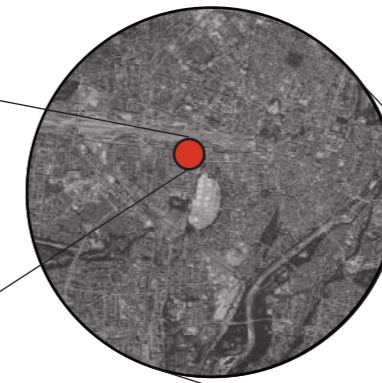


Fig. 55. A map of Munich with Grundschule an der Schwanthaleralstraße 87 marked. © Bayern Atlas 2024.



Fig. 56. An illustrated map of Germany showing the location of Munich (Vecteezy, n.d.)

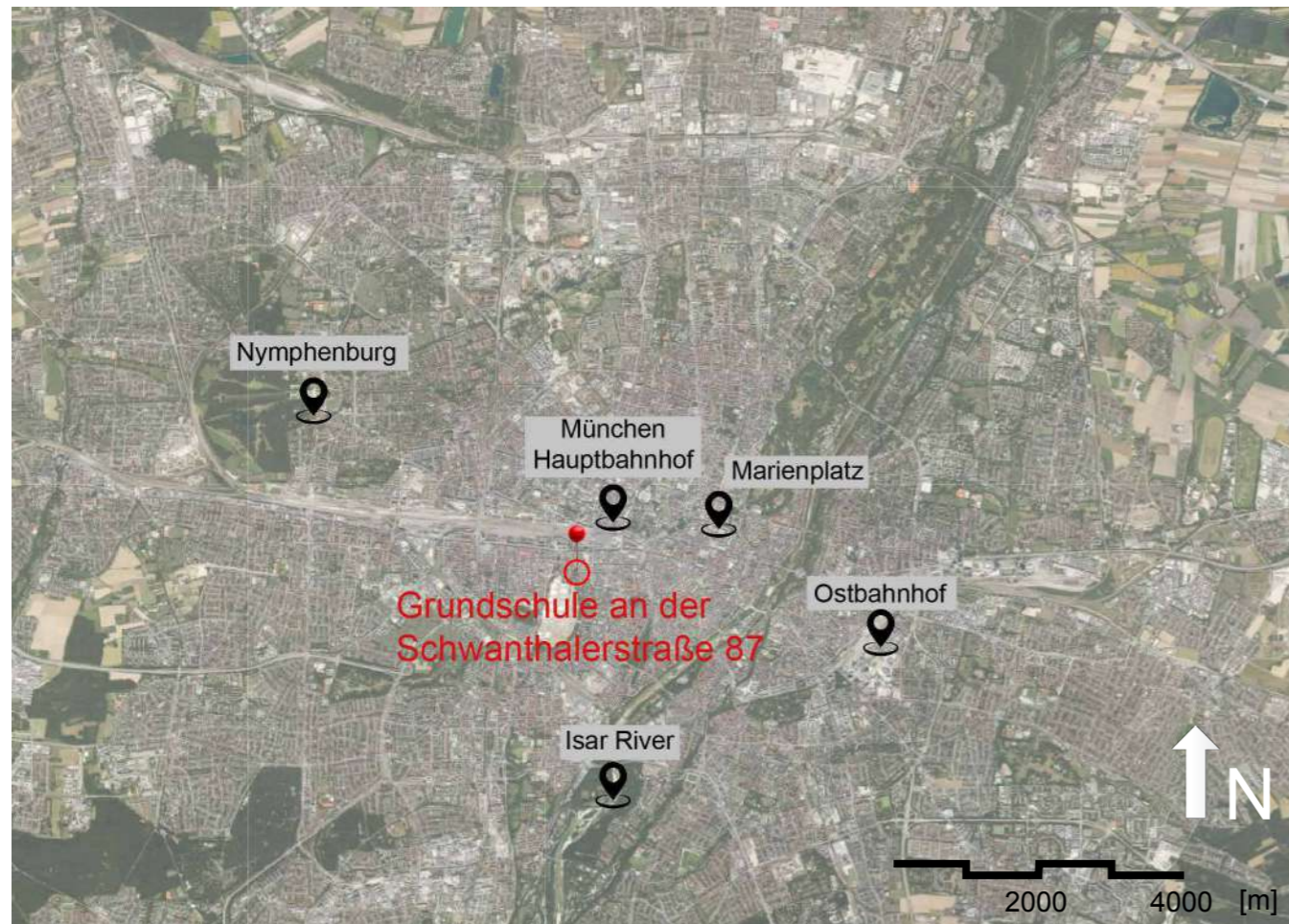


Fig. 57: A map of Munich highlighting Grundschule an der Schwanthaleralstraße 87, displaying its location within the city and key landmarks to provide context and orientation. Map sourced from © Bayern Atlas 2024.

Scale 1:100 000



Fig. 58: A map of Munich with Grundschule an der Schwanthaleralstraße 87 pinned, showing the distance to the nearest green area from the school. Map sourced from © Bayern Atlas 2024.

Scale 1:50 000

## Grundschule an der Schwanthalerstraße 87

The primary school serves around 180 pupils. Their website states a commitment to promoting diversity, as reflected in the school's motto and overall concept. The motto is represented by a swan swimming under a colorful bridge, displayed in figure 59, symbolizing "We are a special bridge." The colored bridge stones represent diversity, emphasizing that everyone is unique, contributing to a vibrant and prosperous community. Every stone is essential for the bridge, representing overcoming obstacles, connecting family kindergarten, primary and secondary school, and ensuring smooth transitions. Each color represents a different value, just as each child is unique.



Fig. 59. The logo of Grundschule an der Schwanthalerstraße 87 (Grundschule an der Schwanthalerstraße, 2024).

## Site Visit

On June 26 at 8 a.m., Mrs. Martina Strehler welcomed me, and we toured the relatively small, mostly asphalted schoolyard. A prominent art installation in the form of two enormous sticks stands in the middle of the yard, which Mrs. Strehle mentioned was installed in the early 2000s. The statue, while artistic, poses safety risks due to its hard edges and slipperiness in wet or frosty conditions, Mrs. Strehler informed. It was not until one of the teachers themselves fell and broke a leg that they closed off the statue area occasionally. Despite children expressing their wishes for more trees, swings, and sports fields during a minor renovation discussion in the late 1990s and early 2000s, they returned after the summer to find this statue instead, shown in figure 63, 64 and 65.

Mrs. Strehler highlighted the need for more funds for upgrades, pointing out that teachers and parents often paint hopscotch patterns, football fields, and other decorations on the schoolyard grounds in their free time. Due to the lack of space, the different grades have their own day on the small hand-drawn football field, seen in figure 66, to the left of the schoolyard. Mrs. Strehler informed me that there was only room for some children to play football or similar games daily.



Fig. 60

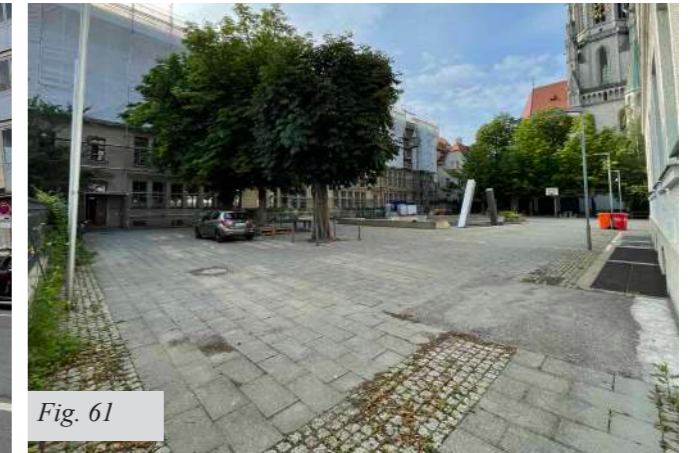


Fig. 61



Fig. 62



Fig. 63

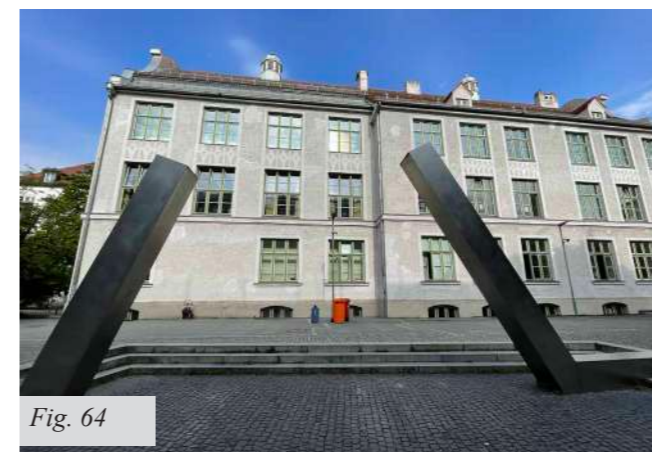


Fig. 64



Fig. 65

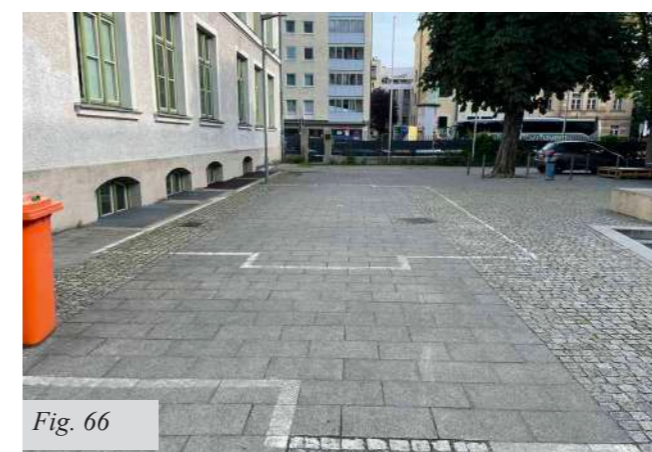


Fig. 66



Fig. 67

# RESULT

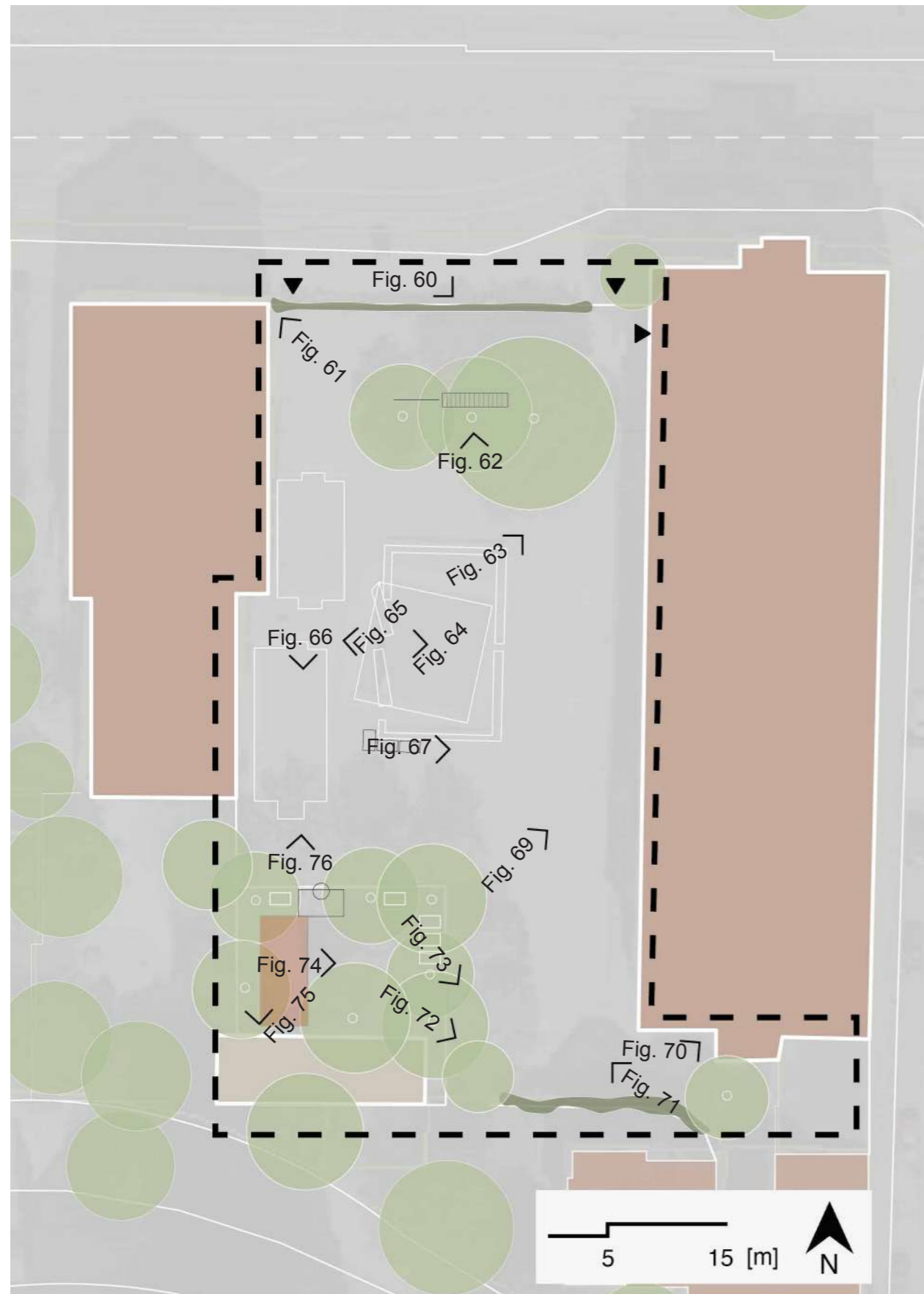


Fig. 68. The image depicts the schoolyard area and shows where and from which angles the photographs of the outdoor environment of Grundschule an der Schwanthalerstraße 87 were taken. The aim is to stand at the corner of the V-shape and gaze out toward the wide angle. Scale 1:500. Processed map from © Bayern Atlas 2024.

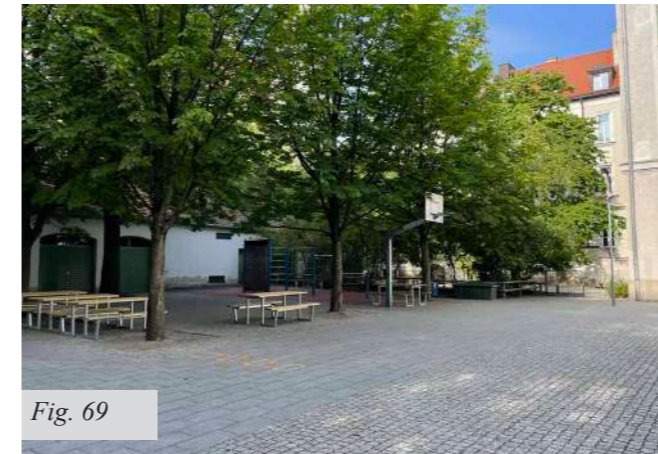


Fig. 69



Fig. 70



Fig. 71



Fig. 72



Fig. 73



Fig. 74



Fig. 75



Fig. 76



## Inventory

The physical and spatial analysis of the schoolyard revealed a flat topography predominantly covered in asphalt, with areas of concrete and cobblestones, resulting in a hard, expansive open space. The only topographical variation is a sunken statue that is approximately 50 cm below ground level and constructed of cobblestones. This feature includes a drain for stormwater runoff. The schoolyard is enclosed by tall barriers formed by the surrounding school buildings to the east and west, creating an enclosed, rectangular, almost courtyard-like space. To the north, where the main entrance is located, there is a gate in a gate, approximately 2-3 meters wide, sufficient for a car to pass through. The wall along the northern edge of the yard functions as a boundary separating the playground from the adjacent sidewalk and the heavily trafficked road. Just inside the wall, cars are parked. According to Mrs. Strehler, this area is utilized by teachers for parking due to the lack of alternative parking spaces nearby.

In the southern part of the yard, most of the vegetation is clustered in one area. Here, picnic tables have been placed, along with some playground equipment with a rubber surface installed beneath for safety. The trees in this area create an enclosed space with a natural canopy from the foliage provides shelter from both strong sunlight and light rain. A similar, but smaller, area can be seen in the northern part near the main entrance, where benches have been placed under the tree canopies, offering a protective ceiling overhead cover.

Aside from the playground equipment near the trees, there are no additional materials or features designed to encourage play. The playground includes marked soccer fields painted with street spray on the ground to the left, where children can play ball. The large, mature trees present are too high for climbing, and there is no suitable fall protection, as the ground is currently covered in concrete and cobblestones.

The school's expansive open areas provide ample sunlight during the day, with available shade either along the building walls or beneath the existing trees. Depending on the direction, the playground is relatively sheltered from winds from the sides but may experience winds from the north and south, which have unobstructed access to the playground due to the lack of significant barriers.

The multisensory elements currently available in the schoolyard include tactile experiences from the bark of the trees and the leaves. Since the trees are predominantly chestnut trees, the chestnuts can be used and played with. The school features clear, solid walls in the form of building facades, which result in good sound retention, though the noise from the nearby road is quite prominent. Visually, the area is mostly gray, from the ground surface and surrounding buildings, and the scent is urban and polluted.

The most active area is the northern section near the gate opening, which serves as the main entrance and is the central flow area of the schoolyard. Apart from this, children mostly move along the sides, as the large statue in the center is somewhat difficult to play around. Children's movements are therefore adapted to the location and size of the statue.

The most frequently used areas are primarily the marked soccer fields in the western part of the yard, followed by the space under the trees in the southern part where the picnic tables and playground equipment are located.

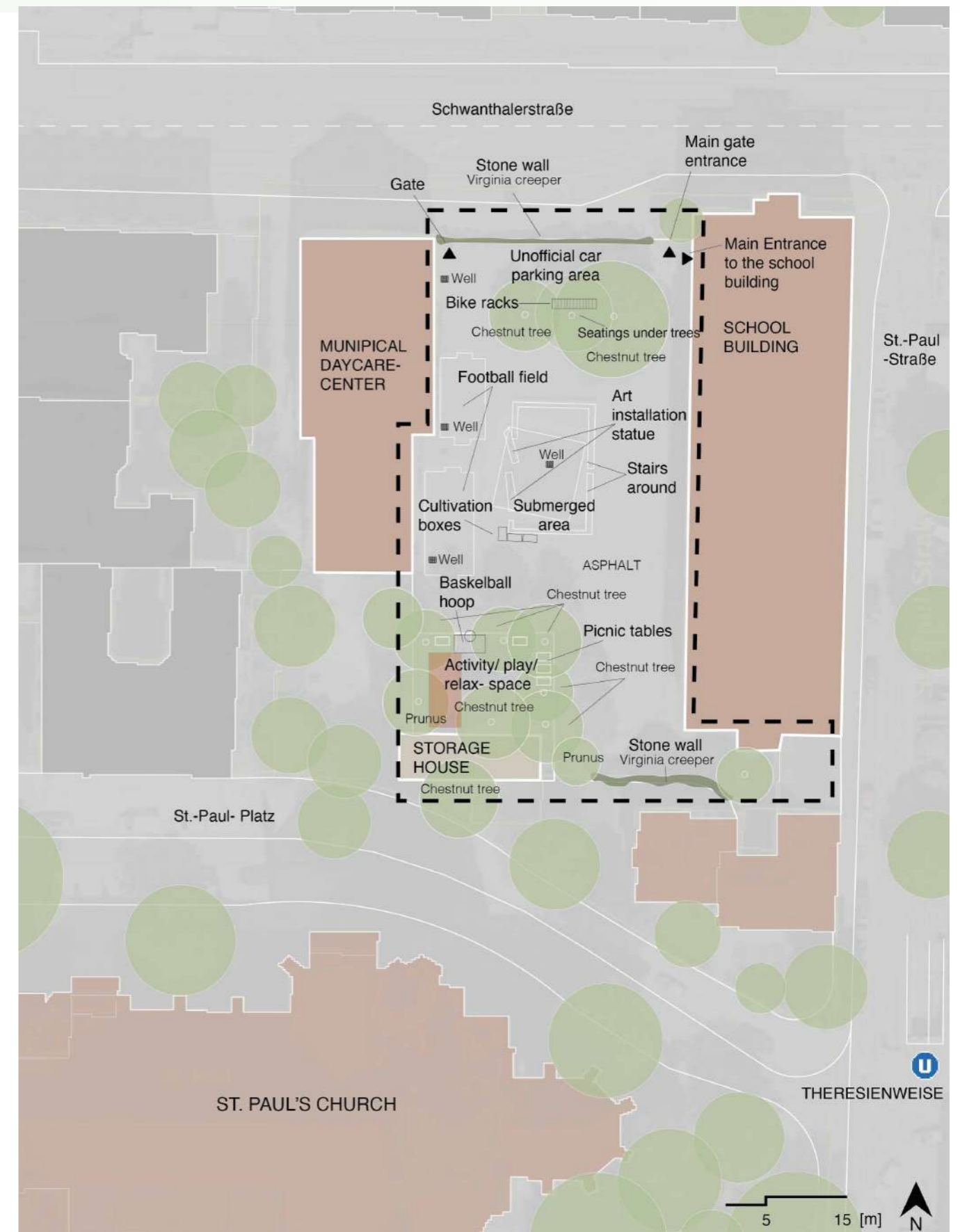


Fig. 77. Processed map from © Bayern Atlas 2024. The image shows a situation plan of what is present on the schoolyard today, as well as some surrounding area. Scale 1:700.

## Place Analysis

Based on the site visit and inventory, a place analysis focused on the ecological, social, and spatial characteristics of the site's fundamental conditions. Each category was divided into advantages and disadvantages to clarify the schoolyard's strengths and weaknesses.

### ECOLOGICAL ASPECTS



**Tree Canopy:** The trees in the south and north part offer shade contributing to a cooler micro-environment.

**Stormwater Management:** The sunken statue area includes a drain, aiding in stormwater runoff management in an otherwise impermeable area.

**Chestnut Trees:** These trees provide some multisensory engagement through chestnuts, which children can collect and play with.



**Limited Greenery:** The predominance of hard surfaces (asphalt, concrete, cobblestones) limit plant diversity and ecological benefits. The lack of varied plants reduces opportunities for hands-on learning about nature and biodiversity.

**High-Temperature Zones:** The large, open, and hardscaped surfaced area contributes to overly heated space during spring and summer, making a great part of the schoolyard environment less comfortable.

**Wind Exposure:** The yard is exposed to winds from the north and south due to the lack of significant barriers, which can make some areas uncomfortable for play.

### SOCIAL ASPECTS



**Designed Play Areas:** The presence of marked soccer fields and playground equipment supports social physical activity, interaction, and organized play, fostering teamwork and social skills.

**Sheltered Social Spaces:** The southern part of the yard features picnic tables under tree canopies, inviting social areas where children can gather to talk, play, or use as outdoor classrooms, supporting academic outcomes.



**Lack of Creative Play Zones:** The yard lacks flexible and creative play zones, such as those incorporating loose parts of varied textures, which are important for imaginative unstructured play. Currently, it is mostly just a hardscaped open space.

**Teacher Parking:** Parking inside the yard reduces available play space and creates safety concerns.

**Unclimbable Trees:** The mature trees are too high to climb and lack appropriate safety surfaces underneath, limiting children's interaction with nature and physical activity.

### SPATIAL ASPECTS



**Natural Enclosure:** The tree foliage in the southern and northern parts of the schoolyard form natural "ceilings" that provide shelter and create a more intimate, enclosed space for children to gather.

**Clear Boundaries:** The school buildings to the north and west frame the yard, creating a defined rectangular shape. Solid walls along the northern and southern edges add a sense of safety, especially given the busy road just outside.



**Hard Surface Dominance:** Hard surface's predominance limits the space's flexibility for varied types of play and exploration. It reduces opportunities for the children to be in their own "rooms" and nooks.

**Statue Issue:** The statue in the middle of the yard acts as a barrier that restricts movement and play while being sharp and slippery during certain weather conditions. This makes children to use the periphery of the schoolyard predominantly and making it difficult for multiple groups to engage in different activities simultaneously.

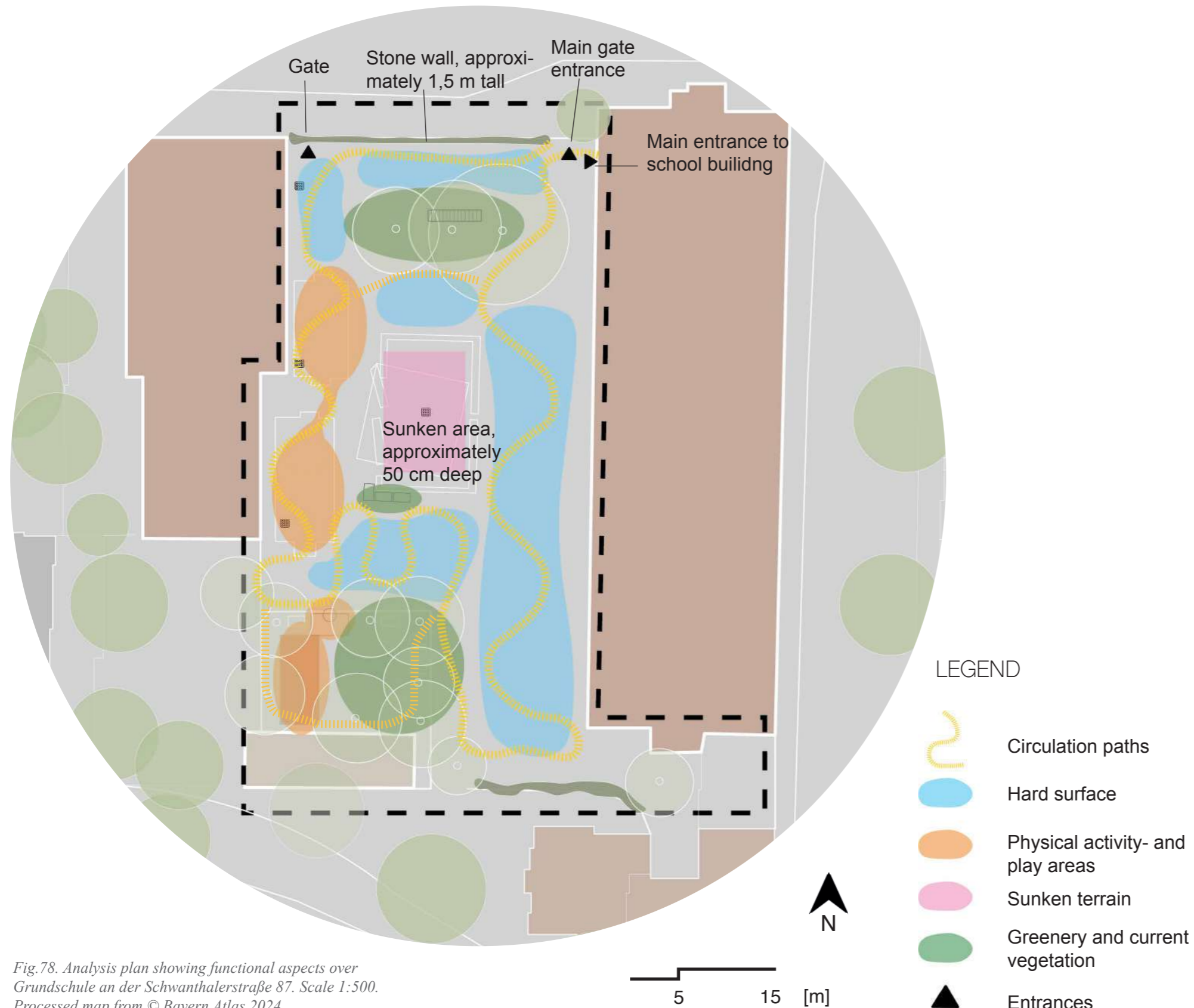


Fig.78. Analysis plan showing functional aspects over Grundschule an der Schwanthalerstraße 87. Scale 1:500. Processed map from © Bayern Atlas 2024.

## Analysis Plan: Functional Aspects

The yellow circulation path illustrates movement through the schoolyard, highlighting that the sunken terrain where the statue is located, is often avoided due to the risk of slipping and its hard edges. This area does not provide opportunities for play or physical activity. While the statue could be seen as an element for risky play with its hard edges, in this context, it poses more of a hazard than a genuine opportunity for adventurous play.

The blue area showing hard surface encompasses a large expanse of durable pavement, offering potential for new planning and design initiatives.

The orange area for physical activity and play indicates the locations of the football pitch, basketball hoop and the playground area with climbing walls. These zones are actively used by students daily, making them popular gathering spots.

The green area in the north and south of the yard, shows existing chestnut trees that provide valuable shade and shelter from rain. Students frequently use these areas for protection from the sun and as spaces for studying or socializing under the canopies. In the middle of the yard, a few cultivating boxes have been placed to bring in some vegetation and plants more central in the space.

There are three key entrances: the main gate entrance, a second entrance, and the main entrance to the school building. These entrances influence how children navigate the space and their overall movement patterns. The northeast corner, where the two main entrances converge, can become particularly crowded, especially during the morning and afternoon transition.

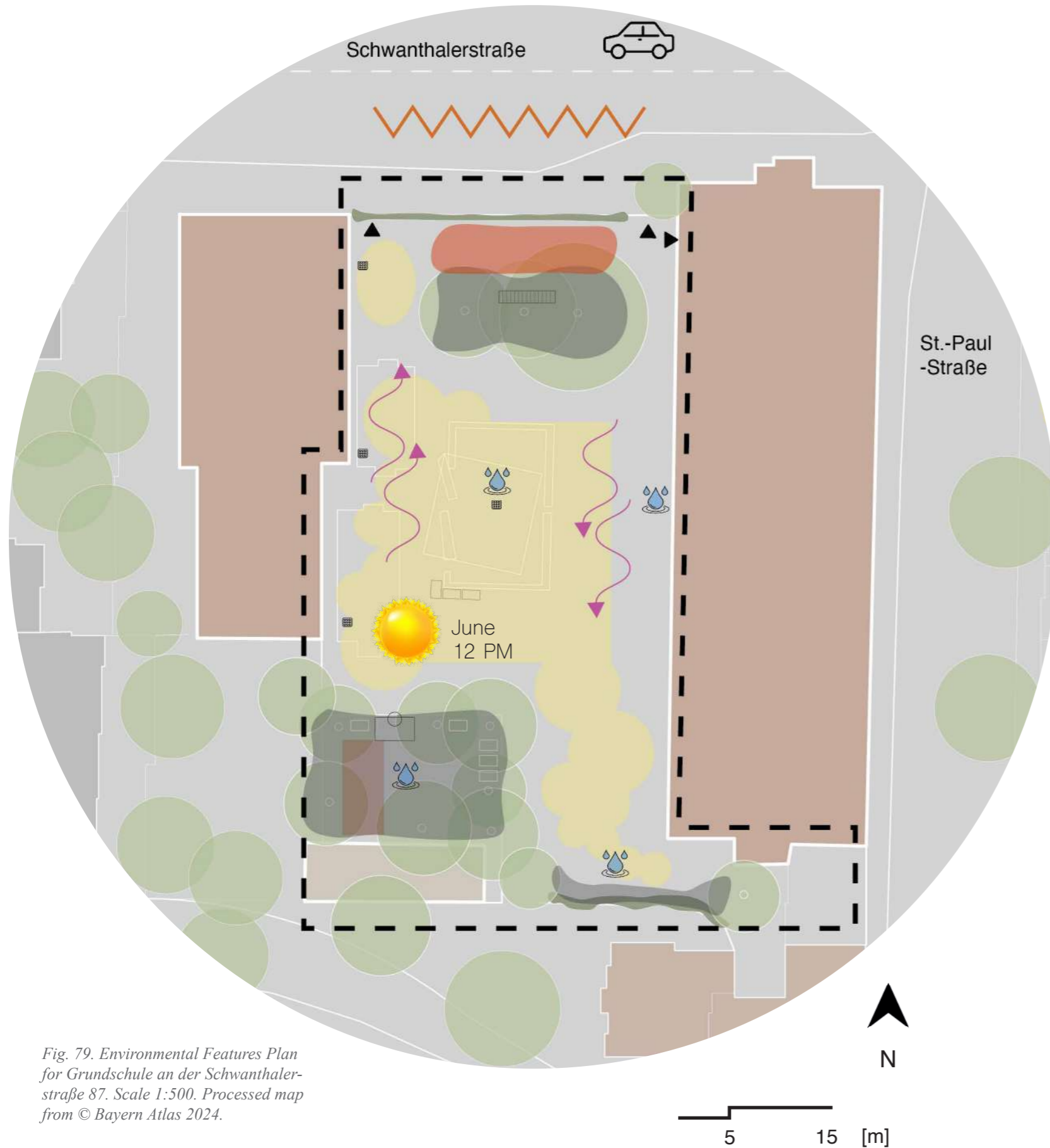


Fig. 79. Environmental Features Plan for Grundschule an der Schwanthalerstraße 87. Scale 1:500. Processed map from © Bayern Atlas 2024.

## Environmental Features

The school is situated right next to a busy road, posing both a safety risk due to the traffic and a significant source of noise. There is minimal buffering in terms of vegetation or buildings, apart from the stone wall along the north side of the yard, which prevents the children from wandering out.

The large, open hard-surface area that dominates the schoolyard receives extensive sunlight, particularly during the day in the spring and summer months when temperatures in Munich are high. This is especially important since children in Germany attend school until the end of July. The abundance of sunlight, combined with limited shade, creates a harsh and unsafe environment for play and recreation. As figure 79 indicates, shade is primarily found in the north and south areas beneath the tree canopies, with additional shade cast by the school buildings in the early morning and late afternoon.

Near the stone wall, inside the schoolyard, there is an unofficial parking area where teachers typically park their cars due to the lack of parking spaces nearby. This is not an ideal feature in a schoolyard for children aged 6-12. Teachers driving in and out pose a potential safety hazard, and the parked cars are also at risk of being damaged during play.

With such a large hard surface covering the yard, there are few places for stormwater runoff to go. The areas marked on the map highlight the zones most at risk for water pooling. However, a few wells are located throughout the yard, providing some drainage opportunities for water collection.

The rectangular layout of the schoolyard, combined with the school buildings on the sides acting as wind buffers, increases the likelihood of wind exposure from the north and south. Without sufficient barriers in those areas, the wind tends to flow through the yard, affecting the overall comfort of the space.

### LEGEND

- Noise
- Sunny area
- Shaded area
- Unofficial car parking
- Risk of water pooling
- Well
- Wind

## Programming

Based on the initial impression, site visit, inventory and analysis, literature review, and the research trip to Berlin with Grün Macht Schule, six program points are established.

### 1. GREEN DEVELOPMENT ZONES

**Problem:** Minimal vegetation leads to the risk of overheated areas when it's sunny during the day, especially during the spring- and summer months.

**Intention:** Increase vegetation and create more shaded, lush areas.

**Actions:** Plant more trees and bushes and shade structures, and create flower beds and lawns. Ground material suggests to be grass, earth, wooden chips or sand.

### 2. PLAY AND ACTIVITY AREA

**Problem:** Minimal area for diverse play and activities.

**Intention:** Create multifunctional play areas and multisensory experiences.

**Actions:** Install various play equipment and sensory elements such as multisport area, sandboxes, water play, and climbing and balancing opportunities.

### 3. OUTDOOR CLASSROOMS AND EDUCATIONAL SPACES

**Problem:** The area that includes picnic tables in which sometimes act as an outdoor classroom is too small for many pupils to gather all at once.

**Intention:** Promote outdoor learning and create spaces for educational activities.

**Actions:** Establish and develop current outdoor classroom with seating under trees and create a school garden for cultivation and scientific experiments environments.

### 4. HEALTH AND WELLBEING

**Problem:** Undersized football area and other spaces that promote physical activity.

**Intention:** Promote physical activity and social interaction.

**Actions:** Create areas for sports and games, such as football fields and basketball hoops, obstacle courses, and resting areas with seating for relaxation and social interaction.

### 5. SAFETY UPGRADES

**Problem:** Large statue in the middle acts as a barrier, is slippery and has sharp edges. Teacher parking space is also an issue.

**Intention:** Making the schoolyard more safe and suitable for play.

**Actions:** Remove statue, but keep the sunken area to create a varied terrain. Remove part of the wall that shields the schoolyard from the road and move it about 5 meters inward, towards the schoolyard. The area outside can then be converted into a parking lot, but it will remain out of reach for the children.

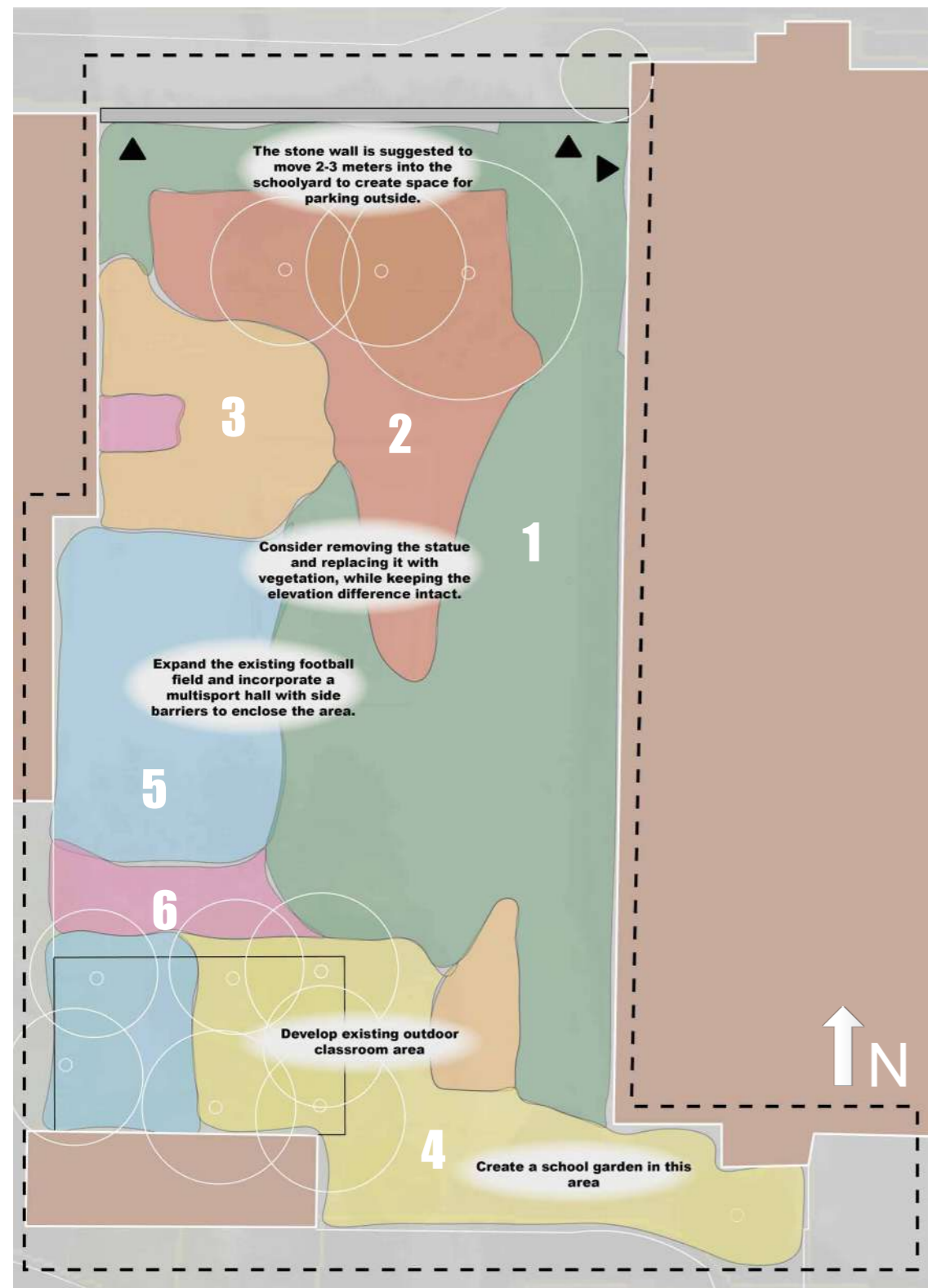
### 6. ART AND CULTURAL ELEMENTS

**Problem:** No area exists that promotes art and creativity, except a few drawings on the ground.

**Intention:** Incorporate art into the schoolyard to add aesthetic value and foster a sense of identity and place.

**Actions:** Include sculptures, murals, or installations that reflect local culture or history. Make space for the children to be creative, such as painting for example.

# Conceptual Program Plan



- 1 The Forest
- 2 Sensory Play Space
- 3 Pollinator Paradise
- 4 The Classroom
- 5 The Sports Field
- 6 Imagination Station

# Implementation

The proposed upgrades and changes for the primary school are presented in a conceptual program plan, with each color representing distinct features that will enhance the schoolyard. The colored zones in the plan have been thoughtfully arranged with specific purposes and sizes. Their characters are formed by a thorough literature review, insights from the research trip to Berlin, and the on-site inventory and analysis. At this stage, a large focus is on addressing the most urgent issues, particularly safety concerns and adding more greenery. Key recommendations include removing the teacher parking area and replacing the existing statue with more sustainable elements that promote a child-friendly, play-oriented environment.

The analysis revealed an excess of open hard surfaces in the schoolyard, significant space has been allocated for vegetation to provide shade and natural play opportunities. Supported by the research and literature review, integrating nature into the design effectively establishes spatial boundaries. Trees, shrubs, and natural loose materials like logs and rocks will create enclosures and natural "ceilings," while offering health benefits in line with the biophilia concept.

# Removal of Statue

One major proposed change is the removal of the statue. However, the site's elevation changes will be kept, and aligned with the principles of Grün Macht Schule and Risky Play. The sunken area will be transformed into a green space, creating a hill and valley where vegetation can flourish, water can collect, and children can hide or slide when it snows. Removing the statue will free up space for play while eliminating the hazards posed by the current slippery stone slabs. A before- and after section presents the conceptual suggestion for this area in figure 81 and 82.

Fig. 80. Conceptual Program Plan over Grundschule an der Schwanthalerstraße 87. Scale 1:400. Processed map from © Bayern Atlas 2024.

10 20 [m]

# RESULT

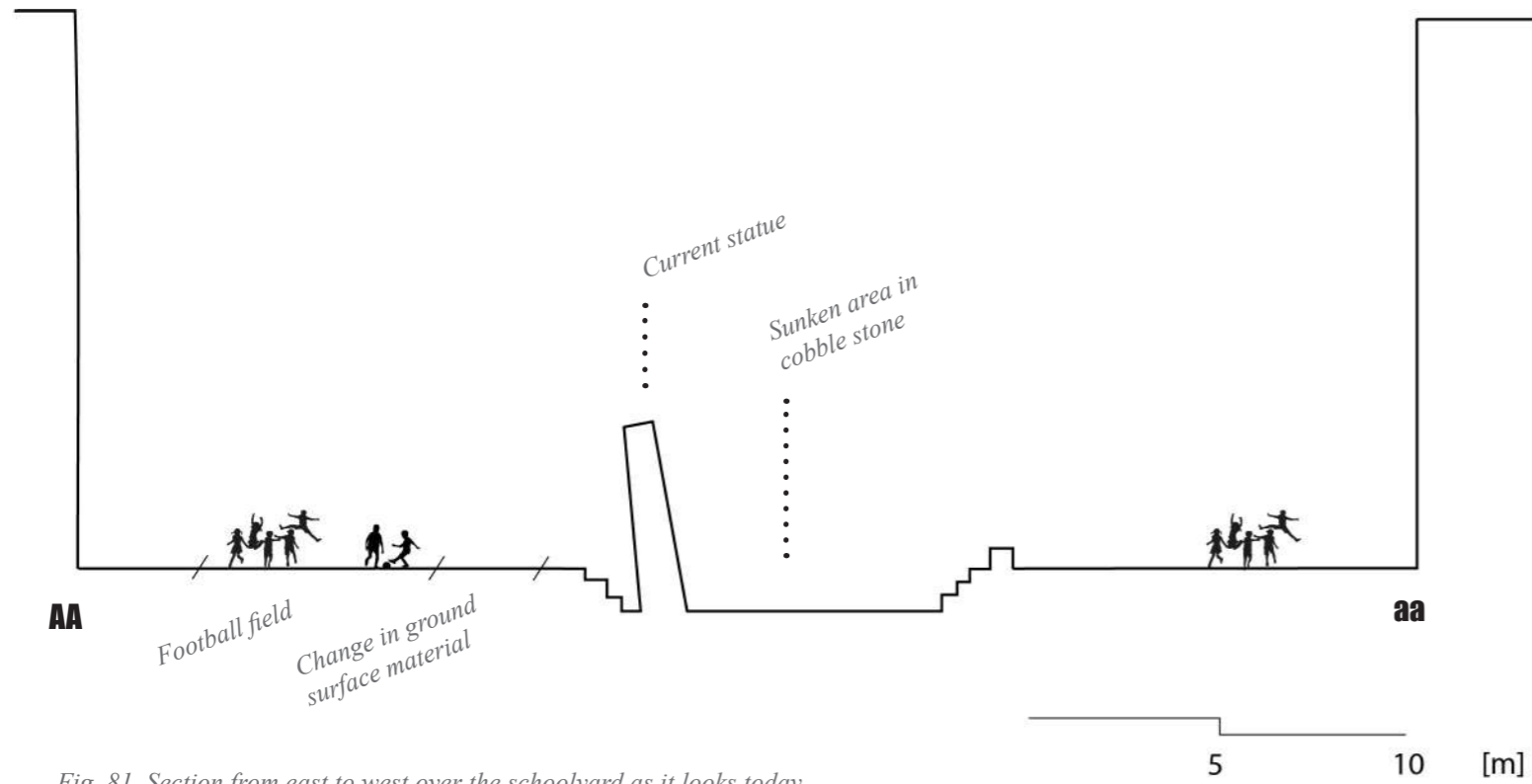


Fig. 81. Section from east to west over the schoolyard as it looks today showing the spatial room. The statue takes up a lot of space as seen. Scale 1:200

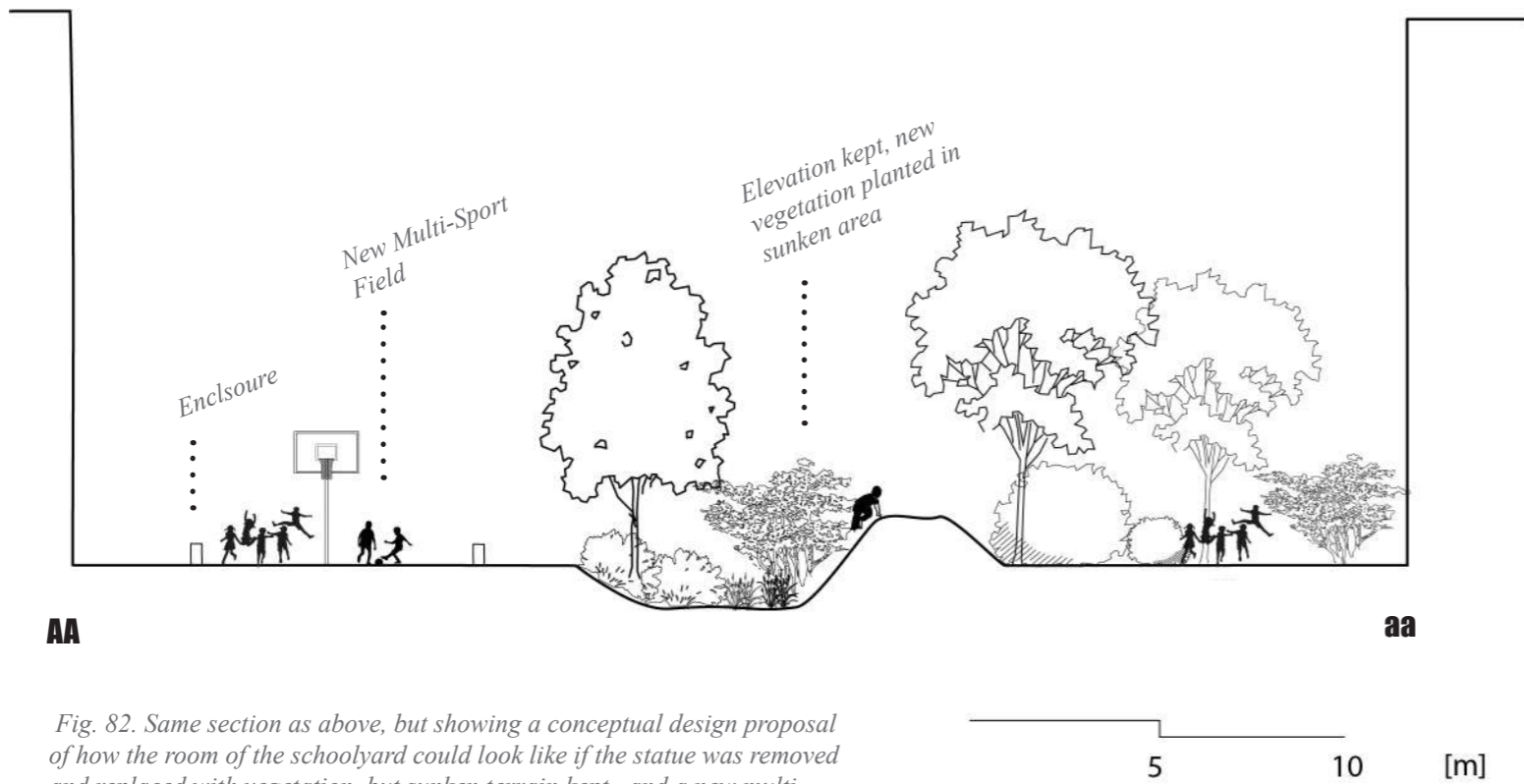


Fig. 82. Same section as above, but showing a conceptual design proposal of how the room of the schoolyard could look like if the statue was removed and replaced with vegetation, but sunken terrain kept, and a new multi-sport area to the left. Scale 1:200

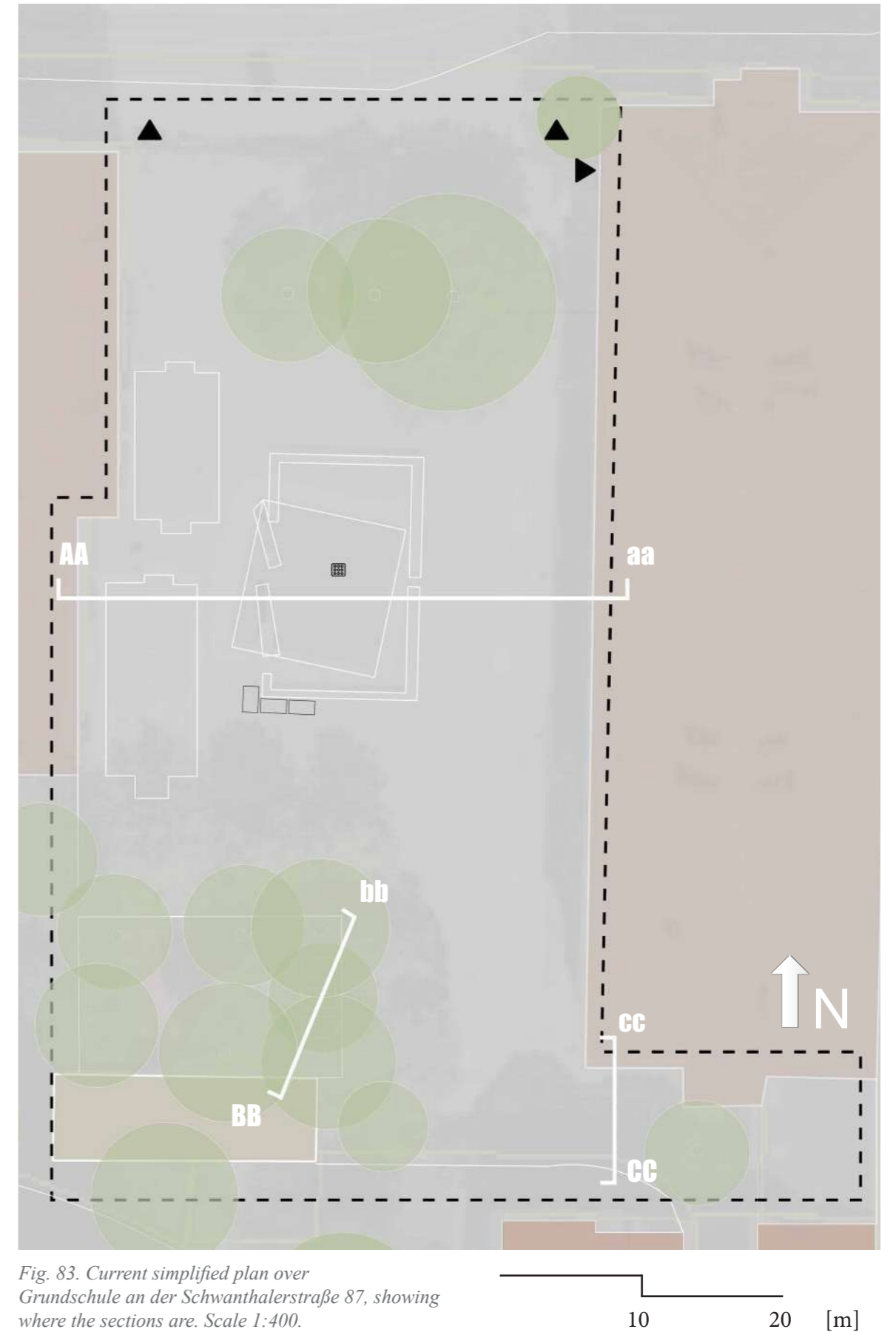


Fig. 83. Current simplified plan over Grundschule an der Schwanthalerstraße 87, showing where the sections are. Scale 1:400. Processed map from © Bayern Atlas 2024.

## Reconstruction of Stone Wall

Another significant change involves shifting the stone wall about five meters inward from the schoolyard, reclaiming the teacher parking area. This will allow for parking outside the yard, protecting both the children and vehicles, and enhancing overall safety. It is suggested to establish new vegetation in the area that previously served as a parking space. This green buffer could function as a sound barrier against the noise from the busy road outside, while simultaneously providing opportunities for sensory and exploratory play.

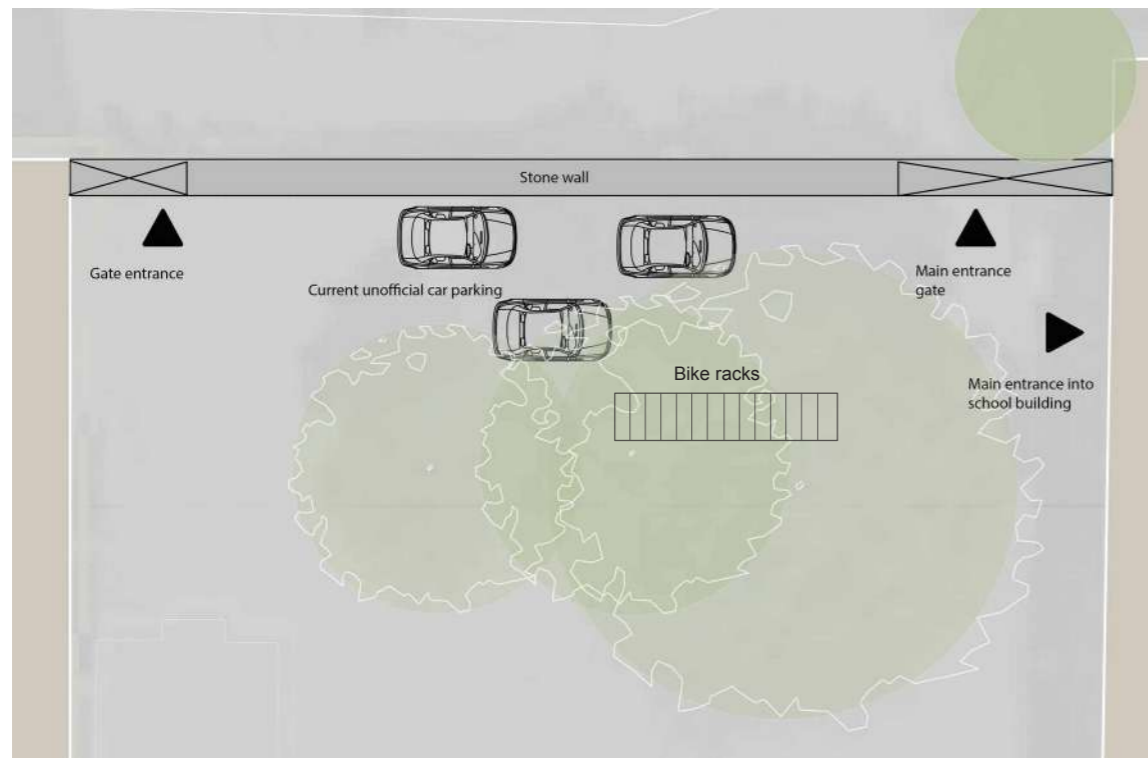


Fig. 84. Zoomed-in detail plan showing the current state of the northern part of the schoolyard, where some cars are parked. Scale 1:200.

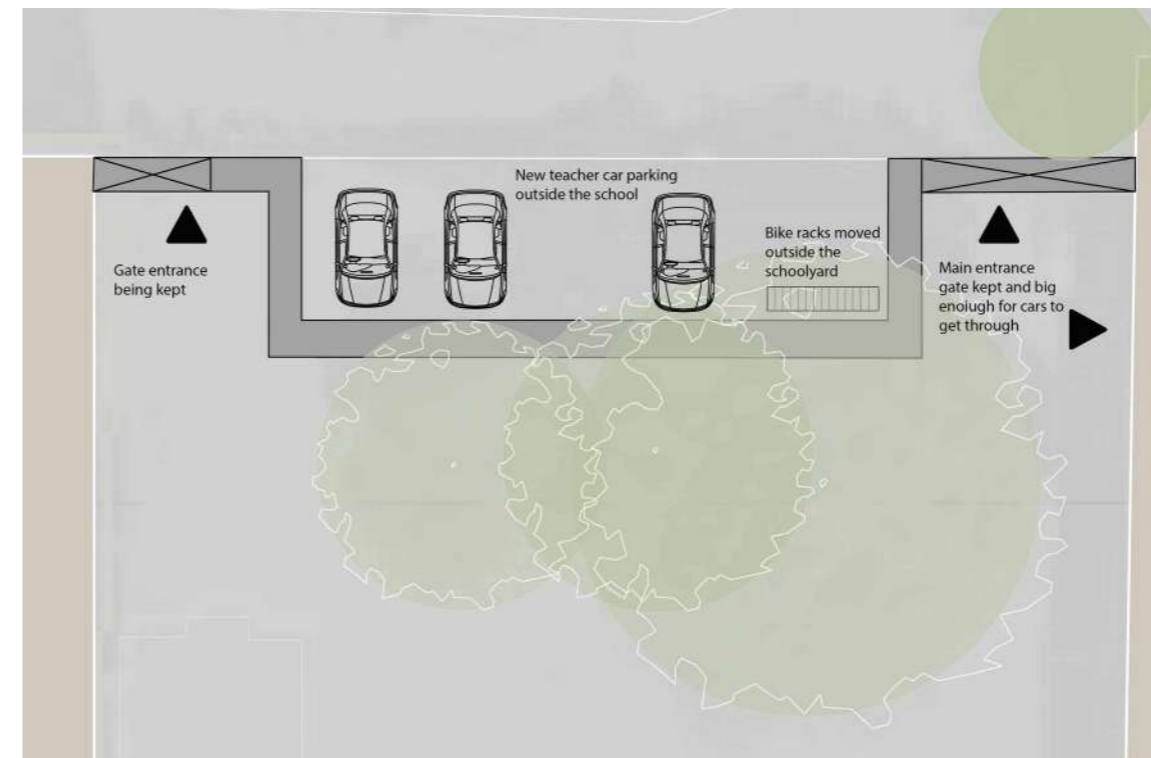


Fig. 84. Zoomed-in detail plan showing the proposed reconstruction of the stone wall by moving it approximately 5 meters inward into the schoolyard. In that way, cars and bikes can be parked outside the schoolyard. Scale 1:200.



## The Characters

1

### The Forest

New vegetation in terms of trees and shrubs is suggested for this area to provide shade and enhance biodiversity. Suitable tree species include the Norway maple (*Acer platanoides*) and the Green ash (*Fraxinus pennsylvanica*), as they both offer broad and dense canopies, which are beneficial in creating shade areas and natural canopy. These trees are also relatively fast-growing, making them ideal for a schoolyard setting where quick establishment is advantageous. Additionally, shrubs like lilacs (*Syringa vulgaris*) or hazel (*Corylus avellana*) can be planted within this zone to create intricate and dense hiding spots with its enclosure, encouraging exploratory play among children. This aligns with Hansen Sandster and Kennair's (2011) perspective on play, where children benefit from environments that allow them to "disappear and get lost," fostering their development and understanding of their surroundings. To include natural loose materials such as wooden sticks, stones, and leaves, aligns with Rihs' (2020) assertion that nature offers a rich sensory experience beyond merely serving as a scenic backdrop. Furthermore, large, uneven boulders and logs can be strategically placed within the area to create barriers in the landscape and stimulate physical activity such as climbing and balancing, encouraging risky play. Suggested ground materials are grass, earth, or wooden chips to make the floor surface soft and natural.

Increasing greener on the school grounds creates opportunities for children to engage in challenging, risky play and therapeutic activities.

A well-vegetated environment supports Kaplan's (1991) theories on voluntary attention, which promotes recovery and well-being. Integrating natural elements into the schoolyard is crucial, given the extensive health benefits supported by both evolutionary knowledge and modern research. Introducing more natural areas in the schoolyard will also bring down the heat during warm summer days, which the schoolyard desperately needs, and is a major reason *The Forest* is the biggest area in the conceptual program plan.

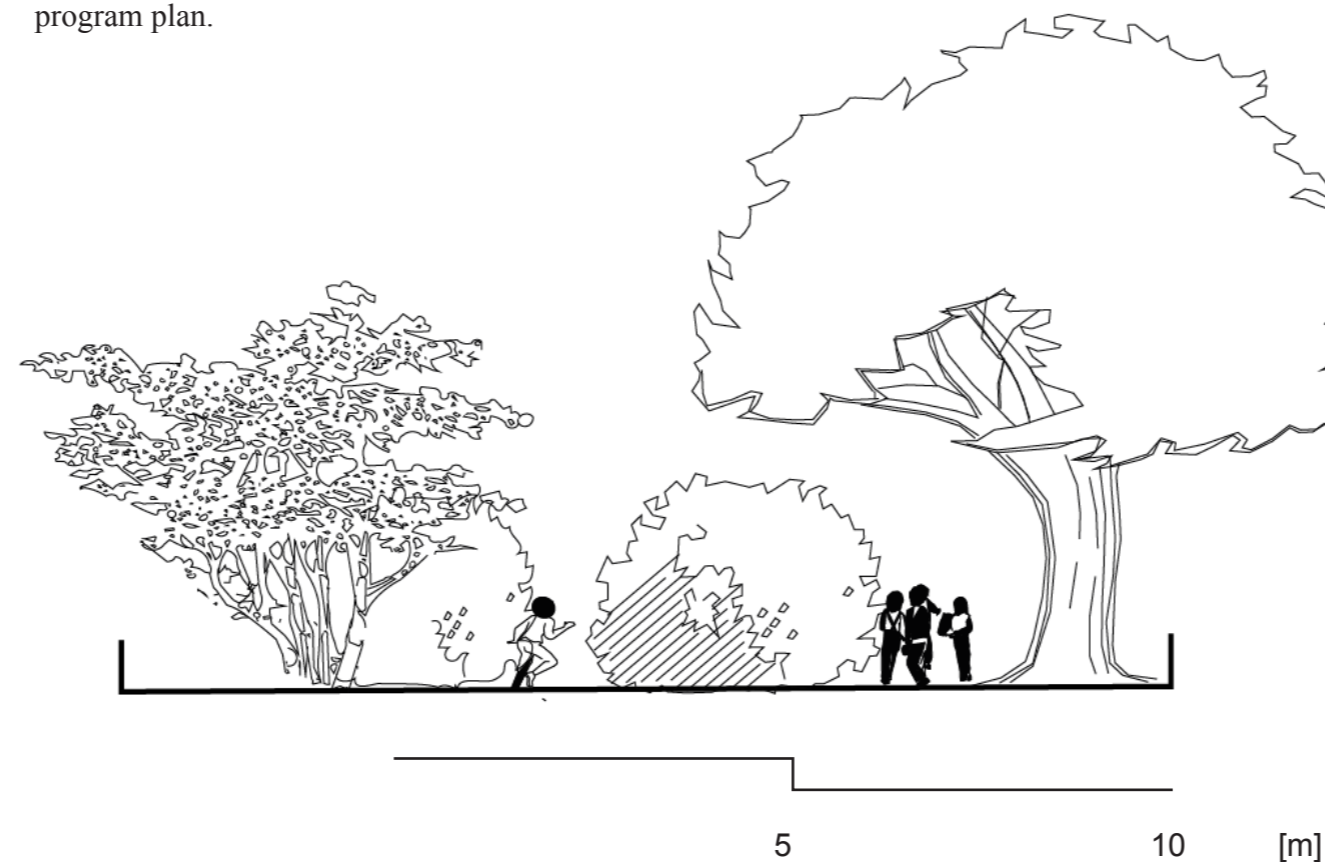


Fig. 86. A conceptual section of how the spatial area in *The Forest* could look. Scale 1:100.



Fig. 87. Hand-drawn sketch showing children playing in *The Forest*.



Fig. 88. Image from Bornholmer Grundschule in Berlin for inspiration.



Fig. 89. Image from the first stop at the bike tour in Berlin with GMS for inspiration.

## 2 Sensory Play Space

For this zone, the emphasis is to incorporate loose parts and challenging play elements, rather than immediate shade, to the presence of already established large chestnut trees. This goes in line with Simon Nicholson’s theory of loose parts. As Casey and Robertson (2016) have suggested, components such as sticks, planks, ropes, saddles, pinecones, and tires are examples of loose parts that have been shown to impact play environments positively. This allows children to engage in creative and constructive play, which can also be integrated with the *The Forest* to provide more space. The aim is to foster more engaged, social, and creative play that loose parts facilitate when made available to children Casey and Robertson (2016). The focus is facilitating risky play by including swings, elevated jumping structures, loose building materials, and balance challenges. These physical activities also offer multisensory experiences. The suggested vegetation includes taller grasses and possibly shrubs, complemented by surfaces such as sand or wood chips, which provide safer landing areas.

A climbing structure is proposed, where children can climb up independently and face a more challenging descent, either by jumping down or climbing back down. Several logs and stones that children can use for balancing should be placed. This aligns with Hansen Sandseter and Kennair’s research, suggesting that risky play activities enhance motor skills, endurance, and skeletal strength. Swings are also valuable in this zone; either multiple individual swings or a sizeable communal swing that can accommodate several children at once should be considered.

According to Ulrike Wolf from GMS, swings are one of the most crucial elements to include in a schoolyard. High-speed swinging also ties into

specifically “playing with high speed,” which is particularly beneficial in this context.

Incorporating swings, slides, loose parts, and opportunities for more significant jumps and potential falls coincides with Hansen Sandseter and Kennair’s (2011) theories on risky play. Engaging in activities involving great height, high speed, and potentially dangerous tools like a wooden stick enhances a child’s spatial awareness, including their perception of size, shape, and depth. These types of play fall under Jean Ayres’s category of proprioception, which is inherently multisensory as it involves sensations related to body position and movement (Roley Smith 2020). The design principles of risky play, as Hansen Sandseter and Kennair advocate, are also supported by the GMS organization, which emphasizes the importance of such elements in schoolyard design, encapsulated in their motto, “No risk is also a risk” (Grün Macht Schule 2024).



Fig. 90. Hand-drawn sketches of risky play, natural materials and elements promoting motor skills like climbing and swinging.

## 3 Pollinator Paradise

This area focuses on creating hotspots for pollinators, such as bees and butterflies. This initiative aims to enhance biodiversity within the dense urban environment and serves an educational purpose, allowing children to observe firsthand how “nature works.”

Grundschule an der Schwanthalerstraße 87 currently has minimal vegetation, reducing the presence of pollinators in the schoolyard. To address this, key planting hotspots are proposed in areas where children are less likely to play, allowing these zones to thrive undisturbed. These green spaces are strategically positioned near *The Forest* to create a natural transition and support pollinators by making it easier for them to move between the zones.

Emphasis should be placed on seasonal planting to ensure the area remains vibrant and active throughout the year. Recommended pollinator-friendly plants include a variety of perennials and bulbs. Examples of perennials could be Lavender (*Lavandula angustifolia*), Purple coneflower (*Echinacea purpurea*), Black-eyed Susan (*Rudbeckia fulgida*), Catmint (*Nepeta x faassenii*), and Korean feather reed grass (*Calamagrostis brachytricha*). Examples of bulbs are Allium species (*Allium ssp.*) and Striped squill (*Puschkinia scilloides*).

This area complements both the naturalistic and educational zones. The goal is for children to learn about biodiversity and the importance of pollinators and to promote biodiversity in the urban environment. Being close to nature and observing living organisms connects to the concept of biophilia, which teaches children to be mindful and respectful of living things.



Fig. 91. Images from the Paul-and-Charlotte-Kniese-Schule in Berlin with Grün Macht Schule. The photos illustrate how biodiversity hotspots can be created in the schoolyard.

# RESULT

## 4

### The Classroom

The creation of outdoor classrooms is crucial for several reasons. Teacher Martina Strehler at the school observed that students frequently utilize the existing tables under the trees for after-school activities and homework. This underscores the need to formalize such spaces to enhance their utility.

*The Classroom* emphasizes the establishment of an outdoor classroom, supported by research from Faskunger et al. (2018), which indicates that students perform better and exhibit improved focus and learning outcomes when studying in outdoor environments. Integrating an outdoor classroom is essential for enhancing educational goals and academic performance.

The selected location for the outdoor classroom is optimal, which includes designated areas for seating and activities. Additionally, established trees provide natural foliage protection from the sun and rain, creating a conducive environment for focused learning.

This zone also includes a proposal for a school garden. The integration of a school garden necessitates that children engage with outdoor environments, which, as research by Grinde and Grindal Patil (2009) indicate, can lead to reduced stress levels. According to the principles outlined by GMS, a school garden fosters a sense of responsibility in students by involving them in planting and caring for the garden. This involvement helps students connect with their schoolyard and appreciate the value of their space.

*The Classroom* serves as the area with the most comprehensive engagement of the senses. Letting children work in the garden aligns with

the concept of loose parts, providing a multisensory experience. Children engage in activities like watering plants, digging with shovels, touching leaves and stems, picking berries, and tasting them - stimulating multiple senses simultaneously.

A school garden offers a sensory-rich environment and a space for social interaction, moments of calm, and opportunities to escape reality. The use of our senses in such a setting promotes mindfulness, and having children spend time in a garden or natural area aligns with theories like the EEA by John Bowlby and the work of Anders Hansen, who advocates that natural settings are preferred by the brain, leading to reduced stress and overall sense of well-being. This decrease in stress levels, in turn, enhances children's ability to focus when they return to the classroom, thus supporting their academic performance, which aligns with Faskunger et al. (2018) approach that spending time in nature enhances academic performance.



Fig. 92. Photo of a school garden in Berlin.

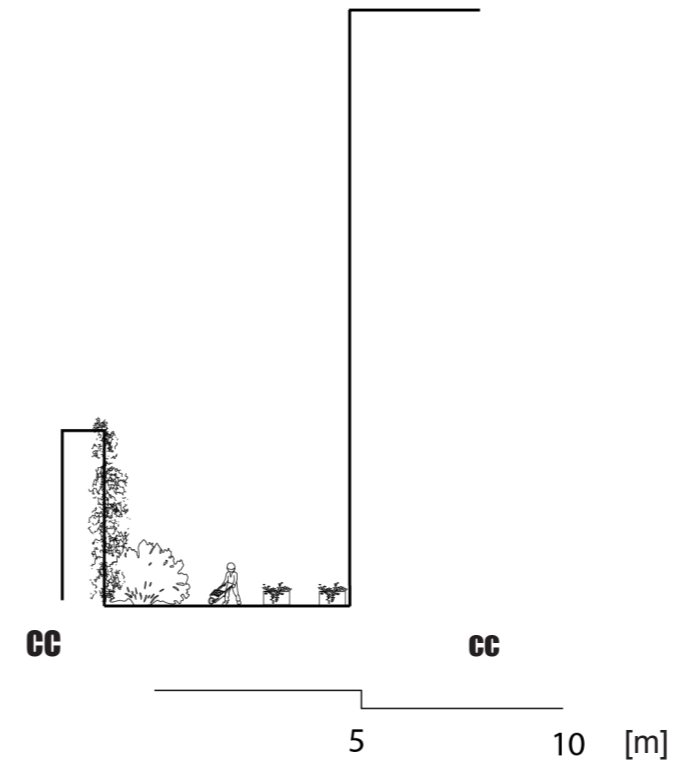


Fig. 93. Conceptual section of the school garden in *The Classroom*, illustrating the spatial layout. Scale 1:100.



Fig. 94. Photos above are taken from the referential projects in Berlin and demonstrates how an outdoor classroom and school garden can be designed.

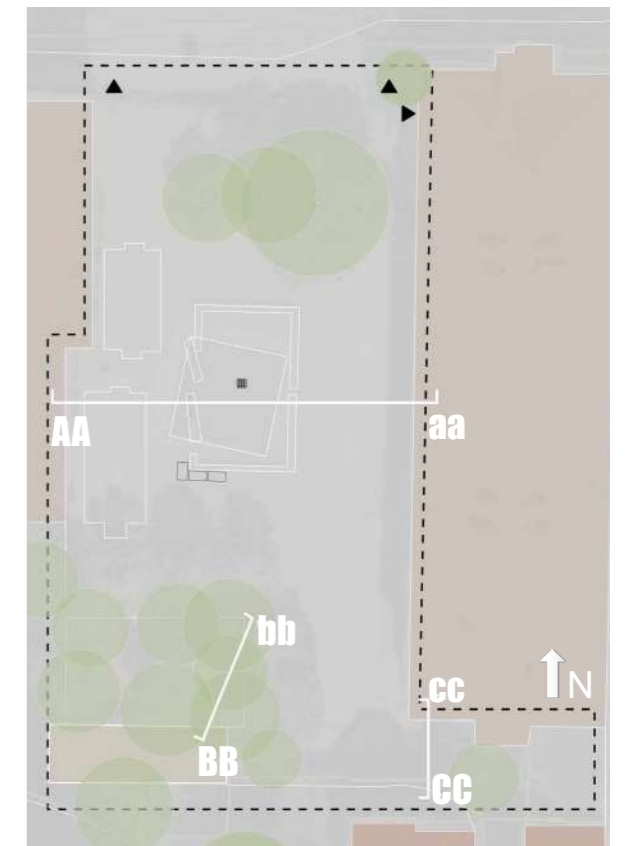


Fig 83. Scale 1:800.

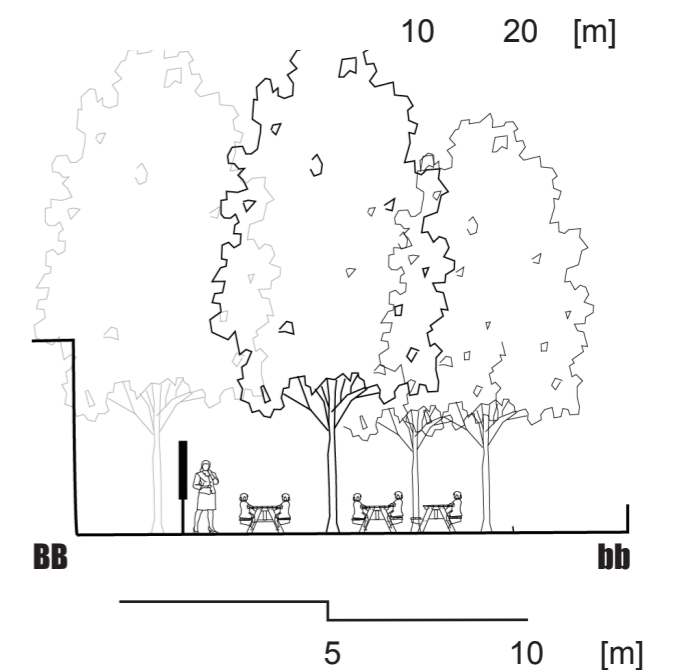


Fig. 94. Conceptual section of the outdoor classroom in *The Classroom* area, illustrating the spatial layout. Scale 1:200

## 5 The Sport Field

This area comprises designated physical spaces with time for organized sports like football and basketball. This proposal considers the school's location, as the teacher, Mrs Martina Strehler, mentioned that this aspect of the school is currently the most appreciated. It is so popular that the grades have to take turns having their own specific day to play sports on the school grounds, as there isn't enough space for all students to play simultaneously.

The conceptual program plan suggests expanding and combining the two marked areas into one large, enclosed space to keep the ball within the area, shown in figure X. This development is expected to increase physical activity, which is crucial for children's health, as supported by various researchers. It meets Hansen Sandseter and Kennairs (2011) criteria for high-speed play and contributes to social aspects being essential for children's health and development. The area addresses many sensory elements and senses, emphasizing the tactile sensation. According to Roehr (2022), incorporating tactile elements in landscape architecture is



Fig. 23 Illustrates how sport facilities and elements can be integrated within the schoolyard. Image taken at stop 2 in Berlin during the research trip.

transformative, offering a more inclusive approach to design. This zone also engage with Ayre's principle of proprioception, which argues that children's innate drive to engage and grow through pleasurable yet challenging sensorimotor activities, such as running in a football game, leads to an increased somatomotor adaptive response (Roley Smith, 2020). This, in turn, helps children develop generalized higher-level adaptive responses. Hansen Sandseter and Kennair (2011) also emphasized that such activities enhance motor skills. Therefore, creating spaces for physical activities like running provides tactile multisensory experiences and introduces the benefits of high-speed, risky play, contributing to physical competence and development.



Fig 95. Hand-drawn illustration of a child playing basketball.

## 6 Imagination Station

Designating one or more areas at a schoolyard for art and creative activities is an important consideration.

Providing opportunities for creativity strengthens children's attachment to their school grounds, as noted by Mazo & Devine (2020). GMS also addresses the importance of integrating art and installations in schools, noting that these elements contribute to the school's identity and enhance place attachment

The proposed concept advocates that individual schools should decide their unique character of their schoolyard. This programmatic aspect is highly subjective and personal from the schools' perspective and should not be dictated by external parties. Examples of artistic activities that children might engage in include setting up easels, using canvases or glass paintings, drawing on the ground with sidewalk chalk, creating craft projects with pine cones, stones, and sticks, and incorporating wind chimes for auditory stimulation. Seasonal art projects could also be implemented, such as leaf piles in the fall, winter snow sculptures, and spring and summer floral displays.

During our bike ride in Berlin, Ulrike reinforced the significance of integrating art into schoolyards, noting that it can create a landmark that cultivates a strong sense of identity and

attachment among students. This aligns with Guiliana's (2003) concept of transforming a space into a place, which occurs when the space is saturated with emotional value. Creating art involves making decisions about color, form, texture, and size, engaging multiple senses, and leaving a lasting impression on children. These experiences can form joyful memories, contributing to a meaningful and personal connection to their environment as they grow up.



Fig. 96. Photo taken from stop 4 during the research trip. It shows chickens and a fox as wooden sculptures which were a kind of landmark for that school. Promoting a sense of identity among the pupils.



Fig. 97. Image from Stop 4, demonstrating how art can be easily created using sidewalk chalk.

## Multisensory Table

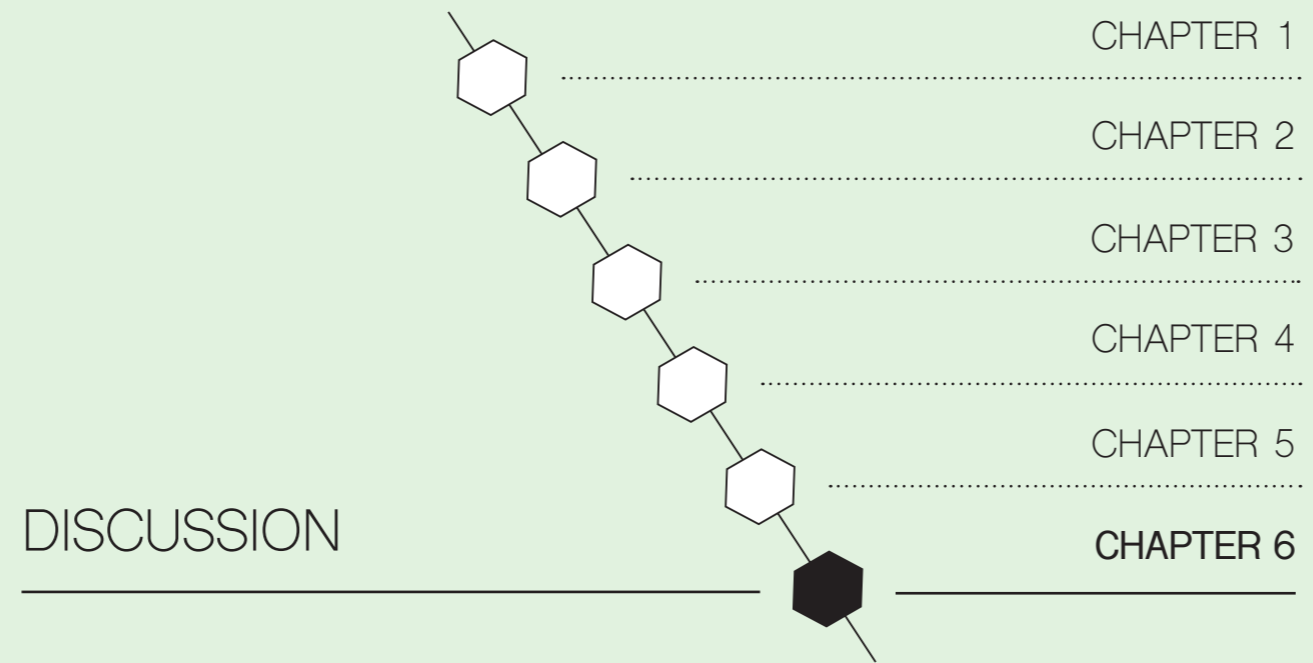
The table illustrates how various senses are engaged and stimulated within each characterized area. *The Classroom* focused on educational promotion, meets the highest sensory criteria. From these observations, it can be concluded that nature offers numerous multisensory experiences.

This table demonstrates how different character zones can introduce multisensory elements into a schoolyard. While the suggestions focus on Grundschule an der Schwanthalerstraße 87, it's important to emphasize that these ideas can be applied to other schoolyards as well. For example, some schoolyards may already have abundant vegetation but lack a dedicated school garden, while others may have ample space for sports but limited areas for creative play. Although this table is tailored to this primary school, it's intended to serve as inspiration for any schoolyard seeking to incorporate multisensory experiences.

The schoolyard's distinct spatial features foster emotional connections through activities in various zones. *The Forest*, with natural boundaries like shrubs and trees, provide a sense of safety and tranquility, while *The Sports Field* encourage social bonds, joy, and camaraderie. These spatial elements enhance children's sense of belonging and support a strong, connected community.

		<b>SIGHT</b>	<b>HEARING</b>	<b>TOUCH</b>	<b>SMELL</b>	<b>TASTE</b>
<b>1</b> The Forest		The trees, shrubs, and flower's varied colors, shapes, and textures create visual stimulation. The contrast between light and shadow under the canopies adds visual interest.	The rustling of leaves in the wind and children playing in the area.	The roughness of the bark, the softness of the leaves, and the cool, smooth surfaces beneath offer tactile sensations.	The fragrance of blooming flowers and the earthy scent of soil and plants engage the sense of smell.	
<b>2</b> Sensory Play Space		The variety of loose materials and the contrast between textures and colors provide a rich visual experience.	The crunching sound of footsteps on wood chips or sand adds an auditory dimension to play. The noise made by children interacting with the loose parts.	Different textures; roughness of wooden logs, the softness of sand, or the firmness of stones, give a sense of touch. The feel the differences in temperature between various materials.	The smell of wood chips mixed with the early aroma of sand and surrounding plants can offer an olfactory environment.	
<b>3</b> Pollinator Paradise		The colors of various plants and perennials create a visually stimulating landscape. The seasonal changes provides a constantly evolving view.	The buzzing of bees and other pollinators adds a natural and soothing soundtrack to the area, enhancing the sensory experience with gentle, rhythmic sounds.	Tactile sensations through interacting with plants— the rough texture of stems, or the soft leaves. These varied textures provide a hands-on way to engage with their environment.	The smell of flowers contribute to the sensory experience. These scents can be calming and create a pleasant olfactory environment that enhances relaxation and focus.	
<b>4</b> The Classroom		The garden is a vibrant visual experience featuring various colors, from blooming flowers to lush greenery and ripening fruits and vegetables.	Insects, rustling leaves, and chirping birds, creates a lively and immersive auditory experience. The sound of children and teachers working together.	The feel of soil between their fingers and textures of different plants. Engaging in planting, nurturing, and harvesting enhances children's fine motor skills and deepens their tactile connection to nature.	Aromatic plants such as mint, basil, and lavender release soothing, calming, and relaxing fragrances.	Tasting the fruits and vegetables children have grown creates a profound emotional connection to their food.
<b>5</b> The Sports Field		Visual perception is essential for hand-eye or foot-eye coordination. This requires constant scanning of the environment.	At a multi-sport area, sounds include balls bouncing, shoes on the floor, laughter, and peer cheers. Social interaction creates a dynamic auditory environment.	Children experience various surfaces while playing. Running, jumping, kicking, and throwing a ball provide a tactile sensation.		
<b>6</b> Imagination Station		Artworks can feature a variety of colors, shapes, and patterns that stimulate the visual senses.	Some artworks, such as wind chimes or elements affected by the wind, can produce sounds that enhance the auditory environment.	Many art pieces incorporate diverse textures, from smooth surfaces to rough ones. Materials like ceramics, metal, and wood provide different tactile experiences.	Art that uses natural materials or plants may emit distinct scents. For example, wood and certain flowers or plants can contribute to the olfactory experience.	

Table 1. Table showing how each zone in the conceptual program engages the five senses.



## RESULT DISCUSSION

The purpose of this work was to investigate and contribute with knowledge of how green and multisensory elements can be integrated into the planning and design of schoolyards in urban environments. This was demonstrated through a conceptual program plan for Grundschule an der Schwanthalerstraße 87 in Munich, which developed six distinct zones, each representing a unique characteristic while promoting multisensory experiences.

The result, derived from the literature review and the study trip to Berlin, underscores the pivotal role of nature in schoolyard design. Nature extends beyond a mere natural setting, providing a diverse range of multisensory experiences and health benefits through its various elements. Many of the schoolyards observed in Berlin showed a large amount of vegetation. This supported the literature's conclusions about the benefits of nature, highlighting its ability to reduce stress, enhance concentration, and encourage more imaginative play. This affected the decision to allocate a large portion of the schoolyard space to *The Forest* in the case study. The work addresses both theoretical and practical design considerations, demonstrating the importance of multisensory integration in educational settings. The case study proposes six distinct characters for incorporating multisensory elements into the schoolyard, tailored to the specific needs of the school. For instance, Grundschule an der Schwanthalerstraße 87 illustrates the necessity of a comprehensive approach to integrating multisensory features, given its previous lack of such elements, made from the inventory and site analysis.

The work demonstrates nature's essential role in enhancing multisensory experiences. As a foundational resource, nature provides a wide array of sensory interactions through its inherent features—leaves, bark, shrubs, stems, stones, sticks, berries, and cones—each facilitating diverse sensory activities. These elements can be climbed, jumped on, run through, and used in risky play, or gardening, or resting, supporting the theory of risky play proposed by Hansen Sandseter & Kennair (2011). The project underscores the importance of nature as a comprehensive resource that meets multiple sensory needs at once. Although there are many strategies for integrating multisensory experiences into schoolyards, the approach demonstrated in this study can be changed to fit the specific needs of each school.

The case study focuses on creating a health-promoting and multisensory environment by improving the current situation in the schoolyard through several key changes. They include removing the statue and teacher parking to create safe spaces, incorporating vegetation for shade and biodiversity, and using natural materials like logs and rocks to encourage imaginative and risky play. Establishing an outdoor classroom and school garden will enhance experimental learning and reduce stress levels. Additionally, creating pollinator hotspots will enhance biodiversity and offer educational opportunities. Overall, these design changes aim to foster a vibrant schoolyard that prioritizes children's health, development, and connection to nature.

Removing the statue is a key step in eliminating obstacles to children's play. Keeping the elevated surface allows for changes in height, creating a hill and a valley. This idea is supported by Hansen Sandseter & Kennair's (2011) research on risky play, which highlights the benefits of having different elevations for encouraging active play. Furthermore, incorporating varied terrain aligns with principles from the Grün Macht Schule initiative, which was seen in the schoolyards in Berlin. This variety in landscape supports different types of play and activities, reinforcing the idea that having a flat surface can limit play opportunities, making it a risk in itself. At Grundschule an der Schwanthalerstraße 87, the limited space made it difficult to make major changes to the ground without compromising other important features, like an outdoor classroom, a school garden, or multisport area. In this case, it was better to preserve the sunken area and use it to create slightly challenging terrain that engages children in play and exploration. In other schoolyards, there might have been more options to build higher hills or several hills to create an even more exciting play area. Using nature is an effective way to create spatial changes in schoolyards. As highlighted in the literature and observed at the schoolyards in Berlin, different spaces can be formed with the help of natural features. This can include planting taller trees for natural canopy ceilings, using compact shrubs for enclosures, or incorporating lighter vegetation that allows sound and sunlight to filter through, creating inviting nooks for children to explore. Natural elements like logs, rocks, and wooden sticks can also be integrated to promote creative play, giving children the freedom to decide how they want to use them. This approach was successfully

demonstrated at Bornholmer Grundschule in Berlin. Integrating these natural elements also supports Jean Ayres' Sensory Integration Theory on promoting physical activity and motor skills development. Additionally, it aligns with Simon Nicholson's loose parts theory, which emphasizes the importance of variable play elements. However, having too much vegetation in a schoolyard isn't always beneficial. It's essential to balance natural elements with other important features. While dense integration of nature at Bornholmer Grundschule can create a sense of enclosure, they may sometimes feel too constricting if the space isn't large enough. Incorporating lighter, more open environments could be beneficial for the case study primary school, especially in areas like *The Forest*. The space doesn't need to resemble a thick forest; instead, a variety of landscapes could enhance the experience.

Moreover, maintaining a lot of natural vegetation requires ongoing care, as unmanaged areas can pose risks for children playing nearby and for balls that might fly into dense thickets. Given the limited space at the selected school, it may be more worthwhile to focus on smaller natural elements, such as low shrubs and loose materials, which allow children to engage creatively. Creating spaces with seasonal perennials could also add variety, offering changing environments that create rooms at times and open spaces at others.

Integrating nature into *The Classroom* is something the case study highlights, as greenery has been shown to enhance focus and improve academic performance. However, in decision of location for *The Classroom* in the chosen primary school was somewhat predetermined due to the presence of large chestnut trees, where picnic tables were already placed. If the school hadn't had any vegetation or picnic tables at all, *The Classroom* might have been placed elsewhere. The existing trees were a significant factor in locating the classroom there, as it was essential to make use of the natural chestnut trees. Additionally, I learned that this area was already being used for outdoor academic activities, which influenced my choice of *The Classroom* location.

The school garden was positioned nearby for convenience, allowing for easy integration of theoretical knowledge with practical lessons. Given the school's limited space, a larger area for the school garden wouldn't have been feasible, as it was more important to prioritize greenery and allocate most of the space for the sports field.

## METHOD DISCUSSION

The methods employed in this study were primarily influenced by Research through Design (RTD), a literature review, a research trip, and a case study.

### Research Through Design

For this master's thesis, Research through Design (RTD) was used to generate new insights into how schoolyards can be designed to promote multisensory experiences and greenery. By creating and testing various design concepts, represented through different colored zones in the conceptual program plan, the project explored how these theories could be translated into practical solutions that contribute to a multisensory and health-promoting environment.

The conceptual program zones were developed to simulate how different types of multisensory experiences could be incorporated. These concepts served as tools for testing and reflecting on how the design solutions could support children's health and play. By comparing different prototypes, new insights emerged regarding the impact of design on the schoolyard. The key insights that emerged and were communicated through this work emphasize the importance of multisensory elements in schoolyards.

### Literature Review

The literature review provided a theoretical foundation for the study, particularly in understanding the positive impact of nature on human health and its role in children's development and long-term well-being. This review allowed me to identify key concepts that were subsequently applied in the conceptual program plan. It was essential to include this method to build a base of knowledge to guide the research. I aimed to use both printed and digital sources to gain a broad perspective. However, I identified gaps, particularly regarding multisensory design in landscape architecture. There is limited research on this topic, and a key reference I found was Daniel Roehr's book *Multisensory Landscape Design: A Designer's Guide for Seeing*. To address the gaps, I explored other sources and discovered Jean Ayres' theories, which emphasize the importance of sensory experiences. It would be beneficial for more landscape architects to delve into the multisensory

approach like Roehr and Ayres, as it has significant potential and offers many positive outcomes.

Louise Chawla's (2015) report *Benefits of Nature Contact for Children* provided in-depth insights into how nature contributes to children's health and development, both in the short term and long term. This was particularly useful when considering the integration of nature when working with an area where children spend a significant amount of time. It strengthened the rationale for incorporating nature into school environments as part of my design approach.

Another valuable source was Sun-Young Rieh's (2020) study *Creating a Sense of Place in School Environments: How Young Children Construct Place Attachment*. This study clarified the critical role schoolyards play in children's development and highlighted the opportunities landscape architects have to create greener, more meaningful school environments. Rieh's focus on place attachment and the importance of the surrounding environment greatly supported my advocacy for integrating nature into school environments.

Hansen Sandseter and Kennair's (2011) article on Risky Play was instrumental in informing the design of play areas. Their practical suggestions for incorporating challenging play environments were particularly useful when considering how to design nature-based play areas.

Casey & Robertson's (2016) article about Simon Nicholson's theory of Loose Parts was another important contribution. It emphasized that simply by integrating loose materials into the landscape, children can shape and create a play environment themselves. This provided valuable insights into practical design elements for schoolyards and helped guide the project's design process.

The literature review offered significant value in helping me understand why certain aspects of schoolyard design (such as nature, place attachment, loose parts, and risky play), are important. However, the review lacked detailed guidance on how to implement these concepts in the actual design. There was a noticeable gap in terms of practical steps or guidelines on how to design an ideal schoolyard. In hindsight, I would have incorporated more material

into the design process itself to bridge this gap. While the review was rich in explaining the benefits of these concepts, it did not provide enough practical information on how to apply them specifically in the field. This is an area that could benefit from further research and exploration.

### Research Trip

The research trip to reference projects in Berlin was conducted to collect empirical data through the observation of real-life examples of schoolyards featuring loose parts, multisensory elements, and vegetation. The purpose was to gain practical insights and directly observe how design principles function in actual environments.

The trip was organized in collaboration with Grün Macht Schule (GMS), and the schoolyards visited were personally recommended by Ulrike Wolf, a key figure in the organization. This was a great advantage, as GMS is highly regarded for its efforts to incorporate greenery and challenging play environments into Berlin's schoolyards, which aligns closely with my research focus.

One limitation of the trip was that only five schoolyards could be visited due to time and budget constraints. Had more schools been visited, or if visits could have been spread out over multiple occasions, additional observations might have been gathered, potentially influencing the outcomes of the study.

The observations from the trip provided valuable insights that contributed to the development of the conceptual program proposal, particularly in integrating natural elements and multisensory environments into schoolyard design in a functional way. However, while the observations offered many useful ideas, some design strategies used in Berlin were not directly transferable to the case study in Munich, as the local conditions differed substantially. The schoolyards in Berlin were not all as centrally located as the chosen primary school in Munich, and many had larger spaces to work with, which limited the applicability of certain strategies.

The research trip to the reference projects was an incredible opportunity that had a profound impact on my work. It was



# DISCUSSION

highly inspiring and offered a unique chance to observe how design principles operate in practice, providing a deeper understanding of how theories from the literature could be applied to real-world environments. A limitation of the trip was that the observations were confined to a short time frame, which prevented capturing the full range of how children interacted with the environment over a longer period. Although some insights from the reference projects can be applied to other schoolyards, certain solutions were specific to the local conditions in Berlin and may need adaptation to work in other settings.

## Case Study

The case study was used to examine a specific example of an urban schoolyard in detail and to gain an in-depth understanding of how multisensory and natural elements can be integrated into school environments. This method was chosen to explore complex and site-specific factors in a real-world context, which would be difficult to achieve with other methods.

Grundschule an der Schwanthalerstraße 87 in Munich was selected as the case study because it represents a typical urban schoolyard with limited green space, making it suitable for exploring the challenges that arise in densely built-up areas. Its central location and lack of greenery were key factors in the selection process. Data were collected through field observations, where I documented the current conditions of the schoolyard, including space usage, vegetation distribution, and play activities. Additionally, maps and construction documents were used to analyze the physical environment, along with interviews with school staff to understand how the space is used from an educational perspective.

A limitation in data collection was that field observations were only conducted at one occasion, making it difficult to gain a full picture of how the schoolyard is used across different seasons or over longer periods. However, the case study provided a site-specific understanding of the challenges and opportunities present at this schoolyard, which was crucial for developing relevant conceptual program proposals that take local conditions into account. The detailed analysis of the site helped in understanding how the current form and structure of the schoolyard could be

improved to integrate multisensory elements.

One weakness of the case study is that the results are tied to this specific case, potentially making it difficult to generalize to other schoolyards. While insights from the case study may be useful in similar urban environments, some solutions may need to be adapted to suit other locations with different conditions. The credibility of the case study was strengthened through the triangulation of various data sources, such as observations, interviews, and documentation. However, there is a risk that subjective interpretations of the site may have influenced the results, which is an inherent limitation of the case study method.

## Wider Impact

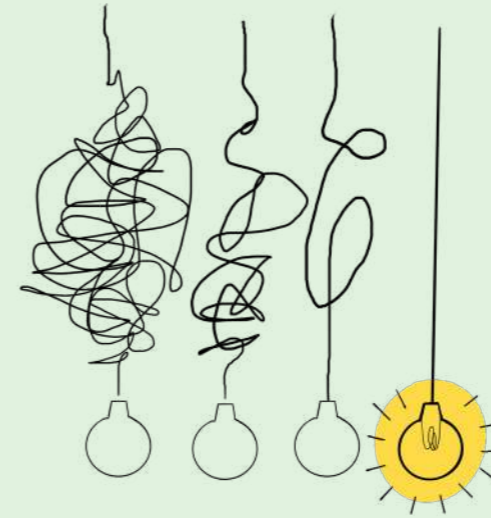
This work aimed to enhance understanding of how green and multisensory elements can be integrated into schoolyard design, focusing on Grundschule an der Schwanthalerstraße 87 in Munich. The findings emphasize the transformative potential of incorporating natural elements into schoolyards, enriching children's play experiences while promoting their health and well-being in urban landscapes. As cities grow and green spaces diminish, the insights gained from this study may inform future landscape architects to create more inclusive, health-promoting school environments that cater to diverse children's needs.

Developing this conceptual program plan into a detailed design proposal for future work would be intriguing, particularly in detailing the removal of the statue and stone wall. Additionally, exploring the selection of vegetation for the school garden and its integration into the curriculum for pupils would be valuable.

## Future Directions

Future research could build on this work by exploring and refining these design concepts in practical applications:

- *How can the multisensory design principles outlined in this thesis be adapted for schools in different climates or cultural textures?*
- *What guidelines should be established for safely integrating risky play elements in schoolyard designs?*
- *In what ways can multisensory schoolyard designs be aligned with educational curricula to enhance both academic and developmental outcomes, and how can teachers and educational planners collaborate to this?*
- *How can innovations such as smart technology, AI and digital interaction be integrated into multisensory schoolyard designs?*



## CLOSING REMARKS

In the preface of this work, I mentioned a memory of my first day at the landscape architecture program. Submitting this thesis and presenting my work marks the end of that journey. However, it also signifies the first steps on the path toward joining the global movement aimed at providing children with a healthier urban childhood.

Delving into literature and researching a topic I am passionate about has been incredibly rewarding and enjoyable, though also challenging. It has made me realize how much there is still to explore. The reference projects I encountered during the study trip in Berlin with Grün Macht Schule have left me with what is sometimes called ‘core memories,’ and they will continue to inspire me throughout my career.

Finally, this thesis can be a limited, but meaningful contribution to the border movement towards improving today's and tomorrow's schoolyards for children. So that in the future, children can still raise their hands when asked if their favorite place is a spot in nature.

# REFERENCES

- Casey, T. & Robertson, J. (2016). *Loose Parts Toolkit. Creative STAR Learning*. Available at: <https://creativestarlarning.co.uk/wp-content/uploads/2020/05/Loose-Parts-Toolkit.pdf>
- Chawla, L. (2015). *Benefits of Nature Contact for Children*. Journal of Planning Literature, 30 (4). Available at: <https://doi.org/10.1177/0885412215595441>
- Christensen, P. & O'Brien, M. (2003). *Children in the City - Home, Neighborhood and Community*. Routledge.
- Deming, M.E. & Swaffield, S. (2011). *Landscape Architectural Research: Inquiry, Strategy, Design*. 1st ed. Wiley.
- Ferrer, S., Thiollier, R., Gil Cifuentes, A., About, C., Zerriahen, M., Pasquale, N., Besançon, M., Cottar, E., Chamblas, J., Dif, M., Duffort, L., Pinto, D., Mourey, S. & Van Doesburg, C. (2022). *OASIS SCHOOLYARDS: Recommendations Booklet for Transforming Schoolyards*. The City of Paris. Available at: <https://eadn-wc04-796033.nxedg.io/wp-content/uploads/Recommendations-booklet-OASIS.pdf> [Accessed 16 August 2024].
- Faskunger, J., Szczepanski, A. & Åkerblom, P. (2018). *Himlen med klassrum som tak: En kunskapsöversikt om vad utomhusundervisning betyder för lärande i grundskolan*. Available at: <https://liu.diva-portal.org/smash/get/diva2:1218908/FULLTEXT05.pdf>
- Goldstein, E.B. (2009). *Sensation and Perception*. 8th ed. Wadsworth. Available at: <https://www.docdroid.net/s9KgCTP/sensation-and-perception-by-e-bruce-goldstein-z-liborg-pdf>
- Giuliani, M.V. (2003). *Theory of Attachment and Place Attachment*. In: Psychological Theories for Environmental Issues. Routledge. Available at: [file:///Users/louiseemilson/Downloads/THEORYOFATTACHMENT%20\(1\).pdf](file:///Users/louiseemilson/Downloads/THEORYOFATTACHMENT%20(1).pdf) [Accessed 7 January 2023].
- Grinde, B. & Grindal Patil, G. (2009). *Biophilia: Does Visual Contact with Nature Impact on Health and Well-Being?* International Journal of Environmental Research and Public Health. Available at: <https://doi.org/10.3390/ijerph6092332>
- Grundschule an der Schwanthalerstraße 87. (n.d.). *Home page*. Available at: <http://www.gs-schwan.musin.de/> [Accessed: 15 July 2024].
- Grün Macht Schule (2024). *Grün Macht Schule: About Us*. Available at: <http://www.gruen-macht-schule.de/index.php/de/ueber-uns-1>
- Haaland, C. & Konijnendijk van den Bosch, C. (2015). *Challenges and Strategies for Urban Green-space Planning in Cities Undergoing Densification: A Review*. Urban Forestry & Urban Greening, 14 (4). Available at: <https://doi.org/10.1016/j.ufug.2015.07.009>
- Hansen, A. (2021). *Depphjärnan: varför mår vi så dåligt när vi har det så bra?* Bonnier Fakta.
- Hartley, J. (2004). *Case Study Research*. In: C. Cassel & G. Symon (eds), Essential Guide to Qualitative Methods in Organizational Research. SAEG Publications Ltd. [Accessed 24 July 2024].
- International School Grounds Alliance (2024). *About ISGA*. Available at: <https://www.internationalschool-grounds.org/about> [Accessed 16 August 2024].
- Kaplan, R. & Kaplan, S. (1989). *The Experience of Nature: A Psychological Perspective*. Cambridge University Press.
- Mather, G. (2011). *Essentials of Sensation and Perception*. Routledge. (Foundations of Psychology). [Accessed 30 June 2024].
- Mazo, L.C. & Devine-Wright, P. (2020). *Place Attachment - Advances in Theory, Methods and Applications*. Taylor & Francis.
- Mårtensson, F. (2011). *Den nyttiga utevistelsen?* Naturvårdsverket. Available at: <https://www.diva-portal.org/smash/get/diva2:396670/FULLTEXT01.pdf> [Accessed 24 July 2024].
- Rieh, S.Y. (2020). *Creating a Sense of Place in School Environments: How Young Children Construct Place Attachment*. University of Seoul. Available at: [https://www.researchgate.net/publication/340706960\\_Creating\\_a\\_Sense\\_of\\_Place\\_in\\_School\\_Environments\\_How\\_Young\\_Children\\_Construct\\_Place\\_Attachment](https://www.researchgate.net/publication/340706960_Creating_a_Sense_of_Place_in_School_Environments_How_Young_Children_Construct_Place_Attachment) [Accessed 24 July 2024].
- Roehr, D. (2022). *Multisensory Landscape Design: A Designer's Guide for Seeing*. Routledge.
- Sandseter, E.B.H. & Kennair, L.E.O. (2011). Children's Risky Play from an Evolutionary Perspective: Theoretical Perspectives and Practical Applications. *Evolutionary Psychology*, 9 (2), 257–284. Available at: <https://doi.org/10.1177/147470491100900212>
- Sandseter, E.B.H. och Kennair, L.E.O., 2011. *Children's risky play from an evolutionary perspective: Theoretical perspectives and practical applications*. *Evolutionary Psychology*, 9(2), pp.257–284. <https://doi.org/10.1177/147470491100900212> [Accessed 2 July 2024].
- Smith Roley, S. (2020). *Understanding Sensory Integration: Theory and Application*. Pro-Ed. Available at: <https://www.proedinc.com/downloads/12565ch01.pdf> [Accessed 25 July 2024].
- Smith Roley, S., Mailloux, Z., Miller-Kuhaneck, H. & Glennon, T. (2015). *Understanding Ayres Sensory Integration*. ResearchGate. Available at: [https://www.researchgate.net/publication/289758466\\_Understanding\\_Ayres\\_Sensory\\_Integration](https://www.researchgate.net/publication/289758466_Understanding_Ayres_Sensory_Integration) [Accessed 24 July 2024].
- Steg, L. (2019). *Environmental Psychology - An Introduction*. 2nd ed. John Wiley & Sons Ltd.
- Strålsäkerhetsmyndigheten (2024). *Planera för sol och skugga på förskolegårdar och skolgårdar*. Strålsäkerhetsmyndigheten. Available at: <https://www.stralsakerhetsmyndigheten.se/omraden/sol-och-solarier/rad-och-rekommendationer/planera-for-sol-och-skugga-pa-forskolegardar-och-skolgardar/> [Accessed 24 July 2024].

# REFERENCES

Ulrich, R.S., Simons, R.F., Losito, B.D., Fiorito, E., Miles, M.A. & Zelson, M. (1991). *Stress Recovery during Exposure to Natural and Urban Environments*. *Journal of Environmental Psychology*, 11 (3), 201–230. Available at: [https://doi.org/10.1016/S0272-4944\(05\)80184-7](https://doi.org/10.1016/S0272-4944(05)80184-7)

Wolf, U., Wolf, U., Schröder, U. & Dietzen, M. (2020). *Schoolyard Habitat. Grün Macht Schule*. Available at: [http://www.gruen-macht-schule.de/images/downloads/kartenset\\_englisch/cardset\\_GmS\\_schoolyard\\_habitat\\_small.pdf](http://www.gruen-macht-schule.de/images/downloads/kartenset_englisch/cardset_GmS_schoolyard_habitat_small.pdf) [Accessed 24 July 2024].

# LITST OF FIGURES

Unless otherwise stated, ©Emilson (2024) for photographs, illustrations, and modified maps.

- Figure 1 *The logo of ISGA* (2024). International School Ground Alliance. Available at <https://www.internationalschoolgrounds.org/> [Accessed: 29 August 2024]
- Figure 4 *Image related to Risky Play* Source: Pinterest, Available at: [www.pinterest.com/pin/eb0a04d9cd389207001263c61cf01af7/](http://www.pinterest.com/pin/eb0a04d9cd389207001263c61cf01af7/) [Accessed: 1 September 2024]
- Figure 8 *The logo of Grün Macht Schule*. (2024). Grün Macht Schule. Available at: <http://www.gruen-macht-schule.de/index.php/de/> [Accessed: 2 August 2024]
- Figure 9 *Schoolyard Habitat Cardset, number 2* (2020) Wolf, U., Wolf, U., Schröder, U. and Dietzen, M. Available at: [http://www.gruen-macht-schule.de/images/downloads/kartenset\\_englisch/cardset\\_GmS\\_schoolyard\\_habitat\\_small.pdf](http://www.gruen-macht-schule.de/images/downloads/kartenset_englisch/cardset_GmS_schoolyard_habitat_small.pdf) [Accessed: 23 September 2024]
- Figure 10 *Schoolyard Habitat Cardset, number 13* (2020) Wolf, U., Wolf, U., Schröder, U. and Dietzen, M. Available at: [http://www.gruen-macht-schule.de/images/downloads/kartenset\\_englisch/cardset\\_GmS\\_schoolyard\\_habitat\\_small.pdf](http://www.gruen-macht-schule.de/images/downloads/kartenset_englisch/cardset_GmS_schoolyard_habitat_small.pdf) [Accessed: 23 September 2024]
- Figure 11 *Schoolyard Habitat Cardset, number 6* (2020) Wolf, U., Wolf, U., Schröder, U. and Dietzen, M. Available at: [http://www.gruen-macht-schule.de/images/downloads/kartenset\\_englisch/cardset\\_GmS\\_schoolyard\\_habitat\\_small.pdf](http://www.gruen-macht-schule.de/images/downloads/kartenset_englisch/cardset_GmS_schoolyard_habitat_small.pdf) [Accessed: 23 September 2024]
- Figure 12 *An illustrated map of Germany*. (2024), Vecteezy, n.d. Available at: <https://www.vecteezy.com/free-vector/germany-map> [Accessed: 10 July 2024]
- Figure 13 *Map of Berlin*. Source: Berlin.de, [Cartographic material] Available at: [www.berlin.de/sen/sbw/stadtdaten/geoportal/](http://www.berlin.de/sen/sbw/stadtdaten/geoportal/) [Accessed: 27 July 2024].

- Figure 54 *Aerial photo of the school playground*. Source: GS Schwan, Available at: <http://www.gs-schwan.musin.de/> [Accessed: 27 July 2024].
- Figure 55 *Map of Munich*. Source: Bayern Atlas, [Cartographic material] Available at: <https://geoportal.bayern.de/bayernatlas/?lang=de&topic=ba> [Accessed: 27 July 2024].
- Figure 56 *An illustrated map of Germany*. (2024), Vecteezy, n.d. Available at: <https://www.vecteezy.com/free-vector/germany-map> [Accessed: 10 July 2024]
- Figure 57 *Map of Munich*. Source: Bayern Atlas, [Cartographic material] Available at: <https://geoportal.bayern.de/bayernatlas/?lang=de&topic=ba> [Accessed: 27 July 2024].
- Figure 58 *Map of Munich*. Source: Bayern Atlas, [Cartographic material] Available at: <https://geoportal.bayern.de/bayernatlas/?lang=de&topic=ba> [Accessed: July 27 2024].
- Figure 59 *The logo of Grundschule an der Schwanthalerstraße 87*. (2024). Source: GS Schwan, Available at: <http://www.gs-schwan.musin.de/> [Accessed: 31 July 2024].
- Figure 68 *Processed map of Grundschule an der Schwanthalerstraße 87*. Original source: Bayernatlas, [Cartographic material] Available at: <https://geoportal.bayern.de/bayernatlas/?lang=de&topic=ba> [Accessed: 25 July 2024]. Processed using Adobe Illustrator.
- Figure 77 *Processed map of Grundschule an der Schwanthalerstraße 87*. Original source: Bayernatlas, [Cartographic material] Available at: <https://geoportal.bayern.de/bayernatlas/?lang=de&topic=ba> [Accessed: 25 July 2024]. Processed using Adobe Illustrator.
- Figure 78 *Processed map of Grundschule an der Schwanthalerstraße 87*. Original source: Bayernatlas, [Cartographic material] Available at: <https://geoportal.bayern.de/bayernatlas/?lang=de&topic=ba> [Accessed: 25 July 2024]. Processed using Adobe Illustrator.
- Figure 79 *Processed map of Grundschule an der Schwanthalerstraße 87*. Original source: Bayernatlas, [Cartographic material] Available at: <https://geoportal.bayern.de/bayernatlas/?lang=de&topic=ba> [Accessed: 25 July 2024]. Processed using Adobe Illustrator.
- Figure 80 *Processed map of Grundschule an der Schwanthalerstraße 87*. Original source: Bayernatlas, [Cartographic material] Available at: <https://geoportal.bayern.de/bayernatlas/?lang=de&topic=ba> [Accessed: 25 July 2024]. Processed using Adobe Illustrator.
- Figure 83 *Processed map of Grundschule an der Schwanthalerstraße 87*. Original source: Bayernatlas, [Cartographic material] Available at: <https://geoportal.bayern.de/bayernatlas/?lang=de&topic=ba> [Accessed: 25 July 2024]. Processed using Adobe Illustrator.

### Publicering och arkivering

Godkända självständiga arbeten (examensarbeten) vid SLU publiceras elektroniskt. Som student äger du upphovsrätten till ditt arbete och behöver godkänna publiceringen.

Om du kryssar i JA, så kommer fulltexten (pdf-filen) och metadata bli synliga och sökbara på internet.

Om du kryssar i NEJ, kommer endast metadata och sammanfattning bli synliga och sökbara. Även om du inte publicerar fulltexten kommer den arkiveras digitalt. Om fler än en person har skrivit arbetet gäller krysset för samtliga författare. Du hittar en länk till SLU:s publiceringsavtal på den här sidan: <https://libanswers.slu.se/sv/faq/228316>.

JA, jag/vi ger härmed vår tillåtelse till att föreliggande arbete publiceras enligt SLU:s avtal om överlåtelse av rätt att publicera verk.

NEJ, jag/vi ger inte vår tillåtelse att publicera fulltexten av föreliggande arbete. Arbetet laddas dock upp för arkivering



Louise Emilson

Independent project • 30 credits  
Swedish University of Agricultural Sciences, SLU  
Uppsala, 2024