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Inclusive Climate Adaptation
in Urban Public Spaces
for People with Disabilities

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Abstract:

The increasing frequency and intensity of extreme weather events as a result of climate change have created an increased need for climate adaptation in urban areas. In Denmark, climate adaptation is more frequently integrated into urban design through nature-based surface solutions. Existing research shows that people with disabilities are not sufficiently included in urban design, while this group is simultaneously particularly vulnerable to climate-related disasters. Despite this, a research gap remains regarding how surface-based climate adaptation solutions address the needs of people with disabilities in planning and design.

This research project examines the relationship between climate adaptation and accessibility in urban public spaces, with a focus on wheelchair users and blind/visually impaired people. The project is based in Frederiksberg Municipality and applies a comparative case study of J.O. Krags Park and the SPARK-Park in Aarhus Municipality, which is used as a reference and inspirational case. The analysis is grounded in the Urban Design Tool derived from affordance theory and qualitative interviews.

The results show that climate adaptation solutions can both enable and limit accessibility depending on their design. The comparison of the two cases demonstrates that wheelchair users and blind/visually impaired people have different needs in relation to the design of climate adaptation solutions, and that early involvement, a clear prioritisation of accessibility, and conscious design choices are crucial for creating accessible climate adapted urban spaces.

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Summary

Den øgede hyppighed og intensitet af ekstreme vejrhændelser, som følge af klimaforandringer, fremmer en central udfordring i byplanlægningen og påvirker både infrastruktur og byliv. I Danmark integreres klimatilpasning i stigende grad gennem naturbaserede overfladeløsninger og er derfor med til at udforme og ændre det nuværende bydesign. Eksiterende forskning viser, at mennesker med funktionsnedsættelse ikke inddrages tilstrækkeligt i den eksisterende by- og design planlægningen, og samtidig er denne gruppe særligt udsat i forbindelse med klimarelaterede hændelser. På trods af dette eksisterer der fortsat et forskningsmæssigt gab i forhold til, hvordan overfladebaserede klimatilpasningsløsninger tager højde for mennesker med funktionsnedsættelse i by- og design planlægningen. Denne rapport undersøger derfor, hvordan overfladebaserede klimatilpasningsløsninger kan muliggøre og begrænse tilgængelighed for mennesker med funktionsnedsættelse, samt hvordan klimatilpasning kan styrkes i praksis og bidrage til mere bæredygtige og inkluderende byrum i fremtiden.

Denne rapport undersøger sammenhængen mellem klimatilpasning og tilgængelighed i urbane offentlige rum med særligt fokus på, hvordan naturbaserede klimatilpasningsløsninger påvirker anvendeligheden af byrum for kørestolsbrugere samt blinde/svagsynede. Dette fokus på netop kørestolsbrugere og blinde/svagsynede er valgt, da danske undersøgelser viser, at disse grupper er blandt de mest udsatte i de eksisterende offentlige byrum. Rapporten tager udgangspunkt i to danske projekter, der begge er naturbaserede klimatilpasningsparker. J.O. Krags Park, i Frederiksberg Kommune, analyseres som en lokal klimatilpasnings park, mens SPARK-Parken i Aarhus Kommune anvendes som en komparativ reference case. Teorien affordance bruges, som teoretiske ramme for rapporten, hvor teoriens urbane design tool anvendes som et metodisk værktøj til at undersøge de to klimatilpasningsparker fysiske omgivelser, samt hvilke handlemuligheder de tilbyder eller begrænser kørestolsbrugere og blinde/svagtseende. Yderligere anvendes metoderne stedsanalyse herunder QGIS værktøjet, interviews, herunder GO-Along interviews, samt observationer til at belyse hvordan parkernes udformning påvirker brugernes bevægelse, orientering og deltagelse.

Resultaterne fra analyserne viser, at klimatilpasningsløsninger både kan udfordre og understøtte tilgængeligheden for kørestolsbrugere og blinde/svagtseende. Sammenligningen af de to projekter viser, at kørestolsbrugere og blinde/svagsynede hovedsageligt har forskellige behov i forhold til udformning og design af klimatilpasningsløsninger. Faste og jævne belægninger, brede stier, ingen kanter og minimale stigninger understøtter sikker bevægelse og orientering for kørestolsbrugere. For blinde/svagtseende understøtter faste og jævne belægninger, smalle stier, kanter eller opmærksomhedsfelter, konsekvente materialeskift, faste elementer og konstante lyde, sikker bevægelse og orientering. Omvendt begrænser bløde belægninger som græs, smalle stier, begrænset lys, niveauforskelle og stejlt terræn kørestolsbrugeres bevægelse og orientering. For blinde/svagtseende udfordrer store åbne rum uden ledelinjer eller referencepunkter, brede og snoede stier og overgange uden opmærksomheds eller advarsels felter deres bevægelse og

orientering. Sammenligningen af de to projekter viser, at tidlig og systematisk inddragelse af mennesker med funktionsnedsættelse, og en tydelig prioritering af tilgængelighed, samt bevidste designvalg bidrager til mere inkluderende klimatilpasningsløsninger for kørestolsbrugere og blinde/svagtseende i urbane offentlige rum.
Ved at anvende affordance-teorien og aktivt inddrage mennesker med funktionsnedsættelse i planlægningsprocesser kan klimatilpasningsprojekter blive mere tilgængelige, inkluderende og anvendelige for en bredere del af befolkningen. Rapportens resultater kan anvendes af Frederiksberg Kommune, samt andre kommuner, planlæggere og arkitekter, der arbejder med by- og klimatilpasningsplanlægning, som et vidensgrundlag for at integrere tilgængelighed som en central del af fremtidige klimatilpasningsprojekter.

Contents

List of Figures

List of Tables

Introduction 1

In this chapter of the project research, the overall topic, field, and problem statement will be elaborated. First, the context of the problem will be described, and subsequently, the central problem statement, along with two supporting problem statements, will be presented.

1.1 Disability and Urban Planning

Approximately half of the world's population live in cities today, and this development is expected to continue, with two-thirds of the world's population projected to live in cities by 2050 (United Nations, Department of Economic and Social Affairs, Population Division, 2025, p 5). Cities have therefore gained a central role within planning, as decisions and solutions will affect many human beings (Cheshmehzangi, 2025, pp 1-3). The decisions made within urban planning affect directly on people's living conditions and well-being, and can support people's welfare and quality of life (Wesz et al., 2023, p 1). According to the UN Sustainable Development Goal (SDG) 11, cities must be developed to be inclusive and accessible for all citizens (De Forenede Nationer, n.d.) (United Nations, Department of Economic and Social Affairs, Population Division, 2025, p 1) (UN-Habitat, 2024, p iii). This means that urban planning is not only about creating physical structures but also about ensuring that all people can participate and benefit from solutions implemented in cities (Cheshmehzangi, 2025, p 5). According to research there is a challenge within both inclusion and accessibility in planning, not only historically but also in contemporary planning (Stafford et al., 2022, pp 103,107,116). The challenge of considering all needs for citizens in relation to urban planning remains a problem (Stafford et al., 2022, pp 103,107,116). Additionally, certain population groups are often not included in the planning, which results in societal groups, such as people with disabilities being excluded from decision-making processes and concrete planning solutions (Stafford et al., 2022, pp 103,107,116). Today, cities and urban planning infrastructure are often designed according to a normative perception of the body, which means that planning commonly excludes citizens living with disabilities which hence creates a form of ableism [1] (Shahraki, 2021, p 1) (Stafford et al., 2022, pp 107,118). According to Shahraki (2021) people with disabilities deserve the opportunity to enjoy and experience urban environments equally with people without disabilities (Shahraki, 2021, p 173). Today, 16% of the world's population live with a disability according to WHO (World Health Organization, 2022). This means that people with disabilities are the largest minority group globally (Stein et al., 2023, p 1) (Calgaro, 2021, p 1).

[1] Ableism means exclusion of people with disabilities from society and planning processes (Stafford et al., 2022, p 103)

1.2 Disability and Climate Change

A particular challenge regarding people with disabilities in urban planning concerns the fact that they are especially vulnerable to climate change, which constitutes an important focus area in the present urban development (Cheshmehzangi, 2025, pp 2-4) (Brown et al., 2025, p 138). Hence, the greatest challenge is that cities are struggling with climate change planning (Cheshmehzangi, 2025, pp 1,4).
As stated by the latest IPCC report, it is important to take climate change seriously, as climate change is a reality and has affected and will continue affecting our climate on a global scale (IPCC, 2023, p 4) (UN-Habitat, 2024, p v). According to IPCC, climate change is understood as changes over longer periods, which can be caused by natural processes, for example volcanic eruptions, or external influences such as human-made impacts as agricultural industry (IPCC, 2023, p 122). In line with IPCC, it is evident that human activities have intensified climate change on a global scale. Climate change are for instance rising temperatures, increased sea levels, and extreme weather events, including heatwaves, droughts and extreme precipitation (IPCC, 2023, p 5) (UN-Habitat, 2024, p xv). Therefore, there should be a strong focus on solving the issues related to climate change, specifically in relation to urban planning (UN-Habitat, 2024, p 344).

There is limited research based on the relationship between climate change and people with disabilities. Existing research primarily focus on emergency preparedness and disasters in relation to the evacuation and rescuing people with disabilities during natural disasters (Eriksen et al., 2021, p 1) (Calgaro, 2021, pp 320-322) (Jodoin et al., 2025, p 1). People with disabilities are particularly affected by consequences of climate change, as they often experience greater risks in connection with extreme weather events (Brown et al., 2025, p 138) (Calgaro, 2021, p 320). In addition, people with disabilities are four times more likely to die in climate disasters than people without disabilities (Brown et al., 2025, p 138). This means that people with disabilities are more vulnerable to climate changes and extreme events, such as floods, heatwaves, and food shortages, as well as they also experience increased challenges with evacuation and disaster mitigation. Furthermore, people with disabilities often experience limited access to important resources, information, and services in general, which intensifies in connection to climate changes and disasters(Stafford et al., 2022, p 128) (Høgsbro and Friis-Hansen, 2024, pp 3-13) (Eriksen et al., 2021, p 1).

Therefore, it is important that marginalised societal groups, such as people with disabilities, are included in urban planning within climate action. Commonly, people with disabilities are systematically excluded from decision-making processes of urban planning related to climate policy and climate initiatives (Stafford et al., 2022, pp 105,129) (Eriksen et al., 2021, p 1). Several arguments in the field of urban planning explain this outcome. One argument is that people with disabilities are perceived as among the last to be saved in society. (Eriksen et al., 2021, p 1). Another argument is that climate policies often assume that all people are able-bodied, meaning that people with disabilities do not exist (Høgsbro and Friis-Hansen, 2024, p 3). Furthermore, there are arguments that people with disabilities are not considered a central part of planning discussions (Stafford et al., 2022, pp 103,130). These arguments are supported by the analysis “A systematic analysis of disability inclusion in domestic climate policies”, which conducted the first systematic analysis of the extent to which people with disabilities and their human rights are included in states' national policies on a global level (Jodoin et al., 2025, p 1). The analysis is based on 195 countries and is part of the Paris Agreement. The analysis results show that countries systematically neglect their obligations toward people with disabilities in their climate policies, which makes people with disabilities more vulnerable in relation to climate change (Jodoin et al., 2025, p 1).

To ensure that people with disabilities are included with a given voice related to climate policy and climate initiatives will help cities and societies with sustainable and resilient climate change solutions (Eriksen et al., 2021, pp 1-4) (Stafford et al., 2022, p 129). Hence, the knowledge of people with disabilities can be considered crucial for gaining better understanding of vulnerabilities and uncertainties that may arise in society, thereby strengthening knowledge production and decision-making processes that will benefit society as a whole and its robustness (Eriksen et al., 2021, pp 1-4) (Stafford et al., 2022, p 129) (Calgaro, 2021, p 323).

1.3 Urban Design and Inclusive Climate Adaptation

Especially people in cities are the most vulnerable to climate change. People living in cities experience more extreme heat conditions, such as air pollution, affecting urban and critical infrastructures (UN-Habitat, 2024, p 344) (IPCC, 2023, p 50). In addition, important urban infrastructure such as transport, water- and energy supply are exposed to severe damage due to weather events like storms and floods (IPCC, 2023, p 50). Furthermore, it has also been observed that the urbanisation of people in cities increases the amount of heavy rainfall and rainstorms as well as intensifies the risk of flooding (IPCC, 2023, p 50).

Therefore it is a necessity to climate-adapt our cities and infrastructure to achieve a reduction in climate impacts, as it is crucial for protecting our cities and infrastructure (IPCC, 2023, pp 29,105). Hence, it is important to consider and implement climate adaptation solutions in order to obtain climate-resilient infrastructure (IPCC, 2023, pp 29,105). Climate adaptation solutions provide opportunities to develop, rethink and improve urban spaces. These adaptations should therefore not only be seen as a challenge, but also as an opportunity for positive urban development planning. In addition, these solutions provide the possibility to reshape cities to become more sustainable, resilient and inclusive, which makes cities better equipped for current and future challenges in urban planning (Sádaba et al., 2024, p 2).

To climate-adapt our cities to a greater extent it is a necessity to incorporate nature-based solutions into urban planning. Nature-based solutions in climate adaptation are for instance, networks of blue and green infrastructure, where the solutions emphasise the use of natural processes in cities. By adapting our cities with these solutions, it will help make cities to become more climate change resilient (UN-Habitat, 2024, p xxi) (Sádaba et al., 2024, p 2). This approach to urban climate adaptation planning, with integrated nature-based solutions, allows solutions to emerge in cities and become part of urban environmental design. (Hoffmann et al., 2015, pp 3,6). Thus, climate adaptation can solve several issues at once in urban planning, as it incorporates several different challenges into the solutions (Hoffmann et al., 2015, pp 3).
This could be a good justification for including people with disabilities in the planning of climate adaptation, as it will help address accessibility and inclusion challenges for people with disabilities in urban planning (Jodoin et al., 2025, p 5). However, there is not much research on how

to practically include people with disabilities in relation to climate adaptation. In fact, there is a gap in this field, and more research is being requested in this area, especially in resourceful countries (Brown et al., 2025, p 138) (Jodoin et al., 2025, p 4). One of the reasons for this research gap may be related to a central issue concerning knowledge and understanding of people with disabilities within the education system. There is a lack of education regarding people with disabilities. Urban planners and architects often do not learn how to design cities that include people with disabilities, which may be due to the presence of ableism (Stafford et al., 2022, p 107).

This leads to a general lack of concrete specifications and directions regarding how solutions can be designed for people with disabilities and how they should be implemented in climate adaptation planning. A few adaptation policies at a global level mentions people with disabilities, and emphasises that vulnerable people in society must be considered, however there are no concrete guidelines or solutions for how this should be done in practice (Jodoin et al., 2025, p 2).

1.4 Inclusive Climate Adaptation in Denmark

Around the world Climate change affects regions differently and creates different consequences depending on their geographical location (IPCC, 2023, pp 13,69). In Europe, the consequences of climate change are already evident, impacting extreme weather events, drought, water scarcity, and rising sea levels (European Commission, 2021*a*, pp 1,6). Europe is expected to experience rising temperatures more frequently, more intense extreme precipitation events, and an increased risk of flooding in the future. (IPCC, 2023, p 69). The consequences of these climate changes impact both the economy and infrastructure, as well as human health (IPCC, 2023, p 76).

Climate changes also affect Denmark, particularly in relation to precipitation levels, where Denmark has experienced extreme cloudburst events causing significant consequences, especially in cities. In 2011, Copenhagen and Frederiksberg Municipality experienced a triple cloudburst which resulted in severe consequences for the city's safety and infrastructure (HOFOR, n.d.) (DMI, 2012). The cloudburst led to political attention on climate adaptation in Denmark, and in 2012, risk mapping and climate adaptation planning became a requirement for all Danish Municipalities (Regeringen, 2012, p 5).

Over time, climate adaptation in Denmark has shifted from predominantly below ground solutions to an increasing focus on nature-based surface solutions, where climate adaptation is integrated into urban design. This means that climate adaptation has become an important part of urban planning in Denmark, as it affects the design of cities (Hoffmann et al., 2015, pp 3,9,22).

Despite Denmark's commitment to equal rights for all human being and the inclusion of accessibility requirements in recovery and resilience plans, people with disabilities remain insufficiently included in climate adaptation planning. (Rothenborg, 2025, pp 1-2) (Det Centrale Handicapråd, 2017, pp 5, 9) (European Commission, 2021*b*, p 4). Even though Denmark has a national knowledge network within climate adaptation, Det Nationale Netværk for Klimatilpasning (DNNK), there is lack off knowledge about how to include people with disabilities in the planning of climate adaptation solutions, and DNNK has also requested knowledge within this field (Rothenborg, 2025, pp 3-4) (DNNK, n.d.). Issues regarding accessibility in existing built environment are already evident in Denmark, particularly for people with disabilities (Grangaard, 2024, pp 10,14,16). The majority of Danish Municipalities acknowledge in their Municipal disability strategies that accessibility challenges exist for people with disabilities, with most of these challenges relating to the built environment in planning (Grangaard, 2024, p 12). This is supported by a study from Danske Handicaporganisationer (2024), which shows that it is especially accessibility in urban spaces that creates challenges for people with disabilities (Danske Handicaporganisationer, 2024, p 2). A Danish study indicates various arguments why people with disabilities are excluded in the Municipality planning. One of the most essential reasons is that people with disabilities in Danish society often are viewed as an economic burden (Grangaard, 2024, pp 14,16). Another key issue is that accessibility has been black-boxed in the construction sector, meaning that there is no interest or priority within the construction sector or legislation to incorporate accessibility to a higher degree (Grangaard, 2024, pp 10,14,15) (rumsans, 2023). As a result, disability measures are often treated as special considerations in municipal planning and tend to be introduced late rather than embedded from the beginning. (Grangaard, 2024, p 15). This practice in planning does not ensure optimal built environments function in cities. Even if a person does not currently need an accessible built environment, they may need it later in life, for instance if losing their vision or in need of a wheelchair (Grangaard, 2024, p 14).

One third of Danes live with a disability in Denmark (Det Centrale Handicapråd, n.d.). These disables are defined according to the UN Convention on the Rights of Persons with Disabilities within four categories, as a long-term mental, physical, intellectual or sensory impairment that prevents the person from fully or partially participating in society on an equal basis with others (Det Centrale Handicapråd, 2017, p 5). According to Danske Handicaporganisationer, people living with a physical or sensory disability are affected by accessibility barriers in public urban spaces and people with physical and sensory disabilities find it either impossible or difficult to move around in an urban space (Danske Handicaporganisationer, 2024, p 5).

1.5 Local Climate Adaptation Project in Frederiksberg

Frederiksberg Municipality is one of the few Municipalities in Denmark that accommodates accessibility for all people in society, including people with disabilities, and operates with the concept of Universal Design in their municipal planning policies (Grangaard, 2024, p 12). Universal Design therefore represents a central approach in Frederiksberg Municipality's urban planning.

Universal Design is a value based design principle that aims to create physical environments that take human diversity into account, including people with disabilities (Frandsen et al., 2023, p 1) (Ryhl, 2009, p 62). In order to operationalise the design principle within municipal urban planning, a theory is needed that enables the realisation of accessible environments and specifies how urban spaces can support usability.(Cohen, 2025, p 1). In this context, affordance theory becomes particularly relevant, as the theory aligns with with the same approaches as the Universal Design principle and clarifies which concrete possibilities for action an urban design offers to different bodies (see section 2.2 for a deeper understanding of the affordance theory) (Cohen, 2025, pp 1,4) (Frandsen et al., 2023, p 62) (Lanng and Jensen, 2022, p 41).

Following this, Frederiksberg Municipality's accessibility plan (2016) points out that wheelchair users and blind or visually impaired people are considered the most vulnerable social groups (Frederiksberg Kommune, 2016, p 6). One of the issues regarding accessibility in the Municipality is particularly the conflict between climate adaptation solutions and accessibility (Frederiksberg Kommune, 2021, p 30).

A climate adaptation project that illustrates accessibility solutions for both wheelchair users and blind/visually impaired people is the SPARK-Park in Aarhus Municipality (Klimatilpasning, 2022) (MarselisborCenteret, 2015, pp 5,6). The SPARK-Park is regarded as the first climate adaptation park in which accessibility for people with disabilities has been included and implemented in the urban design planning of the park (Realdania, 2017*a*).

As part of the research project, a dialogue was established with Frederiksberg Municipality regarding the climate adaptation project at J.O. Krags Park, with a focus on assessing the extent to which accessibility for wheelchair users and blind/visually impaired people is integrated into the urban planning process. Frederiksberg Municipality expressed an interest in engaging in a research collaboration to gain deeper insight into J.O. Krags Park as an urban planning project of a climate adaptation park and to explore how the resulting findings could support and inform municipal practice. In addition, the SPARK-Park in Aarhus Municipality is included as a comparative case in order to gain insight into how accessibility can be successfully integrated into the urban planning of a climate adaptation park. The SPARK-Park serves as a source of inspiration for the project, as it represents a relevant example of a development process that has actively involved people with disabilities in the design of climate adaptation solutions.

1.6 Problem formulation

The research project explores the relationship between climate adaptation and accessibility in urban spaces. The research approaches accessibility through a comparative analysis of two climate adapted Parks, J.O. Krags Park and the SPARK-Park, to examine how climate adaptation solutions enable or constrain use and navigation for wheelchair users and blind/visually impaired people. The main research question is:

> **How do climate adaptation solutions implemented in J.O. Krags Park and the SPARK-Park influence the affordances available to wheelchair users and blind/visually impaired people, and what lessons can be drawn for the Municipality of Frederiksberg for integrating accessibility into climate adapted urban spaces?**

Theory 2

In this chapter, key theoretical perspectives on designing inclusive urban spaces will be presented, including human-centred design, the principles of Universal Design, and affordance theory, in order to justify the research project's choice of theoretical framework. The chapter begins by introducing human-centred design perspectives, which lead to affordance theory as the main analytical framework used to examine how human bodies interact with the design of climate adaptation solutions in public urban spaces.

2.1 Human-Centred Design Perspectives

Climate adaptation in Denmark is increasingly developed through nature-based solutions. The focus has shifted from traditional bellow ground solutions to surface-based water management solutions, where water is collected and becomes part of the urban space design (Hoffmann et al., 2015, pp 3,6). Climate adaptation has therefore developed into an urban design task, where surface solutions are integrated into urban environments. Accordingly, it becomes necessary to apply urban space design when climate adaptation solutions are implemented in the built environment.

The architect Jan Gehl (2010) has developed a central perspective on how to design good urban spaces for people. Gehl's (2010) research is therefore relevant, as climate adaptation solutions are increasingly designed as part of urban public space design. Gehl's (2010) perspectives explain that urban spaces must be designed for people and create well-being to support people's everyday lives (Gehl, 2010, pp 8,16,36) and therefore not only be technically functional, such as climate adaptation solutions.
Through Gehl's 12 quality criteria, he argues that a good urban space must embrace protection, comfort, and enjoyment (Gehl, 2010, pp 178,191, 249). Part of this approach, Gehl (2010) works with universal invitations, where urban spaces invite people to walk, stay, and meet, thereby supporting everyday social interaction in the public realm (Gehl, 2010, p 128). These universal invitations address general human needs which are attractive to a broad population (Gehl, 2010, p 128) (Lanng and Jensen, 2022, p 43).
Although Gehl (2010) acknowledges that people have different needs to be considered in planning, his research principles does not focus on bodies being different, which may encounter different barriers (Gehl, 2010, pp 43, 103). In this context, the principle of Universal Design differs, as the design principle works to create physical environments that take human diversity into account, including people with disabilities (Ryhl, 2009, p 6) (Frandsen et al., 2023, p 62). Thus, Universal Design builds upon and expands Gehl's (2010) research principles by further articulating universal bodily starting points. (Ryhl, 2009, p 5) (Gehl, 2010, p 128).

The architect Ron Mace is recognized in the literature as the founding figure of the Universal Design principle (Frandsen et al., 2023, p 16). Mace defines Universal Design as the creation of buildings and environments that not create extra costs, while remaining both attractive and functional for all people, including people with disabilities (Frandsen et al., 2023, p 16) (Hamraie, 2016, p 293). Over time, various general principles for inclusion have been developed to achieve the goal of ensuring equal opportunities to participate in society (Frandsen et al., 2023, pp 12-20). The original principles were developed by Mace and are based on seven Universal Design principles, which are still in use. These seven principles involve general guidelines for creating environments that are flexible, easy to understand, safe to use, sensorially accessible, and spacious for people with different needs (Frandsen et al., 2023, p 17). Based on the Universal Design ideologies, principles, objectives, and strategies, no specific tools have been developed that explain how Universal Design should be implemented in practice in urban spaces (Ryhl, 2009, p 52) (Lanng and Jensen, 2022, p 42). Therefore, affordance theory can supplement Universal Design by analysing situational experiences and variations in actions (Lanng and Jensen, 2022, p 42). The purpose of this research project is to examine how the design of urban spaces with climate adaptation solutions can be shaped, which is precisely what affordance theory addresses. Affordance theory is an important tool for applying design in urban environments (Lanng and Jensen, 2022, p 41).

2.2 Affordance Theory as an Analytical Approach

The theory of affordance is used in this research project to achieve a deeper understanding of how the two climate adaptation parks, J.O. Krags Park and the SPARK-Park, offer or limit action possibilities for people with disabilities, including wheelchair users and blind/visually impaired individuals. The theory not only contributes a theoretical understanding of the concept of affordance but is also translated into a methodological approach through Lanng and Jensen's (2022) urban design tool. Through this methodological approach to affordance theory, it becomes possible to examine how the physical environment offers, supports, or restricts human actions in the urban space, as well as how different bodies experience and actualise differently. This design tool is used as a methodological tool to examine and assess urban spaces in relation to the human body and its interaction with the surroundings (Lanng and Jensen, 2022, pp 41-49). Furthermore, applying the design tool will contribute to a more nuanced understanding of the affordances of the two case studies J.O. Krags Park and the SPARK-Park in relation to wheelchair users and blind/visually impaired individuals.

First, affordance theory will be described, as it forms the theoretical methodological approach. Secondly, the urban design tool will be described through Lanng and Jensen's (2022) methodological approach.

Understanding of The Affordance Theory

Affordance theory draws on the environmental sociologist James Gibson's initial understanding of the theory, which is the environmental affordance (Lanng and Jensen, 2022, p 42). That is, affordance should be understood as the possibilities for action and interaction that designed environments offer people through physical form. Gibson's definition of environmental affordance is described as follows:

> *The affordances of the environment are what it offers the animal, what it provides or furnishes, either for good or ill* (Gibson, 2015, p 119).

Gibson's theory of affordance is therefore built on a biological and ecological foundation, which means an ecological psychology (Gibson, 2015, p 3). Gibson sees the human as part of the animal and does not differentiate the human from the animal (Gibson, 2015, p 17). This definition of environmental affordance is used as a theoretical foundation to understand the human in connection with the built environment, thereby placing the theory in an urban and bodily context. According to Gibson's theory, the concept of affordance concerns the interaction between the surroundings and the human (Lanng and Jensen, 2022, p 42).

In this research project, the understanding of affordance theory is built on a combination of different theoretical perspectives within affordance, which combined will form a more developed and nuanced approach to the theory (Lanng and Jensen, 2022, pp 42-43). In addition to Gibson's (2015) theoretical definition, which forms the foundation of the theory, a theoretical perspective from a research study on bodies and everyday practices by cultural sociologists Monica Degen, Gillian Rose, and Begum Basdas is also applied (Lanng and Jensen, 2022, p 42). Their study demonstrates a reciprocal relationship between bodies and the built environment. Built environments influence how bodies can act and behave, but at the same time, bodies also respond differently to how the built environment appears and what it offers (Lanng and Jensen, 2022, p 42).

This is supported by another psychologist, Harry Heft (, pp 42-43) who argues that affordances in physical environments, including urban spaces, are not the same for everyone, but depend on an individual's bodily conditions, needs, senses, interactions, and the specific situation (Lanng and Jensen, 2022, pp 42-43). For instance, a staircase may enable movement for certain bodies while simultaneously functioning as a barrier for others, such as wheelchair users. Lanng and Jensen employ this example to emphasise the relational nature of affordance theory. Lanng and Jensen use these sources to understand the relational interpretation of affordance theory (Lanng and Jensen, 2022, pp 42-43).

To understand how the theory of affordance is translated into an operational design tool, Gehl's work with universal invitations is used (Gehl, 2010, p 128). Universal invitations can, within an affordance-based understanding, be interpreted as the actions that an urban space offers. Gehl's (2010) design approach is therefore used as a supplementary source to translate affordance into a usable methodological tool (Lanng and Jensen, 2022, p 43).

2.2.1 Affordance as an Urban Design Tool

The urban design tool is structured around three analytical levels, which form the foundation of understanding urban spaces both in terms of their physical design and the users' experiences (Lanng and Jensen, 2022, pp 43-48). The three analytical levels in the design tool provide an understanding of how affordance theory can be applied in practice to analyse a specific urban environment. These three analytical levels are: *Description of the place*, *Looking at affordances*, and *Examining the subject and accessibility* (Lanng and Jensen, 2022, pp 43-48).

Description of the Place

The first analytical level in the urban design tool involves creating a description of the physical surroundings from one or more selected urban environments.
By analysing the physical surroundings, one examines which material affordances have been used in the urban environment (Lanng and Jensen, 2022, p 42). For instance, this can be materials such as stone, grass, or asphalt. Moreover, the analysis considers how the form of the urban environment and the location's relationship to its surroundings influence spatial conditions (Lanng and Jensen, 2022, pp 42, 45). The forms of the urban environment can for instance be slopes, surfaces, stairs, or ramps (Lanng and Jensen, 2022, p 44). By analysing the site´s location in relation to the surroundings, one examines whether the urban environment is experienced as open or closed, whether there is sun or shade, or whether the site is characterised by traffic or nature (Lanng and Jensen, 2022, pp 43-44).
The analysis of the physical surroundings forms a foundation for assessing the accessibility of an urban environment, as material and spatial conditions influence which actions and possibilities the site offers different bodies (Lanng and Jensen, 2022, pp 42,45).

Look at Affordances

The analytical level look at affordances involves examining what one or more selected urban environments afford (Lanng and Jensen, 2022, p 48). To apply this analytical level, the motor, sensory, and cultural affordances in the urban environment are investigated.

When analysing the motor affordances, the selected urban environment is examined in relation to what the site offers, for example, whether one can sit, walk, play, or rest in the environment, and whether the environment invites slow or fast movement (Lanng and Jensen, 2022, pp 43-45). This means that the motor affordances show the bodily actions that urban spaces enable or prevent.

Within the sensory affordances, the sensory impressions of the selected environment are analysed. This include sounds, light, touch, or visibility (Lanng and Jensen, 2022, pp 42-43). This means that sensory affordances illustrate how sensory impressions support orientation and shape experiences of urban spaces.

The cultural affordances are understood as how the selected urban environment is expected to be used. This may involve a depression in the terrain, which may either be intended to be experienced from a distance or expected to be used in another way (Lanng and Jensen, 2022, p 48). This means that the cultural affordances capture the implicit usage patterns and social expectations that urban spaces communicate.

By analysing the motor, sensory and cultural affordances in the urban environment, it becomes possible to experience the atmosphere that arises in an urban space. The atmosphere emerges from the interaction between the material, sensory, motor and cultural affordances and reflects the character of the urban environment in the form of safety or insecurity, openness or closedness, and calm or dynamism.

Examine the Subject and Accessibility

The final analytical level concerns the relationship between the physical surroundings and the subject's conditions. Bodies are different, and therefore they do not engage with urban environments in the same way. It is therefore important to understand which subject is using the urban environment, as this is crucial for how the environment is afforded (Lanng and Jensen, 2022, pp 42-43). This level therefore, concerns examining which possibilities are actually available to the subject. In this context, the focus is on which actions or orientation possibilities are either limited or enabled by the physical surroundings, as well as how the subject navigates the environment. Affordance theory is also understood as the possibilities for movement and orientation that lead towards an urban space (Lanng and Jensen, 2022, pp 42-43). Therefore, access routes and transition zones are included in the research project in relation to urban spaces.

This analytical level forms an analytical framework for the affordance analysis in the research project, as it defines the foundation of how the two preceding analytical levels, *Description of the place* and *Look at affordances*, are to be interpreted in relation to the specific subject. Furthermore, this analytical level is important in relation to the task, as affordances depend on the subject's prerequisites. This level makes it possible to analyse which affordances are actually available to people with disabilities, specifically wheelchair users and blind/visually impaired individuals.

Method 3

This chapter presents the various methods applied in the project. The methods have contributed to answering the project's main research question. First, the method case studies are described, followed by an account of the methods used, including site analysis, technical mapping, the urban design tool, interviews, observations, and the use of AI tools.

3.1 Case studies

A case study can generally be defined as a detailed investigation of a unit, such as a company, a population group, etc. According to Brinkmann and Tanggaard (2020), case studies are used to gain an in-depth understanding of a specific topic or to investigate a problem (Brinkmann and Tanggaard, 2020, pp 621-622). A case study can therefore contribute to the investigation of qualitative data, quantitative data, or both, in order to obtain a representative picture of reality and the complexity that it entails. This is a strength of case study methods, according to Flyvbjerg (2006) (Flyvbjerg, 2006, p 237).
There is therefore no single way to analyse a case. What characterises a case study is not the specific methods employed, but rather how the case is delimited and the level of detail in the investigation (Brinkmann and Tanggaard, 2020, p 622). A case study does not have to be limited to a single case; additional cases may be included. However, this has implications for the depth of investigation, as conducting an in-depth analysis of each case is time consuming (Flyvbjerg, 2006, p 236). Flyvbjerg also argues that there are two different methods for selecting cases, and maintains that this can be done through "random selection" and "information-oriented selection" (Flyvbjerg, 2006, p 230). These may, however, produce different perceptions of reality: "random selection" can help avoid bias in the selection process, though the cases may be very different and therefore lack a basis for comparison. "Information-oriented selection" can ensure that cases are relevant and reflect reality, thereby providing a basis for comparison. However, this approach may be criticised for selecting cases in line with a predefined narrative, which can introduce bias into the results. (Flyvbjerg, 2006, pp 234-235).

In this project, two case studies have been selected through "information-oriented selection" to ensure a comparable foundation while simultaneously providing a realistic picture of how people with disabilities experience accessibility in newly constructed climate adaptation parks. The two case studies are the parks, SPARK-Park and J.O. Krags Park, both of which have been converted into climate parks. These two cases has been selected to allow both individual analysis and comparative examination, thereby shedding light on differences in planning processes, functionality, local solutions, and accessibility. Both parks primarily use surface-based solutions, and they are both designed to collect, delay, and manage rainwater in the event of extreme precipitation. In addition, both parks are located in urban areas, namely Aarhus

Municipality and Frederiksberg Municipality in Denmark. The case from Frederiksberg Municipality is characterised by a limited focus on people with disabilities in the planning, process, and design of the park. Although J.O. Krags Park, like SPARK-Park, is based on nature-based climate adaptation solutions, accessibility has not been a central design premise. SPARK-Park, by contrast, has been selected as a case due to its strong emphasis on including people with disabilities throughout the planning, process, and design in the context of nature-based climate adaptation.

3.1.1 Comparative Case Study

The comparative case study consists of a multiple case design, where several cases are examined in relation to both shared patterns and central differences (Robert.K.Yin, 2018, p 102). While the case study has contributed to gaining an in-depth understanding of processes, design solutions, and potential challenges, the comparative case study contributes by examining whether there are differences and similarities between the two cases that have the same overall objectives. One advantage of conducting a comparative case study involving multiple cases is that the findings and conclusions may appear more credible than those derived from a single-case study (Robert.K.Yin, 2018, p 102). Furthermore, by comparing two cases, theories can be tested in relation to whether a pattern can be confirmed or a theory challenged, thereby examining whether it can be generalised (Robert.K.Yin, 2018, p 102). A disadvantage of a comparative case study involving multiple cases is that it requires many resources and is time-consuming, which may limit the depth of investigation when time constraints are present (Robert.K.Yin, 2018, p 102).

As mentioned earlier, the cases have been selected using information-oriented selection and are furthermore chosen as maximum variation cases. This means that the two selected cases must be very different in relation to one dimension, which helps to examine whether this has an impact on the process and the final results of the two cases (Flyvbjerg, 2006, p 230). SPARK-Park and J.O. Krags Park differ in terms of park size, which makes them suitable for a maximum variation case. The two cases are compared in terms of topography, types of climate adaptation, design solutions related to accessibility, and planning processes concerning the inclusion of blind/ visually impaired individuals and wheelchair users.

3.2 Site Analysis of the Case Studies

In this project, the compendium Stedsanalyse og analysetraditioner by Hans Kiib and Gitte Marling is used as a methodological foundation (Kiib and Marling., 2001, p. 20-27). The method site analysis forms the framework for the analysis of the two case areas and is applied to establish an overall understanding of their physical and functional structures as well as their urban context, to which the method has been adapted in relation to the project's purpose (see the case study method in section 3.1). The site analysis maps these conditions and thereby supports the urban design tool from the affordance analysis by clarifying the site specific frameworks within which affordances emerge.

Site analysis involves the examination of the physical and functional characteristics of a district or urban space. To understand the physical and functional conditions in a district or urban area, structural analysis is defined as a set of analyses. The purpose of the structural analyses is to create simple themes within the physical and functional conditions. Structural analyses divide the district or urban area into a number of structures, which are analysed individually and compared with each other (Kiib and Marling., 2001, p. 20). Together, the structural analyses provide an overall picture of the planning situation in the district or urban area. Cities can be divided into many structures or substructures, but in this project, the analysis is based on four overall structures to obtain a good understanding of the physical and functional conditions of the case areas (Kiib and Marling., 2001, p. 20). These four structures are: *Building structure*, *Green structure*, *Traffic structure*, and *Terrain and hydraulic structure*.

The *building structure* includes an analysis of the buildings, including their use and function, as well as the coherence and location of the buildings within the district or urban area. The use and function of the buildings include which functions are present in the area, such as residential, commercial, service, etc. This also involves examining how the different functions are distributed spatially in relation to whether the area is mixed-use or functionally divided. The coherence and location of the buildings concern their placement in relation to each other, but also in relation to streets and the specific locations of the case areas (Kiib and Marling., 2001, pp. 21-23). The building structure will provide an understanding of which urban areas the two case areas are located in, and whether the case areas, for example, are situated in densely built-up areas. Both the overall building structure of the area surrounding the case areas and the structures within the case areas themselves will be mapped.

The *green structure* includes a mapping of the green areas in and around the two case areas. In this project, green structures include larger recreational areas such as parks, playgrounds, and sports facilities, as well as open natural areas such as green landscape corridors and ponds. The analysis will help identify the number of green structures located near the case areas, their functions, and how they relate to the case areas. (Kiib and Marling., 2001, pp. 21-23).

The *traffic structure* includes a mapping of the traffic structure in and around the two case areas. This will include mapping where the main streets are located in relation to the case areas and the level of traffic load on the streets (Kiib and Marling., 2001, p. 24). An overall traffic structure will also help to indicate which type of area the case areas are located in.

In continuation of Kiib and Marling's understanding of site analysis as a division of a district or urban area into physical and functional structures, this project includes a *terrain and hydraulic structure*. This structure comprises the site's elevation conditions, flow paths, geological conditions, and areas of water accumulation. The purpose is to gain an understanding of how the two case areas are situated in relation to landscape and geological structures. This will contribute to understanding the decisions made regarding climate adaptation and water management solutions.

3.2.1 QGIS as a Mapping Tool

QGIS is an open source software program that makes it possible to visualise data in an easily understandable way (QGIS, n.d.*b*). This is done by producing maps that contribute to an overview of areas, also called geospatial data (QGIS, n.d.*b*). QGIS can therefore serve as a method in the project, performing visualisations in the form of maps that show the case areas in relation to the site analysis and the affordance analysis. This is made possible by editing the data to display only the most relevant information, thereby excluding unnecessary data, and by adjusting the symbology to enhance clarity and readability (QGIS, n.d.*a*).

As mentioned above, QGIS has been used to visualise the case areas in the site analysis by creating visual representations that provide a detailed insight into both the park areas and the surrounding areas. QGIS makes it possible to import and combine different types of geodata. For the visualisations, data from the Data Forsyningen (Dataforsyningen, n.d.), including building data and orthophotos, have been used, which together provide a topographic overview of the parks and their surroundings. As part of the affordance analysis, QGIS is employed to visualise and map the routes followed by the interview participants.

In this project, the QGIS mappings are based, among other things, on the most recent orthophotos from November 2024 (Dataforsyningen, n.d.). These orthophotos do not always reflect the current conditions. A concrete example from the project is the mapping of J.O. Krags Park in Chapter 4, Section 4.1 of the project. Here, the most recent available orthophoto has been used, which still shows conditions such as roadwork and a lack of visible vegetation and planting in the park. This means that the maps do not show the most recent conditions in the park, which may affect the understanding of the park's appearance, expression, and state.

Furthermore, mapping in QGIS is a time consuming method, as it often requires manual steps, such as clipping data and processing large data files, such as building data from the Data Forsyningen (Dataforsyningen, n.d.).

3.3 Interviews

In this project, the method of semi-structured interviews has been used. Semi-structured interviews are a qualitative research method that combines elements from both structured and unstructured interview (Brinkmann and Tanggaard, 2020, pp. 33,39,40). For a semi-structured interview, an interview guide is often prepared, in which some questions are formulated beforehand. The interview guide is structured around WH-questions, which allow for elaborated responses. Through working with the interview guide, the interviewer will gain insight into and reflect on the intended objectives of the interview(Brinkmann and Tanggaard, 2020, pp. 42,44).

In a semi-structured interview, the interview guide must function as a guiding tool for the interview, in which some open questions have been prepared for the interviewees. These open questions allow for dialogue and follow-up questions during the interview, which enables the interviewer to follow the interviewee's narratives (Brinkmann and Tanggaard, 2020, pp. 43-44). The interview guide makes it possible for the interviewer to manage the interview while at the same time allowing the interviewee to answer and elaborate on the questions (Brinkmann and Tanggaard, 2020, pp. 44,47).

The method of semi-structured interviews has been used to gain a better understanding, insight, and knowledge of the interviewees' opinions, perspectives, and experiences (Brinkmann and Tanggaard, 2020, pp. 35–36). In addition, the method also makes it possible to obtain knowledge that is not always accessible through other methods, such as document analysis (Brinkmann and Tanggaard, 2020, p. 39).

3.3.1 Interview Informants

Semi-structured interviews have been conducted with eleven interviewees. The interviewees has been selected due to their professional expertise and role.

In the project, the interviewees have been divided into two categories. This, to gain a better overview of where, when, and how the interviews should be used in the project. These two categories are: *preliminary interviews* and *interviews for the analysis*.
The preliminary interviews has been conducted to gather knowledge about the project's topics as well as the direction for the analysis. This includes, for example, collecting knowledge about which climate adaptation parks is relevant to examine and analyse in relation to accessibility for people with disabilities. The interviewees in the category of *interviews for the analysis* is chosen to provide better knowledge and understanding of the specific climate adaptation parks, both regarding water management, the accessibility solutions behind the climate adaptation parks, and knowledge about accessibility solutions in practice.

Both physical and online interviews have been conducted, where all online interviews has been carried out via the platform "Microsoft Teams". Prior to each interview, a literature search and an interview guide were prepared, as described above (for access to the interview guides, please contact the author of this project). For each interviewee, the reasons for selection, the interview preparation process, and the conduct of the interview will be outlined. All interviewees have approved consent and permission for recording, allowing their responses to be used in the project and for them to be mentioned by full name. The interviewees have been divided into two categories within the two selected cases: The SPARK-Park and J.O. Krags Park (See section 3.1 for the case studies).

3.3.2 Interview Informants at SPARK-Park

To understand both the water management, the design solutions in relation to accessibility in SPARK-Park, and how the park's accessibility works in practice for wheelchair users and blind/visually impaired people, six interviews have been conducted. All interviewees have contributed with knowledge to the project's analysis. The six interviewees are the following:

Jan Sau Johansen

Jan Sau Johansen (pers. comm.) is an area manager at the Marselisborg Center in Aarhus Municipality and has been involved in the development and implementation of SPARK-Park from start to finish. During the transformation of SPARK-Park, Johansen acted as a representative for the Marselisborg Center and was responsible for collaboration partners, while also being involved in decisions regarding accessibility solutions in the park for both wheelchair users and blind/visually impaired people. Johansen has been an important source in relation to the SPARK-Park case, as he has extensive knowledge about the design solutions and the choices behind the solutions in the park. Two interviews were conducted with Johansen: an initial interview and an interview for the analysis.

Anne Lausten

Anne Lausten (pers. comm.) is head of climate adaptation at Aarhus Vand. Lausten has been involved in the SPARK-Park project from the very beginning to its completion. The interview with Lausten has been conducted in connection with the interviews for the analysis, where the purpose of the interview was to gain a better understanding of water management in SPARK-Park, including the technical solutions and the hydraulic conditions that formed the basis for the design of the park. In addition, the interview also contributed knowledge and experience regarding the process of SPARK-Park, as well as insight into how accessibility solutions for people with disabilities, including wheelchair users and blind/visually impaired people, were embedded in the work with climate adaptation solutions. The interview also contributed to an understanding of the municipal planning approaches that Aarhus Municipality applies in the development of climate adaptation projects.

Tine Munk Ramskov

Tine Munk Ramskov (pers. comm.) is a physiotherapist and works as a consultant at the Marselisborg Centre with rehabilitation and recovery. The interview was conducted in connection with the interviews for the analysis, where the purpose of the interview was to gain a deeper understanding of the design of the park itself and its spatial characteristics. The interview also contributed knowledge and experience within the design of accessibility solutions for people with disabilities, including wheelchair users and blind/ visually impaired people, in the SPARK-Park.

Daniel K. Gartmann

Daniel K. Gartmann (pers. comm.) is born practically blind, which means that he has a visual acuity of 0.25/60 [1]. In his daily life, Gartmann works as a volunteer at the Centre for Special Counselling Aarhus at the Marselisborg Center, where he teaches other blind/visually impaired people to use assistive devices. Gartmann also participates in projects where accessibility must be considered, where project managers gain an understanding of how blind/visually impaired people navigate and orient themselves, and how this affects the intended project. The interview was conducted as part of the empirical data collection for the analysis, with the aim of gaining insight into how a person with a visual impairment navigates SPARK-Park, as well as the challenges that may arise when living with a blind/visually impaired condition. The interview with Gartmann was conducted in the SPARK-Park and carried out as a Go-Along Interview.

Antoniett Verbel Pharao

Antoniett Verbel Pharao (pers. comm.) is an electric wheelchair user and has muscular dystrophy. Pharao has used an electric wheelchair since the age of 16 and therefore has many years of experience with mobility, accessibility, and the practical challenges encountered in everyday life as an electric wheelchair user. Pharao is employed at the Marselisborg Center as part of Team Marselisborg Center, where her work focuses on supporting association activities and facilitating collaboration with municipal and regional actors using the park. In addition, she is affiliated with the association Tours on Wheels, which presents wheelchair users' perspectives by allowing both non wheelchair users and new wheelchair users to experience the park from a wheelchair. The interview was conducted in connection with the interviews for the analysis,

[1] A person with normal vision has a visual acuity defined as 6/6. A visual acuity of 0.25/60 means that Gartmann (pers. comm.) can see at a distance of 0.25 metres what a person with normal vision can see at a distance of 60 metres (Instituttet for blinde og svagtseende, n.d.)

where the purpose of the interview was to gain insight into Pharao's personal experience, professional practice and active association work. The interview with Pharao was conducted as a Go-Along Interview in the SPARK-Park, which has contributed to providing insight into the daily opportunities and challenges for an electric wheelchair user in a climate adaptation project.

Per Bøgeskov

Per Bøgeskov (pers. comm.) has lived with multiple sclerosis for more than 27 years, which has led to physical limitations and resulted in his use of an electric wheelchair today. Bøgeskov has engaged in voluntary work, particularly within areas related to accessibility and mobility. He is active in the association Tours on Wheels, where together with other volunteers he takes both people with disabilities and various types of decision makers around the city in a wheelchair. The interview was conducted in connection with the interviews for the analysis, where the purpose of the interview was to highlight how small and large physical barriers affect accessibility for a wheelchair user in a climate adaptation project. Bøgeskov has contributed insight into what daily life looks like from an electric wheelchair user and which challenges may arise. The interview with Bøgeskov was conducted as a Go-Along Interview in the SPARK-Park.

3.3.3 Interview Informats J.O. Krags Park

To understand both the water management, the design solutions in relation to accessibility in J.O. Krags Park and how the accessibility of the park functions in practice in relation to wheelchair users and blind/visually impaired people, five interviews have been conducted. All interview participants have contributed knowledge to the analysis of the project. The five interview participants are the following:

Malene Rockall Muus

Malene Rockall Muus (pers. comm.) is a trained landscape architect and has been employed by Frederiksberg Municipality for 10 years. Muus works with a focus on planning and project management of large climate adaptation projects, where she is part of the Municipality's climate adaptation team, which often involves the transformation of urban spaces, squares and streets with both technical and aesthetic considerations. Two interviews were conducted with Muus, consisting of an initial interview and an interview for the analysis. Muus contributes insight into the work with climate adaptation in relation to decision making as well as the implementation of the construction of transformed climate parks, where she has helped to shed light on the planning, process, and design of J.O. Krags Park.

Susanne Tarp

Susanne Tarp (pers. comm.) is visually impaired, which she became at the age of 35. Tarp's visual impairment has played a central role in her engagement in disability and interest-based political work in Frederiksberg. She has been active in the municipal Disability Council for ten years, where she has served both as a member and as chairperson. In addition, she has held chair positions within the Danish Disability Organisations and the local Frederiksberg branch of *Dansk Blindesamfund*. The interview with Tarp was conducted in connection with the interviews for the analysis, where the interview contributed in depth knowledge of municipal decision making processes, accessibility in the city's spaces and the challenges that citizens with disabilities encounter in practice.

Niels Lützen

Niels Lützen (pers. comm.) is a trained landscape architect and owner of the landscape architecture firm Niels Lützen, which collaborates broadly with both municipal and private clients on the development of green urban spaces. Lützen has many years of experience with projects ranging from initial sketches to completed constructions. Lützen has a particularly long history with climate adaptation projects and rainwater management. In 1994, Lützen authored "Use Rainwater in the Courtyard", a publication that generated significant interest from the former Ministry of Housing. The landscape architecture firm Niels Lützen was the architect on the climate adaptation project J.O. Krags Park. The interview with Lützen was conducted in connection with the interviews for the analysis, where the interview contributed to an understanding of the choices that have been made in practice as well as the development and challenges within the climate adaptation project J.O. Krags Park.

Julie Culmsee Pedersen

Julia Culmsee Pedersen (pers. comm.) was born with cerebral palsy (CP), which can vary widely, but for Pedersen this means, among other things, that she permanently uses an electric wheelchair and also has a manual wheelchair, which she is unable to manoeuvre independently. Pedersen reflects a daily life with mobility limitations and is dependent on accessible surroundings. Pedersen has lived her entire life in Frederiksberg in an urban context. The interview with Pedersen was conducted in connection with the interviews for the analysis, where the interview contributed an experience based perspective that is particularly relevant for understanding accessibility and how barriers are experienced in climate adapted urban spaces. The interview with Pedersen was carried out as a Go-Along Interview, which provided insight into her experiences of accessibility in J.O. Krags Park.

Sofie Monggard

Sofie Monggaard (pers. comm.) is blind, meaning she can only perceive strong light without being able to distinguish shapes, colors, shadows, or silhouettes. Monggaard is a trained social worker and works in the course department of the Dansk Blindesamfund, where she teaches, among other things, the course "The Good Life," which supports people in the process of coping with vision loss. Monggaard was born with her visual impairment and has lived without sight throughout her life, giving her a well-developed, experience-based perspective on accessibility, sensory-based orientation, and the challenges urban spaces can pose for people with visual impairments. The interview with Monggaard was conducted in connection with the interviews for the analysis, where the interview contributed insight into how accessibility is experienced by people with visual impairments, both in relation to her own observations and how other people with visual impairments may face different challenges. The interview with Monggaard was conducted as a Go-Along Interview, focusing on how she experienced the climate-adapted J.O. Krags Park.

3.3.4 Conducting GO-Along Interviews

As part of the project, a series of expert interviews has been conducted to support the analysis. Among these, GO-along interviews were carried out with participants with reduced functional capacity. This was done using wireless microphones. The method “GO-ALONG INTERVIEWS” by Kelsey Harvey combines observation and semi-structured interviewing by having the interviewer follow the interviewee in their familiar or new surroundings while data is collected continuously (Harvey, 2025, p 141).

The method is characterised by the interviewer both observing the interviewee's actions and simultaneously following their reflections and experiences in real time, which provides access to situated knowledge that can otherwise be difficult to capture in traditional interview formats (Harvey, 2025, p 141). The method can be divided into two different interview types: "natural go-along interviews," where the interviewer follows the interviewee around in their everyday surroundings, and "experimental go-alongs," where the interviewee is introduced to new environments or situations to examine their reactions and impressions (Harvey, 2025, p 141).

The method provides interviewees with a first-hand impression. However, a limitation of the method is that the interviewer may find it challenging to capture all aspects of the interviewee's experience (Harvey, 2025, p 144). Furthermore, prompting interviewees to reflect on feelings and sensory impressions may influence their behaviour, potentially affecting the naturalness of their actions (Harvey, 2025, pp 143-144). Harvey also points out that the method can have issues related to weather conditions, and there is a risk that the interviewer may overlook details, as the interviewer must simultaneously walk, listen, record, ask questions, and observe both the environment and the interviewee's body language (Harvey, 2025, pp 145-146).

3.4 Processing an Analysis of Interview Data

In this section, the methods that have been applied in this project to process the interviews prepared in section 3.3 will be presented.

3.4.1 Transcription of Interviews

Transcriber is a tool available through the digital research platform UCloud that can transcribe audio and video files, thereby automatically converting them into text (for access to the interview transcriptions, please contact the author of this project). Transcriber has therefore been used to facilitate the transcription of all interviews, a process that would otherwise be time-consuming if carried out manually (Aalborg Universitet, n.d.).

Transcriber divides the interview into timestamps whenever a sentence is spoken, and it is then up to the user to manually enter who says what. Transcriber is not perfect, partly because the audio is not always completely clear, for example, in GO-along interviews where it is windy, which can make it difficult for the microphone to capture the sentences from the interviewer and the interviewee. As a result, all interviews were reviewed and corrected to address inaccuracies in speaker attribution and transcription errors where Transcriber failed to capture words or sentences correctly. This to ensure that all interviews have been transcribed correctly.

As mentioned earlier, Transcriber is a very useful tool for providing the first draft of the transcription of the interview, which in itself is a time saver, however the method also works best when the audio is completely clear without too much background noise, which is one of the challenges.

3.4.2 Qualitative data coding with NVIVO

NVivo is a software program that can be used to handle, organise, and provide an overview of qualitative data, as well as categorise qualitative data in a way similar to quantitative data (NVIVO, n.d.). The categorisation helps create an overview of the data, making it manageable and interactive to find specific points later in the project. In the project, NVivo is used to categorise all interviews to create an overview of what and when the interview participants mention specific experiences, opinions, or knowledge.

In the categorisation of the coding of the interview participants, the participants' responses are divided into groups and subgroups. A concrete example of the coding process is drawn from the interview with the participant Monggaard. The coding is structured into groups and subgroups based on the interview material. The main coding groups include, for example, the route, personal information, and relation to the park. Subgroups are then used to further specify the interview participants' responses. An example of this is the group "the route," where the subgroups were "the senses," "motor skills," and "material." Here, affordance theory has helped identify the subgroups in the coding.
In general, these groups of coding have helped provide an overall insight into the interview participant's responses and the use of their knowledge, experiences, and opinions in the project's analyses.

Although the categorisation of qualitative data facilitates analysis and improves data usability, it is also time-consuming. The use of NVivo requires all data to be reviewed and coded individually, which makes the method resource-intensive. Consequently, it is necessary to consider whether the analytical insight gained outweighs the time invested in the coding process.

3.5 The Urban Design Tool

In this project, the urban design tool developed by Lanng and Jensen (2022) will be described (Lanng and Jensen, 2022, pp 43-48). The section will provide an understanding of how the urban design tool has been applied and how it has been used methodologically in the project.

The urban design tool is used in this project in Chapter 4, Sections 4.2 and 4.4. The tool is applied as a central method to examine how the two climate adaptation parks, J.O. Krags Park and the SPARK-Park, enable or limit accessibility for wheelchair users and blind/visually impaired individuals. Furthermore, the tool has also been selected as it investigates the relationship between body and environment, thereby highlighting how the parks in their current design offer or hinder different actions and sensory experiences. The tool makes it therefore, possible to analyse the actual affordances in the park.
The urban design tool is supported by the site analysis, which identifies the overall physical and functional structures of the case areas and thereby forms the basis for the analysis of site specific affordances (see the site analysis method in section 3.2. Whereas the site analysis focuses on an overall and structural mapping of the physical and functional conditions of the site, the urban design tool is used to analytically describe and examine how these conditions are experienced, experienced, and used by different bodies in concrete situations (Lanng and Jensen, 2022, pp 43-48).

As described in Theory Section 2, the urban design tool is structured into three analytical levels. These levels are: *Description of the place*, *Look at affordances*, and *Examining the subject and accessibility*.
The Theory section will outline how the three analytical levels have been applied in practice in this project.

Description of the Place

As mentioned in Theory Section 2.2, this analytical level of the urban design tool involves creating a description of the physical surroundings in selected urban environments. At this level, fieldwork based on own observations was conducted in both climate adaptation parks, with a particular focus on examining the materials used in the parks. This could include materials such as stone, grass, or asphalt. In addition, the shapes of the parks were investigated, such as slopes, surfaces, stairs or ramps. Furthermore, the placement of the parks in relation to their surroundings was examined, for example, whether the parks are experienced as open or closed, or whether they are characterised by traffic or nature.

A physical initial and neutral mapping of the parks' surroundings was carried out to gain a basic understanding of the possibilities or limitations the parks present for wheelchair users and blind/visually impaired individuals. These neutral mappings were theory-driven as part of the urban design tool and contributed to creating an understanding of the place in relation to its affordances in potential actions that the parks offer. This mapping was necessary both for planning the interview routes in J.O. Krags Park and for developing the interview guides for each interview with the wheelchair users and blind/visually impaired participants (see section 3.3 for the interview participants).

After completing the interviews with the wheelchair users and blind/visually impaired individuals in J.O. Krags Park and the SPARK-Park, observations of both climate adaptation parks were carried out. These were documented through continuous audio recordings, photographs and notes. By audio recording the observations, it became possible to capture sensory impressions, atmospheres and details in the surroundings that cannot be registered through digital tools alone.

Look at Affordances

This second analytical level in the urban design tool was used to develop interview questions and routes, which were based on the four subcategories: *Motor affordances*, *Sensory affordances*, *Cultural affordances*, and *Atmosphere*.

For each interview with the wheelchair users and blind/visually impaired individuals, a detailed interview guide was prepared. All interview guides were structured around the three affordance levels, including the five affordance subgroups mentioned above. The questions in the interview guide were structured around either a route or specific areas in the parks. The interview participants were therefore asked to reflect on concrete affordances while being physically present in the situation.

During the interviews with the wheelchair users and blind/visually impaired individuals, both the interview guide and own observations were used for elaboration and for the use of follow-up questions. A concrete example from the interview with Gartmann in the SPARK-Park, who is blind/visually impaired, was that follow-up questions asked about traffic sounds during the interview, as this was an observation noticed directly. With Pedersen in J.O. Krags Park, a wheelchair user, it was observed that her wheels got stuck in the surface, which led to follow-up questions about the experience. The combination of planned and situationally emerging questions helped capture affordances that only appeared through movement with the body.

Examine the Subject and Accessibility

This analytical level in the urban design tool concerns relating the users' concrete bodies, senses, and needs to the physical affordances. Here, the focus was on observing, throughout each interview with the wheelchair users and blind/visually impaired individuals, which designs in the two climate adaptation parks enabled or restricted their movement. This was examined through interview participants' experiences of the parks' material, sensory, and cultural affordances. Furthermore, at this analytical level, key similarities and differences in affordances between wheelchair users and blind/visually impaired individuals were identified. In this way, it became possible to analyse affordances in relation to wheelchair users and blind/visually impaired individuals.

The routes for the wheelchair users and blind/visually impaired individuals in the climate adaptation parks differed in practice. In the SPARK-Park, the route was not known prior to the interviews. Thus, the routes were analysed based on the participants' own choices of routes and places to stop in the park. In contrast, the interview participants were unfamiliar with J.O. Krags Park, and the route was therefore created based on observations from the first analytical level. In J.O. Krags Park the routes for both the wheelchair user and blind/visually impaired individual began on Vagtelvej, near the park, as this was a location both participants were familiar with. Although the wheelchair user and blind/visually impaired individual had no prior knowledge of the park itself, their experiences of the park are still relevant in relation to accessibility. Experiencing the park for the first time provides an understanding of which action possibilities and challenges the climate-adapted park enables for them as wheelchair users and blind/visually impaired individuals. Therefore the routes in J.O. Krags Park are methodologically constructed, whereas the routes in the SPARK-Park are the subjects' own routes and chosen places to stop.

By applying this urban design tool, it requires a detailed and time-consuming interview guide. All interview guides for wheelchair users and blind/visually impaired participants have been developed on the basis of affordance theory, which is challenging, as sensory-based questions are often difficult to answer because such impressions are frequently registered unconsciously, or because interview participants lack the language to describe their experiences. Furthermore, there may also be biased, as it is the interview participant who chooses which observations the follow-up questions address. This may, for example, influence which affordances are highlighted and which are overlooked.

3.6 Own Experience in a Wheelchair

In developing the project and carrying out one of my interviews, I was given the opportunity to gain an understanding of what it is like to sit in a manual wheelchair and what issues wheelchair users experience in their daily lives. This can be described as the method "participant observation" which is a qualitative method where the focus is on allowing the interviewer to shed light on and understand other people's experiences and experiential processes (Brinkmann and Tanggaard, 2020, p 100). The method is therefore a combination of participation and observation, as the interviewer moves between being actively involved and taking a more observant, distant position (Brinkmann and Tanggaard, 2020, p 103). The method thus also makes it possible for the interviewer to ask concrete and targeted questions, because the interviewer has gained insight into some of the challenges experienced by the interviewee (Brinkmann and Tanggaard, 2020, p 103).

By trying out a manual wheelchair, it provided insight into how small level differences, surfaces, and slopes affect mobility for wheelchair users. The participant observation in a wheelchair was carried out in the SPARK-Park together with the interview participant Per Bøgeskov. The experience helped to underline the details pointed out by the interviewees. By being involved in the data, there is a risk that the interviewer may be influenced, as it can be difficult to remain objective going forward, because the interviewer may draw on their own senses, experiences, and interpretations, thereby creating a need to avoid bias (Brinkmann and Tanggaard, 2020, p 103-104). Additionally, the participant observation was carried out in a manual wheelchair, which is a different type of wheelchair than those used by the wheelchair users who were interviewed for the analyses in the project, as they all use electric wheelchairs.

3.7 Application of AI tools

In the project, AI programs have been used, including ChatGPT, CoPilot, and AAU Primo. ChatGPT has also contributed with sparring and understanding, as well as discussing the Affordance theory by Lanng and Jensen (2022). ChatGPT has helped with synonyms and English phrasing to ensure better clarity. ChatGPT has also provided assistance with the use of Overleaf, which is the program in which the project is written. CoPilot has been used to find relevant sources, providing a quicker overview of what might be relevant, after which selected texts were examined more closely. In addition, AAU Primo, Aalborg University's own search engine, has been used to find relevant sources for the project. AI tools have been used as a supportive resource; however, their use has been guided by a critical perspective emphasising correctness and validity. AI contributions have been critically reviewed, verified, and supplemented through independent source checking.

3.8 Research Design

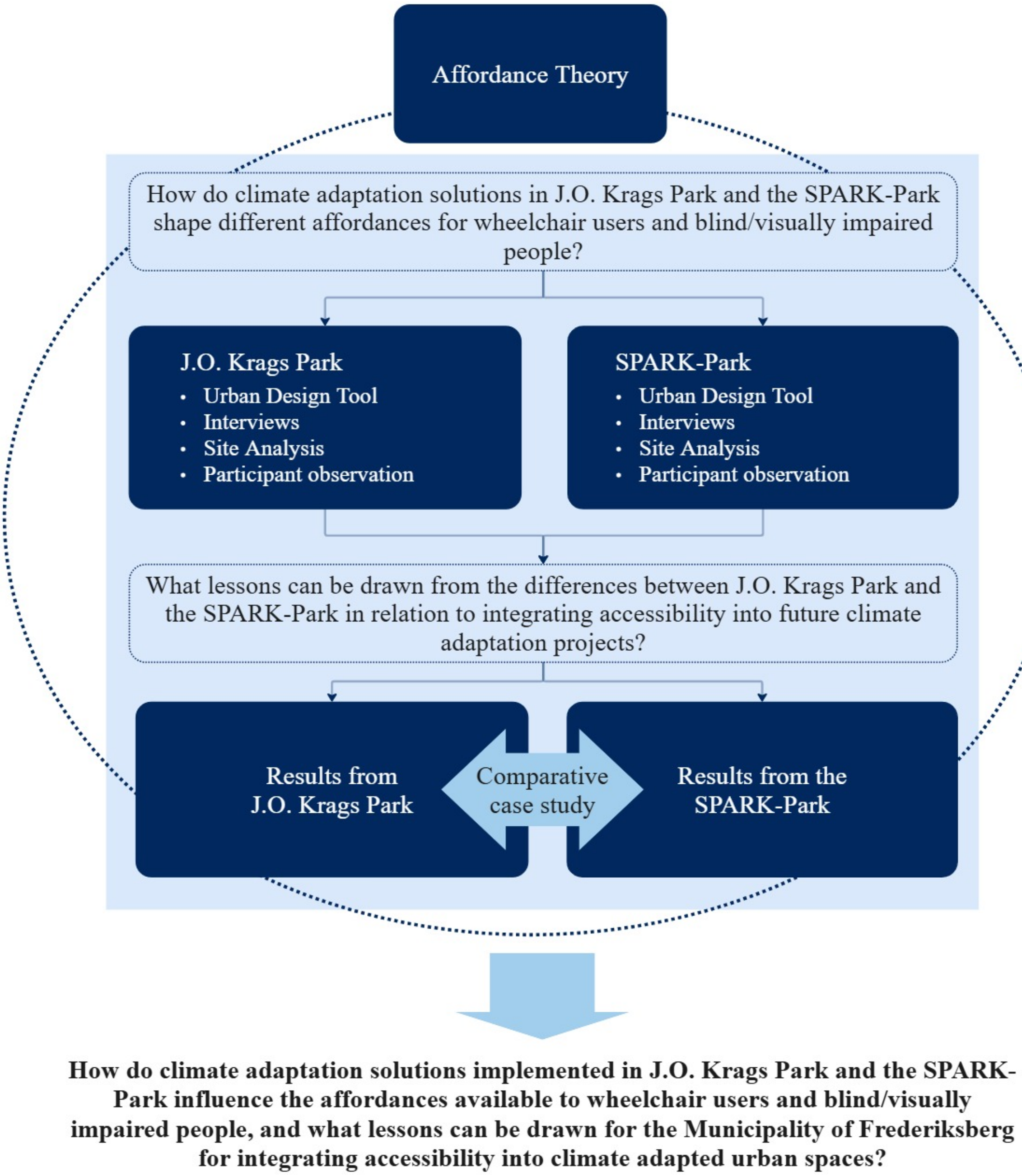

Figure 3.1. Research Design

In order to address the research question, two supporting questions have been conducted, which together support the research question and structure of the analysis:

1. How do climate adaptation solutions in J.O. Krags Park and the SPARK-Park shape different affordances for wheelchair users and blind/visually impaired people?

2. What lessons can be drawn from the differences between J.O. Krags Park and the SPARK-Park in relation to integrating accessibility into future climate adaptation projects?

Figure 3.1 illustrates the project's research design, in which affordance theory provides the overall framework for the research. The first sub-question is addressed through the two case studies of J.O. Krags Park and the SPARK-Park, where the methods; urban design tool, interviews, including GO-along interviews, site analysis, including the use of the tool QGIS, and participant observations are applied in both cases. The results from the case studies lead to the second sub-question, in which the two case analyses of J.O. Krags Park and the SPARK-Park are compared using a comparative analysis.

All together, the results demonstrate how climate adaptation solutions implemented in J.O. Krags Park and the SPARK-Park influence the affordances available to wheelchair users and blind/visually impaired people. At the same time, the analysis highlights which lessons Frederiksberg Municipality can apply and integrate into future climate adaptation projects in urban areas.

Analysis 4

In this chapter, the analysis of the two cases, J.O. Krags Park in Frederiksberg Municipality and the SPARK-Park in Aarhus Municipality, with be presented. For each, the analysis is divided into two main parts which consists of an overall site analysis and a affordance analysis of the parks. The site analysis purpose is to establish a contextual understanding and background knowledge that identifies similarities and differences of the parks. The affordances analysis is based on the urban design tool from the affordance theory (see chapter 2.2). The affordance analysis examines how the design solutions of the two parks enable or restrict action possibilities and accessibility for both wheelchair users and blind/visually impaired individuals, with a focus on material, motor, sensory, and cultural affordances. Finally, the chapter presents a comparative analysis of the two cases, focusing on differences and similarities in accessibility experiences across the two climate adaptation parks within different municipal and design contexts.

4.1 Site Analysis of J.O. Krags Park

This section examines the site specific characteristics of J.O. Krags Park. The analysis focuses on the parks spacial, functional, physical characteristics and climate adaptation solutions. The section provides an analytical framework for the subsequent affordance analysis in section 4.2.

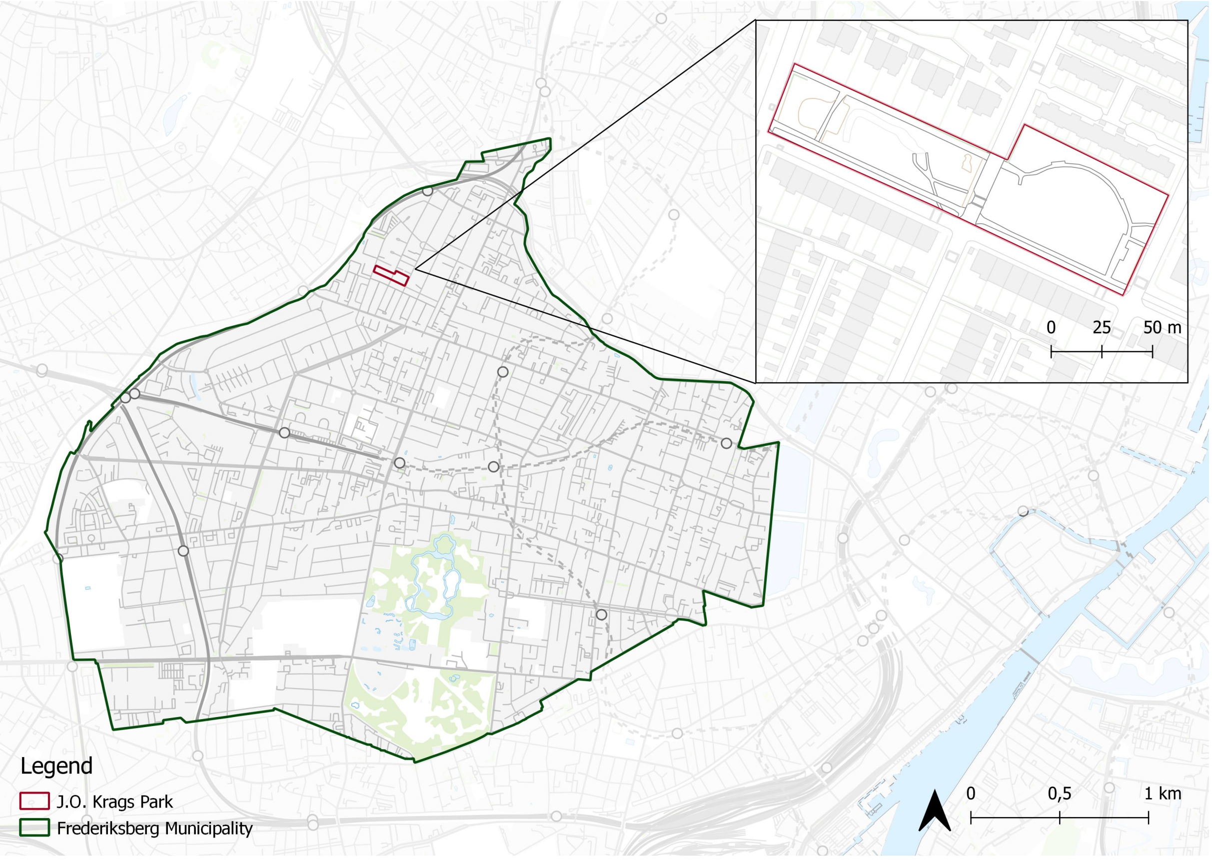

Figure 4.1. Location of the J.O. Krags Park in Frederiksberg Municipality, own illustration made in QGIS

The urban relation to J.O. Krags Park

J.O. Krags Park is located in the northwestern part of Frederiksberg, in a local area named Fuglebakkekvarteret (Kommune, 2023, pp. 1-2). Figure 4.1, illustrates that J.O. Krags Park is situated in an urban context as a small rectangular park area of approximately 6,000 m^2 (Kommune, 2023, p. 2) (WSP, 2022, p. 7). J.O. Krags Park has historically functioned as a small recreational park centrally located in the Fuglebakkekvarteret area of Frederiksberg (Kommune, 2023, pp. 1-2) (WSP, 2022, p. 7). J.O. Krags Park was designated in Frederiksberg Municipality's local plan of an area to be transformed into a climate adaptation park. The planning of the park began in 2019 and was completed in 2024 (Kommune, 2023, pp. 5-6).

Figure 4.2. Streets around J.O. Krags Park and entrances to the park area, own illustration made i QGIS with inspiration from (Møller & Grønborg, 2015)

Traffic and Access Conditions in the Immediate Urban Space

Figure 4.2 shows that J.O. Krags Park is surrounded by smaller local streets with less traffic. The streets bordering J.O. Krags Park are Egernvej, Solsortevej, Drosselvej, and Vagtelvej. The park is divided into two areas, as Solsortevej runs through and separates the site, as illustrated in Figure 4.6. In Figure 4.2, eight different entrances to the park are illustrated, showing that it is possible to enter the park from Drosselvej, Solsortevej, and Vagtelvej. Along Solsortevej, which divides the park, entrances C, D, E, and F are positioned opposite one another, enabling visitors to cross the street directly and access the adjacent part of the park. All entrances to the park, except for service entrances 1 and 2, are entrances that can be accessed by both wheelchair users and blind/visually impaired people, which is also mentioned by Muus (pers. comm.) and Lützen (pers. comm.) (own observation). As shown in Figure 4.6 the service entrances 1 and 2 are designed for maintenance vehicles, also mentioned by Lützen (pers. comm.) (Lützen and EnviDan, 2023).

Figure 4.3. Building functions around J.O. Krags Park, own illustration made i QGIS, with inspiration from (Møller & Grønborg, 2015)

Functions in and Around J.O. Krags Park

Figure 4.3 illustrates the current functional structure of the area surrounding J.O. Krags Park. The park is located in an urban area where the surroundings primarily consists of residential buildings, particularly villas and terraced houses, which directly border the park (Kommune, 2023, p. 2). In addition to residential functions, the surrounding area includes other uses such as a service function in the form of a youth club located northwest of the park (see Figure 4.3). Furthermore, there is also a therapy business in one of the residential buildings northeast of the park (see Figure 4.3). Thus, the local area surrounding J.O. Krags Park comprises a limited range of functions.

Figure 4.4. Structure analysis of J.O. Krags Park, own illustration i QGIS

The Structure of J.O. Krags Park

Within J.O. Krags Park, two overall main structures can be observed. These main structures consist of both green and traffic structures. Figure 4.4 shows that the green structure consists of two separate green park areas, 1 and 2. These two park areas constitute the park's recreational areas. The traffic structure is primarily shaped by Solsortevej, which separates the park into area 1 and 2, affecting connectivity and accessibility between the two parts, as also noted by Muus (pers. comm.) and Lützen (pers. comm.) (see Figure 4.6).

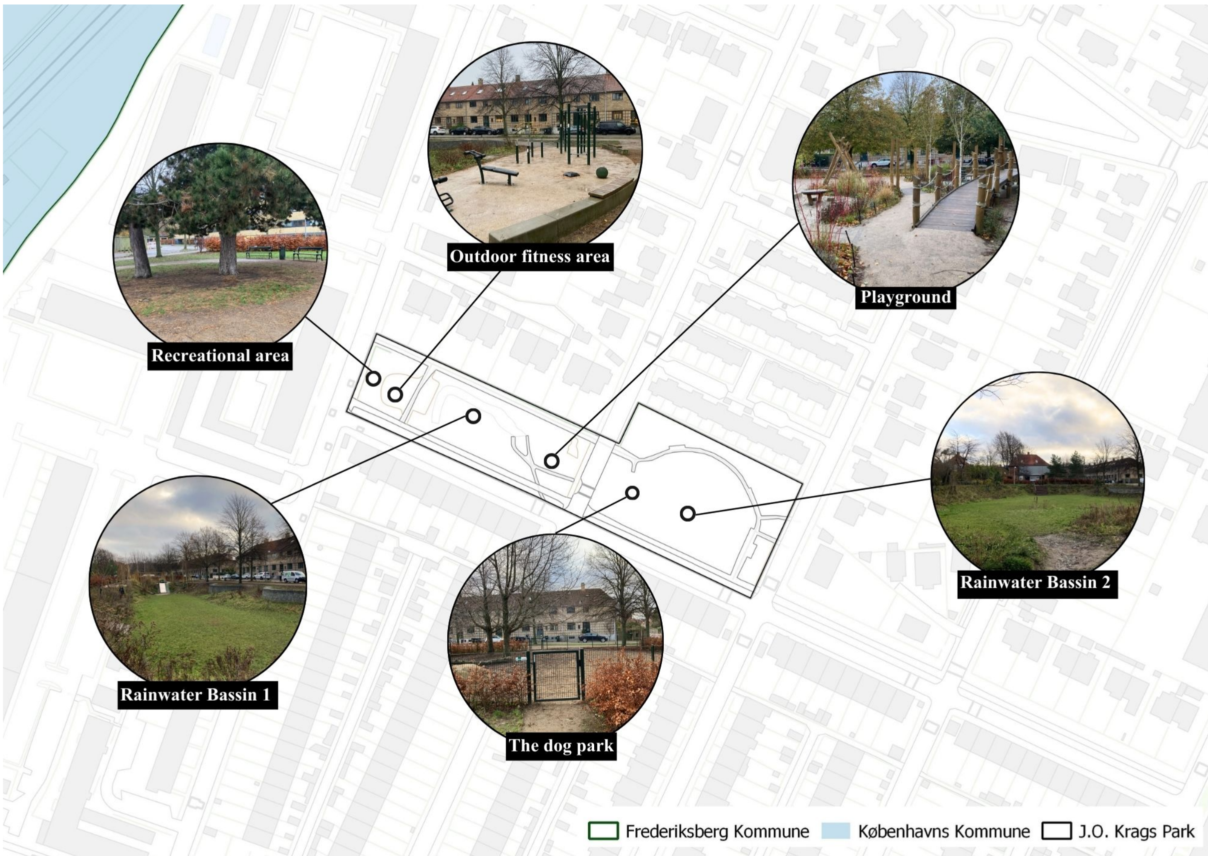

Figure 4.5. The different functions inside J.O. Krags Park, own illustration in QGIS and own picture

The Design of the Park

Inside J.O. Krags Park, various spaces with different functions have been created. Figure 4.5 shows the different functions in the park, which include both active spaces, such as the playground and the exercise area, as well as passive spaces, such as the rainwater basins 1 and 2 (see Figurambie 4.5).

The design of the park has been influenced by the local residents as well as political interests. In particular, strong political priorities have shaped the ambition for the park to include multiple functions, as noted by Muus (pers. comm.). Furthermore, the design of the park has also been shaped by the Municipality's policies, particularly the *tree policy* and the *biofactor method* highlighted by Muus (pers. comm.). The trees in J.O. Krags Park are classified as preservation-worthy, meaning that they cannot be cut down or removed (Kommune, 2023, p 3). In relation to the *biofactor method*, Muus (pers. comm.) mentions that the Municipality prioritises less paving and more greenery in climate adaptation planning. This is because the *biofactor method* is a central principle in the Municipality's climate adaptation projects, aiming to create as many green areas as possible that contribute positively to the Municipality's overall CO_2 uptake (Frederiksberg Kommune, 2024*a*, pp 10,25).

The overall park design is characterised by pronounced changes in level differences, including a deep surface depression that collects rainwater in both Park area 1 and 2 (see Figure 4.4 for the location of the park areas). The rainwater retention basins are designed with varying depths, with retention basin 1 having a depth of 1.55 m and retention basin 2 a depth of 1.25

m. (see Figure 4.5 for the location of the basins). According to both Muus (pers. comm.) and Lützen (pers. comm.), these basins serve both as recreational spaces and as storage for rainwater during heavy rainfall events.

Described by Muus (pers. comm.), accessibility has been incorporated into the park from the early planning phase, with particular focus on elderly residents. Although, Muus (pers. comm.) and Tapp (pers. comm.) state that there has been no dialogue with the disability council during the process, consideration was nevertheless given to wheelchair users' access to both the playground and the dog park. A continuous gravel path system runs around the entire park, which is shown in Figure 4.6 and works as an access route to the various functions of the park. There are a few cross paths that intersect the park and connect to the main path. The path system is designed to be simple and legible, with routes primarily configured as straight, linear alignments and only minimal changes in direction such as bends and curves. In addition, a defining feature of the park is the integration of constructed cloudburst channels designed as open surface channels. These channels intersect the paths at several locations, where steel bridges ensure continuity within the path system (see Figures 4.7 and 4.8 for the location of the cloudburst channels and Figure 4.9 for pictures of a cloudburst channel).

The park is predominantly characterised by grassed surfaces extending across both park areas 1 and 2, with the two rainwater retention basins in particular forming extensive grassed areas (see Figure 4.4 for the location of the park areas). The vegetation is highly varied and consists of both tall and low planting. The park is characterised by a high presence of hedges and trees. Figure 4.6 illustrates how the hedges provide visual screening towards Solsortevej, a function that similarly applies to Drosselvej and Vagtelvej (Kommune, 2023, p 3).

(a) Service access to rainwater basin 2

(b) Solsortevej, which divides J.O. Krags Park

(c) The gravel path system in the park

(d) Vegetation of hedges that screen Solsortevej

Figure 4.6. Pictures of the traffic structure and the design of J.O. Krags Park, own pictures

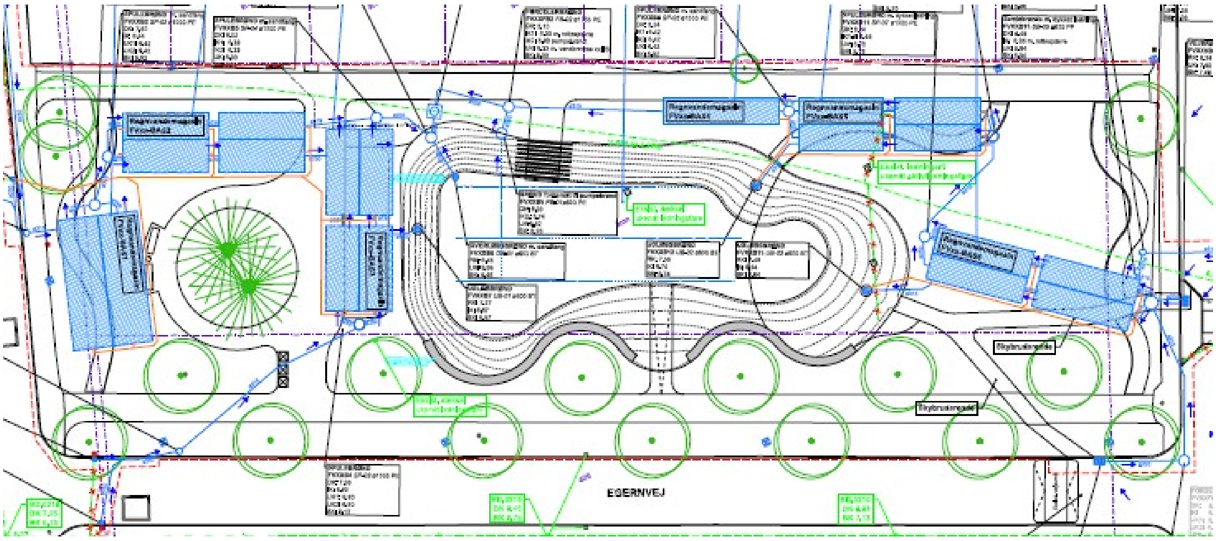

Figure 4.7. The Figure shows a drainage and sewer drawing of park area 1 (see Figure 4.4 for the location of the park ares) in J.O. Krags Park. The Figure illustrates, among other things, soakaways, which are marked as light-blue rectangular fields. In addition, the Figure illustrates the pipelines that connect the soakaways, as well as the sewer pipes from the streets. The pipelines are marked with dark-blue lines with small dark-blue arrows indicating the path of the water in the below ground system. The Figure also shows the cloudburst channels, which are marked as white wide lines with a black edge, leading down to a bowl-shaped surface basin located in the middle of the park, Figure received from (Lütsen and EnviDan, 2022)

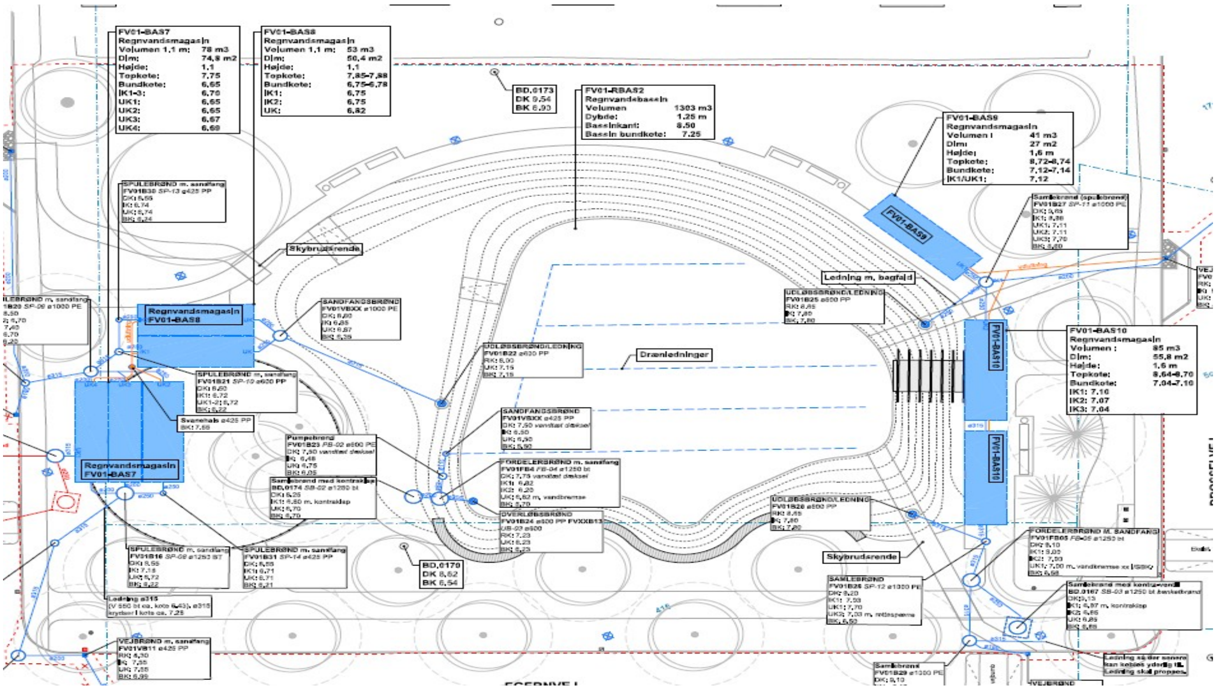

Figure 4.8. The Figure shows a drainage and sewer drawing of park area 2 (see Figure 4.4 for the location of the park area) in J.O. Krags Park. The Figure illustrates, among other things, soakaways, which are marked as grey rectangular fields with a light-blue edge. In addition, the Figure illustrates the pipelines that connect the soakaways, as well as the sewer pipes from the streets. The pipelines are marked with dark-blue lines with small dark-blue arrows indicating the path of the water in the below ground system. The Figure also shows the cloudburst channels, which are marked as wide white lines with dark-blue arrows showing the path of the water down to the bowl-shaped surface basin located in the middle of the park, Figure received from (Lütsen and EnviDan, 2022)

Terrain and Hydraulic Structure

J.O. Krags Park's water management has, according to Muus (pers. comm.), been developed in collaboration with Frederiksberg Municipality and the utility company as well as the architectural firm Niels Lützen and the consulting engineering firm EnviDan. J.O. Krags Park is located in a low-lying terrain area of Frederiksberg and is therefore at risk of flooding (Kommune, 2023, p. 5). For this reason, the park has been designated as an area suitable for the collection and temporary retention of rainwater (Kommune, 2023, pp. 2,5,9). Muus (pers. comm.) further explains that the park is also an area where it is possible to store large amounts of water. This has meant that the project has, from the very beginning, been driven by climate adaptation and the need for sufficient retention volume, as noted by Muus (pers. comm.). In addition, Muus (pers. comm.) explains that it has been the highest priority to ensure that the park achieves the necessary capacity for rainwater and cloudbursts. The park is designed to collect all rainwater from the surrounding streets, such as Fuglebakkevej, Drosselvej, Solsortevej, and Egernvej. This corresponds to a catchment area of 11 ha, from which J.O. Krags Park collects all surface water (Kommune, 2023, pp. 2-3). Today, the park is designed to handle a 10-year rain event projected 100 years into the future (Frederiksberg Forsyning, 2022).

Figure 4.7 and 4.8 show an illustration of the pipelines and sewer lines in the installations in J.O. Krags Park. Two large terrain depressions have been constructed in both park areas 1 and 2, where the rainwater basin in park area 1 has a basin volume of 908 m^3, and the rainwater basin in park area 2 has a basin volume of 1303 m^3 (see Figure 4.4 for the park structure). In total, the park can handle 3000 m^3 of water through surface and underground water management solutions (Frederiksberg Kommune, 2024*c*, p. 11).
To reach the desired volume in the facility, it has been a necessity to construct a stone wall in each of the stormwater basins to maintain the shape of the basin, as Muus (pers. comm.) explains (see Figure 4.9 of the wall in the rainwater basin).
When an everyday rain event occurs, the soakaways in J.O. Krags Park can store the water and delay it before it is subsequently directed into the existing sewer systems in the surrounding streets around the park (see Figure 4.2 for the surrounding streets) (Kommune, 2023, p. 3). In a cloudburst event, the soakaways in the park will fill up and direct the water further to the rainwater surface basins in park area 1 and 2. Here, the water will be stored and infiltrate naturally (Kommune, 2023, p. 3). In addition, the water from the surrounding street network is conveyed through surface-based cloudburst channels that form part of the installation and discharge into the rainwater basins, according to Lützen (pers. comm.).

(a) A cloudburst channel in park area 2

(b) The rainwater basin with the stone wall in park area 2

Figure 4.9. Water management solutions in J.O. Krags Park, own pictures

4.2 Affordance Analysis of J.O. Krags Park

To gain an understanding of accessibility in J.O. Krags Park within Frederiksberg Municipality, an analysis is conducted based on Pedersen (pers. comm.), and Monggaard's (pers. comm.) experiences of the park. Pedersen (pers. comm.) is an electrical weelchair user, while Monggaard (pers. comm.) is blind/visually impaired. Both informants live in Frederiksberg but have never visited J.O. Krags Park. Therefore, a route through the park has been established for the analysis and is followed by both Pedersen (pers. comm.) and Monggaard (pers. comm.) . The two routes will be analysed using the urban design tool from the affordance theory in section 2.2. To support Pedersen (pers. comm.) and Monggaard's (pers. comm.) route in J.O. Krags Park, own observations are also included. First, the analysis of Pedersen (pers. comm.) will be presented, followed by the analysis of Monnggard (pers. comm.).

4.2.1 The Route through J.O. Krags Park as a Wheelchair User

Pedersen (pers. comm.), who uses a wheelchair and has cerebral palsy, participated directly in the analysis. The assessment is based on the route developed and completed in collaboration with Pedersen(pers. comm.) as illustrated in Figure 4.10 following with the six points of attention along the route. Figure 4.10 illustrates both the proposed route and the actual route. The analysis take the actual route as its point of departure. In the analysis, Pedersen's (pers. comm.) experience of the park will be examined, including which challenges she experiences in the park. As a wheelchair user, Pedersen (pers. comm.) experiences a number of recurring challenges that relate to the park's climate adaptation solutions and overall design. In particular, the terrain displacements at rainwater basins 1 and 2 limit her ability to move around and use the basins, just as level differences in the surfacing at the playground and in the dog park create a risk of getting stuck. In addition, Pedersen (pers. comm.) experiences a lack of ramps at park entrances, narrow passages, and soft surfaces such as grass which overall reduces the park's affordances for wheelchair users. These challenges form the basis for the following analysis.

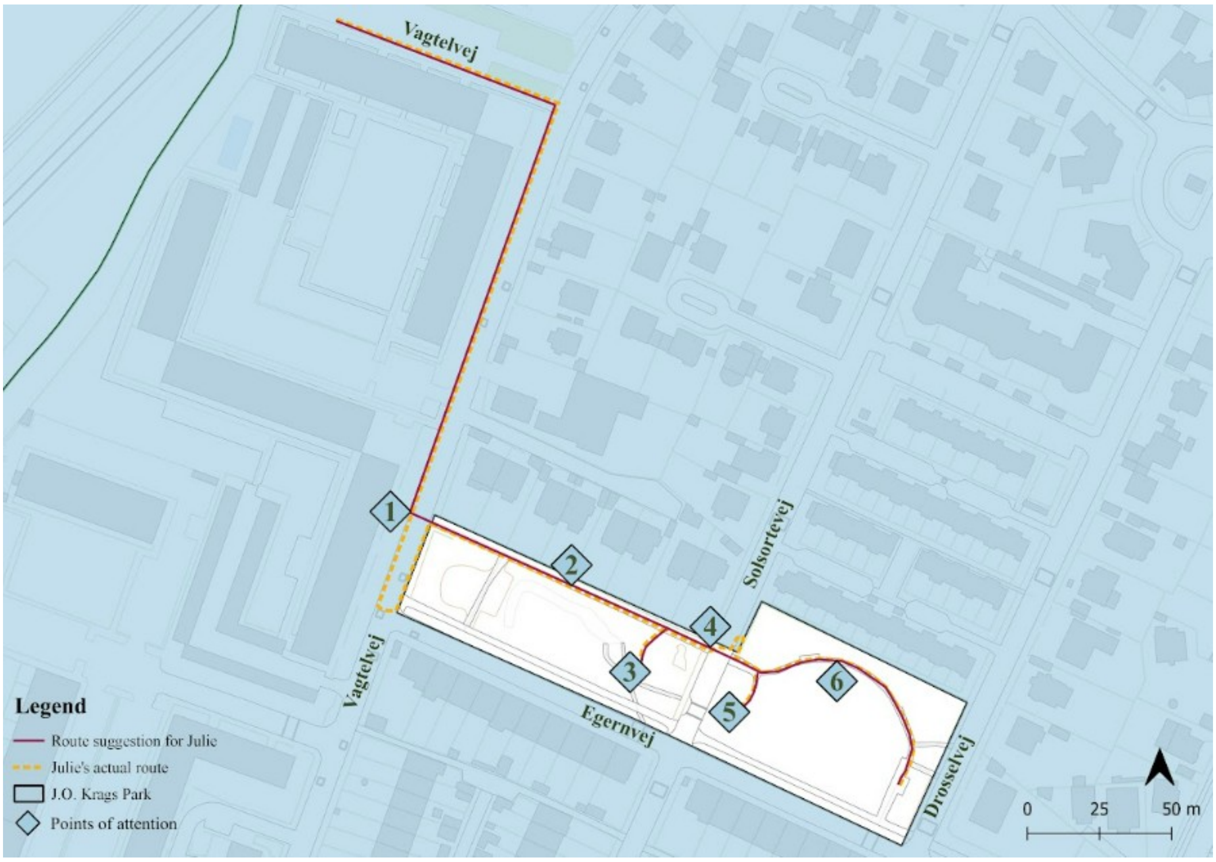

Figure 4.10. Pedersens route through J.O. Krags Park, own illustration in QGIS

Access and Entrance to J.O. Krags Park

Pedersen (pers. comm.) calmly drives up onto the pavement on Vagtelvej towards J.O. Krags Park, as illustrated in Figure 4.10. On the pavement, Pedersen moves at a brisk pace; therefore, it does not take long before she reaches Entrance A to the park, which is located on Vagtelvej (see Figure 4.2 showing where the entrance is located). Since Pedersen (pers. comm.) is on the opposite side of the park entrance on Vagtelvej, she needs to cross the street. Here, the first challenge on the route occurs, as illustrated by attention point 1 in Figure 4.10, due to the absence of a kerb ramp from the pavement down to the street. Pedersen (pers. comm.) mentions that she has experienced this before in other places in the city. This challenge therefore makes it difficult for Pedersen (pers. comm.) to access the park, as she has to take a long detour to reach the park entrance on Vagtelvej. This clearly shows a lack of motor affordance in the surroundings around the park, as the missing kerb ramp makes it impossible for Pedersen (pers. comm.) to cross the street directly. This creates an accessibility challenge for Pedersen (pers. comm.) in relation to accessing the park.

When Pedersen (pers. comm.) arrives at the entrance to J.O. Krags Park, the first thing she encounters is a gravel path, which is shown i Figure 4.6. This gravel surface is not a problem for Pedersen (pers. comm.) , as she mentions that it is firm gravel. Although the gravel surface is firm and Pedersen (pers. comm.) does not experience slippage when using her wheelchair, she remains attentive while moving, explaining that she is always particularly cautious on surfaces that are not asphalted. Weather conditions, such as rain and snow, can have a significant impact on Pedersen's (pers. comm.) accessibility on the gravel surface, as she mentions that these weather changes will affect the firmness of the surface, making it more difficult to navigate the path. This shows that both motor and sensory affordances come into play. The gravel path offers a positive motor affordance for Pedersen (pers. comm.), as the surface is firm, which she can sense through the wheelchair via sensory affordance. However, the motor affordance is conditional on the weather, as rain or snow may cause the gravel path to lose firmness, making it more difficult to move along.

Rainwater Basin 1 as a Recreational Space

Pedersen (pers. comm.) calmly continues down the gravel path in the park. Along the gravel path, she passes the first rainwater basin in the park (see Figure 4.5 for the location of the rainwater basin 1). The rainwater basin is, as mentioned in section 4.1, part of the park's climate adaptation. The rainwater basin itself has an organic shape, almost circular. It is recessed into the terrain, and at the bottom of the basin there is a large, flat grass lawn. Figure 4.9, illustrates that there is a high stone wall with a winding design, at one end of the rainwater basin. Along the sloping terrain, there is varied planting and three access points, one of which is a stone staircase, while the other two are grass paths (own observation). This area of the park is designed as a recreational space where visitors can stay on the grass lawn in the rainwater basin. The lawn is intended for dog walking or being active, for example with play or sport activities as explaid by Muus (pers. comm.) and Lützen (pers. comm.).

When Pedersen (pers. comm.) encounters the rainwater basin, she immediately assesses that it is not a place suitable for her to remain, as access to the recreational space is not possible, as illustrated by attention point 2 in Figure 4.10. This is due to the slopes leading down into the rainwater basin being too steep for Pedersen (pers. comm.) to navigate. Pedersen (pers. comm.) mentions that the main challenge is especially getting back up from the basin, as this would not be possible for her. It is not only the slope inside the basin that affects her accessibility; the grass surface in the recreational area also plays a role in whether Pedersen (pers. comm.) can use the space. Pedersen (pers. comm.) notes that if the grass is wet, it becomes more difficult for her to move across it.
Again, both motor and sensory affordances can be observed, where there is a negative motor affordance because the area does not allow access for Pedersen (pers. comm.), which she can perceive visually through the sensory affordance. The material affordance of the grass surface affects the motor affordance and thereby Pedersen's (pers. comm.) action possibilities. Furthermore, the cultural affordance is also present, as the rainwater basin is intended to function as a recreational space, but this does not apply to wheelchair users due to the design of the space.

The Playground Area

Located close to the rainwater basin is the entrance to the playground in J.O. Krags Park (see Figure 4.5 for its location). The playground is situated along Solsortevej and consists of various play area zones. These play area zones include a sandbox, a swing set, a lookout tower, a carousel, trampolines, a slide, and a central meeting point with a circular bench (KOMPAN, n.d.) (own observation). The layout of the playground is very organic, with winding paths (KOMPAN, n.d.). In addition, the playground can be accessed from both sides of the park via the gravel path, as two entrances have been created leading into the playground (own observation).

Pedersen (pers. comm.) slowly drives into the playground area, where the surface changes from firm gravel to rubber surfacing. Pedersen (pers. comm.) mentions that this surface is perfectly fine to drive on, but there are some places on the playground where the surface creates challenges due to certain level differences, as illustrated by attention point 3 in Figure 4.10) . As Pedersen (pers. comm.) enters the playground, she experiences briefly getting stuck with her wheel in a small depression in the surfacing. It therefore does not take much in terms of changes in surface levels for Pedersen (pers. comm.) to notice it. This makes Pedersen (pers. comm.) pay more attention to the playground surface, and she explains that she needs to slow down. This shows how the motoric affordance has both a positive and a negative significance for Pedersen's (pers. comm.) possibilities for action in the area. The rubber surfacing offers her a positive motoric affordance, while the level difference creates a negative motoric affordance as Pedersen (pers. comm.) gets stuck in the surface. The fact that Pedersen (pers. comm.) feel her wheels getting stuck in the surfacing simultaneously shows how the sensory affordance influences her experience of the area.

The playground has been designed so that wheelchair users, like Pedersen (pers. comm.), can move all the way around it, as mentioned by Muss (pers. comm.). By the swings on the playground, another entrance has been created, where a wooden bridge has been built over a sunken channel that is intended to carry water down to the rainwater basin as part of the park's climate adaptation (Lütsen and EnviDan, 2022) (own observation). The wooden bridge over the channel is shaped like a tall rectangular block. Pedersen (pers. comm.) does not notice this entrance immediately, as she does not perceive it as an entrance to the playground. When she realises that it also functions as an entrance, she immediately notes that this type of access does not work for wheelchair users, as illustrated by attention point 3 in Figure 4.10. Pedersen (pers. comm.) explains that both the wooden bridge is too high and too narrow to be used by a wheelchair user, and that it is also not possible for her to drive down into the sunken channel, as no ramps have been installed. Pedersen (pers. comm.) expresses that this entrance to the playground is not designed to be used by all people (see image in Figure 4.11 of the wooden bridge). The entrance with the wooden bridge creates a cultural affordance, as the entrance culturally invites free access for users, but the design of the wooden bridge makes it exclusionary and therefore not an entrance for all users. The wooden bridge is designed in a way that creates a negative motoric affordance for Pedersen (pers. comm.), as it is physically impossible for her to use the bridge, since it is both too high and lack ramps, but also too narrow for a wheelchair.

Crossing Solsortevej

Pedersen (pers. comm.) drives out of the playground area and back to the gravel path. To reach the other part of the park, Pedersen (pers. comm.) has to cross Solsortevej, which runs through J.O. Krags Park. Here, Pedersen (pers. comm.) encounters yet another challenge, as the absence of a ramp prevents her from entering the park, as illustrated by attention point 4 in Figure 4.10. This reflects the same challenge as at the entrance to the park on Vagtelvej, where the lack of a ramp creates a negative motoric affordance for Pedersen (pers. comm.) (see image in Figure 4.11 of the missing ramp). Pedersen (pers. comm.) therefore has to take a detour along the street to find a ramp so she can enter the other part of the park.

The first thing Pedersen (pers. comm.) encounters, once she finds a ramp and heads toward the park, is a steel bridge with a patterned surface (see image in Figure 4.9 of the steel bridge). The bridge has been constructed as part of the park's climate-adaptation measures, as a sunken

channel is located beneath the steel bridge to convey water to the rainwater basin in this part of the park, as noted by Lützen (pers. comm.). When Pedersen (pers. comm.) drives over the bridge, she does not experience any discomfort, and this type of surface does not pose a problem for her.
The design of the steel bridge is expressed as a material affordance, as the bridge's solid surface creates a stable ground for Pedersen (pers. comm.) to drive on, enabling a positive motoric affordance. The sensory affordance appears in interaction with the motoric affordance, as Pedersen (pers. comm.) can feel through her wheels that the surface does not cause her discomfort.

(a) Missing ramp at the entrance of park area 2 in entrance E with two stones that frame the entrance

(b) The wooden bridge entrance for the playground

Figure 4.11. Attentions points in J.O. Krags Park, own pictures

The Dog Park Area

Pedersen (pers. comm.) , continues to the dog park which is located close to the steel bridge. The dog park is designed as a circular courtyard enclosed by a tall fence. Inside the dog park, there are some trees and benches, as well as some tree stumps scattered randomly across the soil surface (see Figure 4.5 of the location) (own observation). In the planning phase of the dog park, accessibility for wheelchair users was considered, specifically with regard to access to the area. The gates to the dog park have therefore been designed to be usable by wheelchair users, as also noted by Lützen (pers. comm.).
When Pedersen (pers. comm.) approaches the gate, she becomes very confused, but with some difficulty, the gate is opened for her, and she drives into the dog park. Pedersen (pers. comm.) reduces her speed due to the presence of numerous holes in the ground that create significant level differences, and she therefore remains highly attentive to her route, as illustrated by attention

oint 5 in Figure 4.10. Even though there are large level differences in the surface, Pedersen (pers. comm.) does not experience them as an obstacle in terms of using the space, as the unevenness of the ground is clearly visible, allowing her to reduce her speed and either navigate around it or cross it slowly. The time of day may therefore influence when Pedersen (pers. comm.) access a park such as this, as level differences may not be visible in low-light or dark conditions
The dog park offers various affordances. The material affordance in the form of the soil surface, with its unevenness and level differences, creates a negative motoric affordance, as there is a risk that Pedersen (pers. comm.) may get stuck, and the surface therefore limits her speed. At the same time, the sensory affordances show that Pedersen (pers. comm.) can visually interpret the terrain, but this is not possible in dark conditions, and therefore the lighting in the area has great significance for Pedersen's possibilities for action.

Rainwater Basin 2 as a Recreational Space

Pedersen (pers. comm.) slowly drives out of the dog park and increases her speed on the firm gravel surface. Just after leaving the dog park, she again encounters a steel bridge over a sunken channel in the park, which she drives across. Located next to the steel bridge on the gravel path, the second rainwater basin constitutes part of the park's climate adaptation infrastruc, as shown by attention point 6 in Figure 4.10. The rainwater basin 2 has an organic design, where the basin is recessed into the terrain, and at the bottom of the basin there is a large flat lawn (own observation). Along the sloping terrain of the recreational space, there is varied planting and three access points, one of which is a stone staircase located on one side of the area toward Drosselvej (own observation). Toward Egernvej, a vertical, tall, winding stone wall has been constructed (see Figure 4.9 of the wall in the rainwater basin 2) (own observation). The rainwater basin is intended to function as a recreational space where one also has the possibility, for example, to walk one's dog, which is mentioned by Muss (pers. comm.) and Lützen (pers. comm.).

One of the grass paths has a slight slope down to the bottom of the recreational area, and Pedersen (pers. comm.) mentions that she is able to drive down this path. However, this depend on the weather conditions, as Pedersen (pers. comm.) notes that she only will be able to access the sunken recreational space if the grass is completely dry. In addition, Pedersen (pers. comm.) indicates that she would feel most comfortable if a helper were present to assist her up the slope, as she is uncertain about navigating the grassy incline independently.
The rainwater basin offers only conditional affordances for Pedersen (pers. comm.). The sensory affordance is seen in Pedersen's (pers. comm.) ability to see the slope and the character of the surface and assess what possibilities for action the area provides for her. Although one of the grass paths offers a potential motoric affordance by enabling access to the recreational space within the rainwater basin, this access is contingent upon the grass being completely dry and upon her ability to receive assistance when ascending the path. The material affordance therefore, contributes to creating an unstable motoric condition, as it depends on the weather conditions.

Pedersen (pers. comm.) continues along the gravel path to the end of the park at Drosselvej, where the route concludes. Table 4.1 summarises Pedersen's (pers. comm.) affordance experiences along the route in J.O. Krags Park, providing an overview of how the park's design enables and constrains her use of the space.

Affordance type	**Summary of experiences**
Material affordance	Firm and stable surfaces support movement No barriers related to the steel bridge Weather conditions, such as rain, reduce movement and mobility
Motor affordance	Steep entrances (like rainwater basins) restrict access Wide paths afford mobility Curbs and level differences limit speed or require avoiding certain routes
Sensory affordance	Clear visual sightlines allow evaluation of accessibility in the park Uneven surfaces are perceived through tactile feedback transmitted via the wheelchair
Cultural affordance	The wooden bridge and the rainwater basins reflect a design that prioritises pedestrians

Table 4.1. Summary of Pedersen (pers. comm.) affordance in J.O. Krags Park, own illustration

4.2.2 The Route through J.O. Krags Park as a Blind/Visually Impaired Person

Monggaard (pers. comm.) was born blind and currently lives in Frederiksberg with her husband. For Monggaard (pers. comm.), it is very important to be able to use the parks in Frederiksberg, as these constitute urban spaces without car traffic. Figure 4.12 illustrates Monggaard's (pers. comm.) route to and through J.O. Krags Park, showing both the planned route and the route that was actually carried out. The analysis takes its point of departure in Monggaard's (pers. comm.) actual route, as well as the four points of attention identified along this route. In this analysis, the focus will be on how Monggaard (pers. comm.) experiences the climate adapted J.O. Krags Park, as well as which possibilities for action the park offers her. As a blind/visually impaired person, Monggaard (pers. comm.) experiences a number of recurring challenges in the park that relate to both the climate adaptation solutions and the overall design of the park. In particular, open spaces such as rainwater basins 1 and 2 without reference points, paths or guiding lines challenge her orientation. Similarly, wide and open path courses, such as at the playground, make it difficult for her to maintain a clear direction. In addition, Monggaard (pers. comm.) experiences challenges at the cloudburst channels, as the lack of tactile warnings makes it difficult to register upcoming level differences. These challenges form the basis for the following analysis.

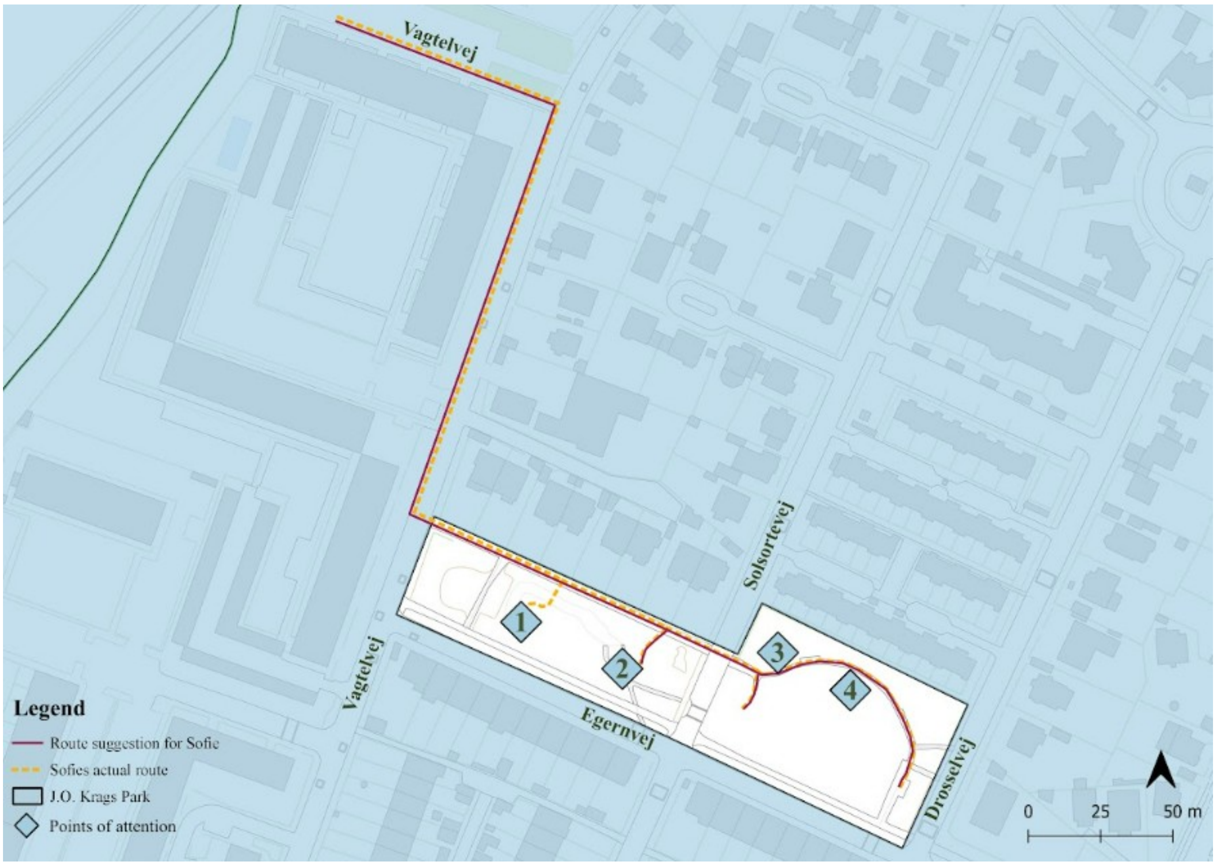

Figure 4.12. Monggaards route through J.O. Krags Park, own illustration in QGIS

Access and Entrance to J.O. Krags Park

Monggaard (pers. comm.) begins by walking at a brisk pace on Vagtelvej toward the park, as shown in Figure 4.12. While walking toward the park, Monggaard (pers. comm.) explains that she cannot see anything at all and therefore primarily uses her sense of hearing for orientation. Through her white cane, Monggaard (pers. comm.) can hear the sounds produced when the cane hits different surfaces, and she therefore actively uses her cane as she walks along Vagtelvej toward the entrance to the park.
Here, the motoric affordance is evident in the fact that Monggaard (pers. comm.) can move at a brisk pace on the surface without obstacles. In addition, the sensory affordance also comes into play, as Monggaard (pers. comm.) uses her sense of hearing for orientation through the sounds from her cane, which is essential for navigation.

When Monggaard (pers. comm.) stands at the entrance to J.O. Krags Park, she uses her white cane to feel the surfaces in the park (see Figure 4.2 with entrances). Here, she can quickly sense that she is walking on a gravel path with grass along the edge, and this shift in surface helps her follow the path, which thus functions as a natural guiding line. The gravel surface itself does not pose a problem for Monggaard (pers. comm.) to walk on, as it is firm and even. However, she explains that softer surfaces, such as sand or moist soil, would make orientation more difficult and increase the risk of her cane becoming lodged in the surface.
The firm gravel surface in the park creates a positive motoric affordance, as Monggaard (pers. comm.) can move safely and steadily. The material affordance is therefore crucial because the condition of the surface affects both the sensory and motoric affordances. If the surface becomes soft, it can limit Monggaard's (pers. comm.) possibilities for action, as both the sounds from the cane change on a softer surface and may become lodged in the surface.

Rainwater Basin 1 as a Recreational Space

Located a short distance from the entrance to the gravel path is the park's Rainwater basin 1 (see Figure 4.5 with rainwater basin location). As mentioned in section 4.2.1, this rainwater basin is part of the park's climate adaptation planning, where the basin is recessed into the terrain with a large lawn at the bottom, functioning as a recreational space for visitors during periods without heavy rainfall.
Monggaard (pers. comm.) stops on the gravel path by the staircase leading down to the rainwater basin, which is one of the three access routes to the basin. For Monggaard (pers. comm.), the staircase itself is not a challenge, and she explains that she does not need to use the handrail to descend to the recreational area within the basin. This shows that the staircase offers a positive motoric affordance for Monggaard (pers. comm.), as she can use it without difficulty.
The challenge only arises once Monggaard (pers. comm.) has reached the recreational space in the basin, which consists of a large, flat lawn, as illustrated by attention point 1 in Figure 4.12. Although, Monggaard (pers. comm.) tries to follow the edge of the space, she explains that she can quickly lose her orientation if she needs to turn around or take just a few steps in the wrong direction. It would therefore be far more accessible for her if the recreational area had some paths or elements she could use as reference points within the rainwater basin.
As Monggaard (pers. comm.) is unable to orient herself within the recreational space of the basin, the area constitutes a negative motor affordance for her. The material affordance

simultaneously plays an important role, as the space primarily consists of a grass surface, which makes orientation challenging for Monggaard (pers. comm.). This is because the grass surface does not provide clear sensory reference points, such as auditory cues or tactile markings. The recreational space in the rainwater basin generates an atmosphere of uncertainty and disorientation for Monggaard (pers. comm.) due to the design of the area, with its open surfaces and lack of reference points.

The Playground Area

Once Monggaard (pers. comm.) has ascended the staircase from the rainwater basin, she continues along the gravel path in the direction of the playground. As described in section 4.2.1, the playground is located along Solsortevej and consists of various play areas. The design of the playground is organic with winding paths, and it can be accessed through two entrances (KOMPAN, n.d.) (own observation).
Monggaard (pers. comm.) again uses her white cane to feel the natural guiding line between the gravel path and the grass. When she reaches the entrance to the playground, she can sense that there is an entrance because the surface changes, which indicates to her that something different is happening. Here, the sensory affordance is evident as Monggaard (pers. comm.) feels through her feet and cane how the surface changes.
Upon entering the playground, the first thing Monggaard (pers. comm.) notes is that she senses ample space and wide paths using her white cane. For Monggaard (pers. comm.), this is not optimal in terms of her spatial orientation, as she needs narrow, long paths, as illustrated by attention point 2 in Figure 4.12. This is most comfortable for her when navigating and orienting herself in a space. Monggaard (pers. comm.) explains that if the space opens up, just like in the rainwater basin, it becomes difficult for her to navigate and orient herself.
The cultural affordance is also visible here, as the playground is designed as an open recreational space where one is expected to move freely around (KOMPAN, n.d.). Monggaard (pers. comm.) experiences the opposite, as open spaces make it more difficult for her to orient herself.

Inside the playground, Monggaard (pers. comm.) actively uses her white cane, and she quickly senses that there are edges she can follow, which makes it safer for her to navigate. Not far from the playground entrance, the surface changes as a wooden bridge appears. The wooden bridge becomes a kind of reference point for Monggaard (pers. comm.) on the playground, as it is a solid, large element she can navigate by (see image in Figure 4.11 of the wooden bridge). When a recreational space has several fixed elements, it becomes easier for Monggaard (pers. comm.) to orient herself. She therefore explains that the playground could be a space she would be able to navigate easily if she visited it several times.
The playground offers both positive and negative motoric affordance for Monggaard (pers. comm.), as the ample space and width of the paths makes it difficult for her to orient herself, but at the same time there are edges and elements she can follow and use for orientation.

As Monggaard (pers. comm.) approaches the second entrance to the playground, she slows her pace. As mentioned in section 4.2.1, this entrance is constructed as a bridge over a cloudburst channel, which is part of the park's climate adaptation system, which is also mentioned by Muus (pers. comm.) and Lützen (pers. comm.). Even before Monggaard (pers. comm.) reaches the cloudburst channel, she senses that a change lies ahead. With her white cane, she can hear that the sound of the surface changes, which signals to her that she needs to pay

attention to what is in front of her.
At the cloudburst channel, there are no edges or tactile attention fields indicating an upcoming change in level, as noted by Monggaard (pers. comm.). Therefore, Monggaard's (pers. comm.) sense of hearing becomes essential for navigating the playground. She describes the experience as similar to standing on a train platform, where she must be aware of level differences to avoid stepping incorrectly. In the same way, Monggaard (pers. comm.) listens to the sound produced by her cane to understand what is changing ahead. This means that noise has a significant impact on Monggaard's orientation, as loud sounds can interfere with her ability to navigate.
As Monggaard (pers. comm.) gets close to the cloudburst channel, she can feel both the change in level and the wooden bridge across the channel. She explains that this entrance would not be a problem for her to use, as long as she walks slowly across the bridge. This again shows that sensory impressions, such as the sound from the cane, are crucial for sensory affordance, as she uses her sense of hearing to pick up the sounds that help her understand what lies ahead on the playground. Monggaard (pers. comm.) is therefore highly dependent on auditory cues, and sensory impressions such as noise can affect sensory affordance, as they can drown out the sounds she navigates by. The motoric affordance is also present, as Monggaard (pers. comm.) is able to use this entrance to the park, since it does not constitute a physical barrier for her.

Crossing Solsortevej

As Monggaard (pers. comm.) reaches the exit from the playground, she does not walk far along the gravel path before the path ends. This is because she reaches Solsortevej, which runs through the park, as noted by Monggaard (pers. comm.). She therefore needs to navigate to the other part of the park. As she prepares to cross Solsortevej, she mentions that what she is most curious about is whether she will be able to find the actual entrance to the park.
It quickly turns out not to be a problem, as two stones frame the gravel path (see image in figure 4.11). When Monggaard (pers. comm.) detects this with her white cane, these become clear reference points for her. These reference points function as the sensory affordance that helps her locate the entrance to the park. In addition, the reference points also support the motoric affordance, as they make it easier for Monggaard (pers. comm.) to find the entrance and move safely back into the park.

The Dog Park Area

Not far from the entrance to the second part of the park there is the dog park. Monggaard (pers. comm.) explains that already as she enters the entrance, she can hear through her white cane that the area opens up. When Monggaard (pers. comm.) reaches the gate to the dog park, she opens it without any problems and slowly walks into the enclosure. Inside the dog park, Monggaard (pers. comm.) follows the fence by using both her white cane and her hands to feel where the fence is. Monggaard (pers. comm.) explains that she does this to avoid losing her orientation. By walking along the fence in the dog park, Monggaard (pers. comm.) can more easily sense where she is and how she can find the exit again.
Monggaard (pers. comm.) walks slowly along the fence, as she is aware that the surface inside the enclosure is not completely even. She therefore also actively uses her white cane to examine the surface. The fence in the dog park gives Monggaard (pers. comm.) a feeling of safety, as the fence acts as an edge she can follow. At the same time, the benches in the enclosure function as reference points for Monggaard (pers. comm.), helping her orient herself in the space.
The dog park offers both sensory and motoric affordances. The sensory affordance is evident

in the fact that Monggaard (pers. comm.) can both hear that the space opens up and orient herself by feeling the fence with her cane and hands. This supports the motoric affordance, as Monggaard (pers. comm.) can move safely around the dog park because the fence supports her orientation. At the same time, the material affordance also affects the motoric affordance, as the uneven surface causes Monggaard's (pers. comm.) speed and movement to change.

Crossing the Cloudburst Channel

A challenge Monggaard (pers. comm.) encounters after leaving the dog park is yet another cloudburst channel, as illustrated by attention point 3 in Figure 4.12. This time, it is more difficult for her to hear that a change in the surface lies ahead, and it is therefore fortunate that she notices the level change from the cloudburst channel with her cane. Again, Monggaard (pers. comm.) detects that there are no elements or attention fields indicating that something ahead requires caution (own observation).

The cloudburst channel cuts across the gravel path, where a steel bridge has been installed over the channel (see image in Figure 4.9 of the cloudburst channel). On the surface of the steel bridge, there is a pattern of winding grooves. Monggaard (pers. comm.) uses her white cane to feel the bridge but does not notice the pattern itself as she crosses it. However, she mentions that this steel bridge would serve as a good reference point for her orientation in the park.

The cloudburst channel demonstrates a negative sensory affordance, as Monggaard (pers. comm.) cannot hear through her cane that a change lies ahead. On the other hand, the sensory affordance is also present in the sense that the steel bridge can function as a reference point for Monggaard (pers. comm.), which is positive for her orientation in the park.

Rainwater Basin 2 as a Recreational space

The cloudburst channel leads to the rainwater basin 2 in the the park. As mentioned in section 4.2.1, the rainwater basin is part of the park's climate adaptation system, as noted by Muus (pers. comm.) and Lützen (pers. comm.).

Given that the rainwater basin is designed similarly to the first basin, Monggaard (pers. comm.) experiences the same challenges, as illustrated by attention point 4 in Figure 4.12. Monggaard (pers. comm.) explains that she would also be able to enter this basin without difficulty. If Monggaard (pers. comm.) lived closer to the park and had a companion with her, it would be easier for her to use the recreational space. As with the first rainwater basin, there would need to be paths or elements functioning as reference points to help her orient herself and use the space. This would allow Monggaard (pers. comm.) to use the recreational area independently, even without a companion.

The rainwater basins offer few sensory affordances, as they are open spaces with uniform surfaces and no reference points. However, Monggaard (pers. comm.) can access the basin by walking down the staircase, which supports the motoric affordance. Furthermore, the cultural affordance is also evident, as these rainwater basins are designed as open and free recreational spaces that require visual orientation, which does not support Monggaard's (pers. comm.) orientation needs.

Table 4.2 summarises Monggaards (pers. comm.) affordance experiences along the route in J.O. Krags Park, providing an overview of how the park's design enables and constrains her use of the space.

Affordance type	**Summary of experiences**
Material affordance	Firm surfaces afford stable and safe movement along the route Soft surfaces limit use, as the cane may get stuck and reduce stability Hard materials afford clearer auditory feedback from the surroundings
Motor affordance	Changes in surface materials support navigation by functioning as guiding elements Edges and curbs support navigation and directional control along the route Level differences (like staircases) do not restrict the ability to move independently Large open spaces without defined elements or paths make navigation and orientation difficult
Sensory affordance	Tactile and auditory feedback from surface variation supports orientation Large elements function as reference points that support spatial orientation
Cultural affordance	Open recreational spaces where users are expected to move freely (such as the rainwater basins) pose challenges for orientation

Table 4.2. Summary of Monnggard (pers. comm.) affordance in J.O. Krags Park, own illustration

4.3 Site Analysis of the SPARK-Park

This section examines the site specific characteristics of the SPARK-Park. The analysis focuses on the parks spacial, functional, physical characteristics and climate adaptation solutions. This section provides an analytical framework for the subsequent affordance analysis in section 4.4.

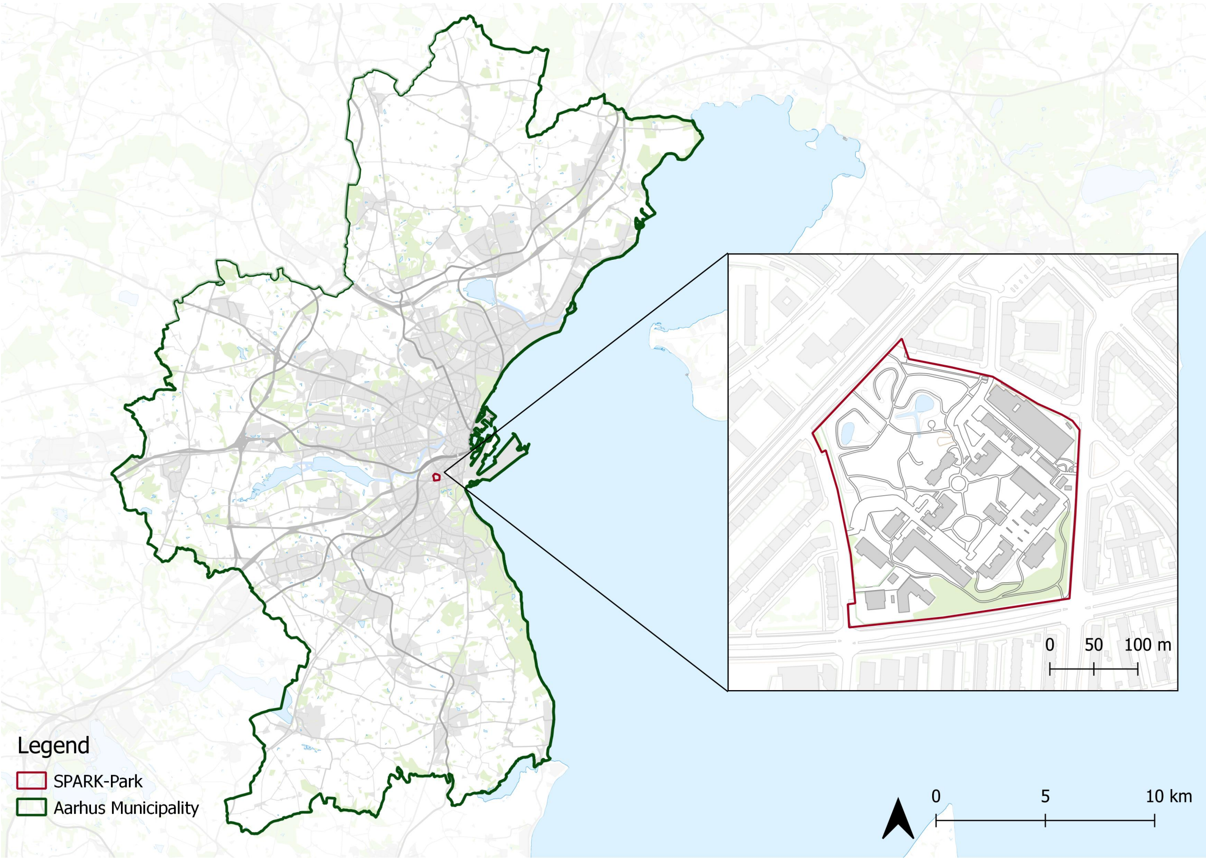

Figure 4.13. Location of the SPARK-Park in Aarhus Municipality, own illustration made i QGIS

The Urban Relation to the SPARK-Park

SPARK-Park is located at the southern edge of Aarhus C, bordering Frederiksbjerg. Figure 4.13, illustrates where the SPARK-Park is located in an urban context with an area of 7.2 hectares and an axial structural form (Møller & Grønborg, 2015, pp 4-6).
The area was originally built as a hospital outside the old city, where the hospital buildings were placed detached and open with green areas between and around the buildings to prevent the spread of infection. Slowly, the city of Aarhus has grown around the hospital, and today the SPARK-Park appears as a green oasis in the city (Møller & Grønborg, 2015, p 6). The park were completed in 2021 after a four-year redesign of the park (Madsen et al., 2021, p 3).

Figure 4.14. Streets around the park area and entrences to the park area, own illustration made i QGIS with inspiration from (Møller & Grønborg, 2015)

Traffic and Access Conditions in the immediate Urban Space

Figure 4.14 shows that the SPARK-Park is located between two major streets, Skanderborgvej and Marselis Boulevard, and three smaller streets, Kongsvang Allé, Jyllands Allé, and Evald Krogs Gade. The picture in figure 4.15 shows the two major streets, Marselis Boulevard and Skanderborgvej. These two streets are heavily trafficked, whereas P.P. Ørumsgade, Jyllands Allé, and Kongsvangs Allé carry lower traffic volumes. The surrounding streets define the area and separate the SPARK-Park from its surroundings. At the same time, they provide easy access, as the park has multiple entrances directly connected to the surrounding street network (Møller & Grønborg, 2015, p 8). Figure 4.14, illustrates the nine different entrances to SPARK-Park, showing that the park can be accessed from all surrounding streets. There are two entrances that allow car access to the park, namely Entrances C and H, located on Kongsvangs Allé and P.P. Ørumsgade, respectively. The entrances A-H can be accessed both by wheelchair users and by blind/visually impaired visitors. Figure 4.15 illustrates entrance D and how the accessibility has been considered in the design of the park entrances. Entrance I, located on Kongsvangs Allé, is designed as a staircase leading up to the path (own observation). The picture in Figure 4.15 shows how the entrance cannot be accessed by wheelchair users or blind/visually impaired visitors, as no ramp has been made and the staircase is constructed from wooden beams placed randomly up a rise leading to the path in the park (own observation).

(a) Entrance I in the SPARK-Park

(b) Entrance D in the SPARK-Park

(c) Skanderborgvej by the SPARK-Park

(d) Marselis Boulevard by the SPARK-Park

Figure 4.15. Pictures of the traffic structure and entrances by the SPARK-Park, own pictures

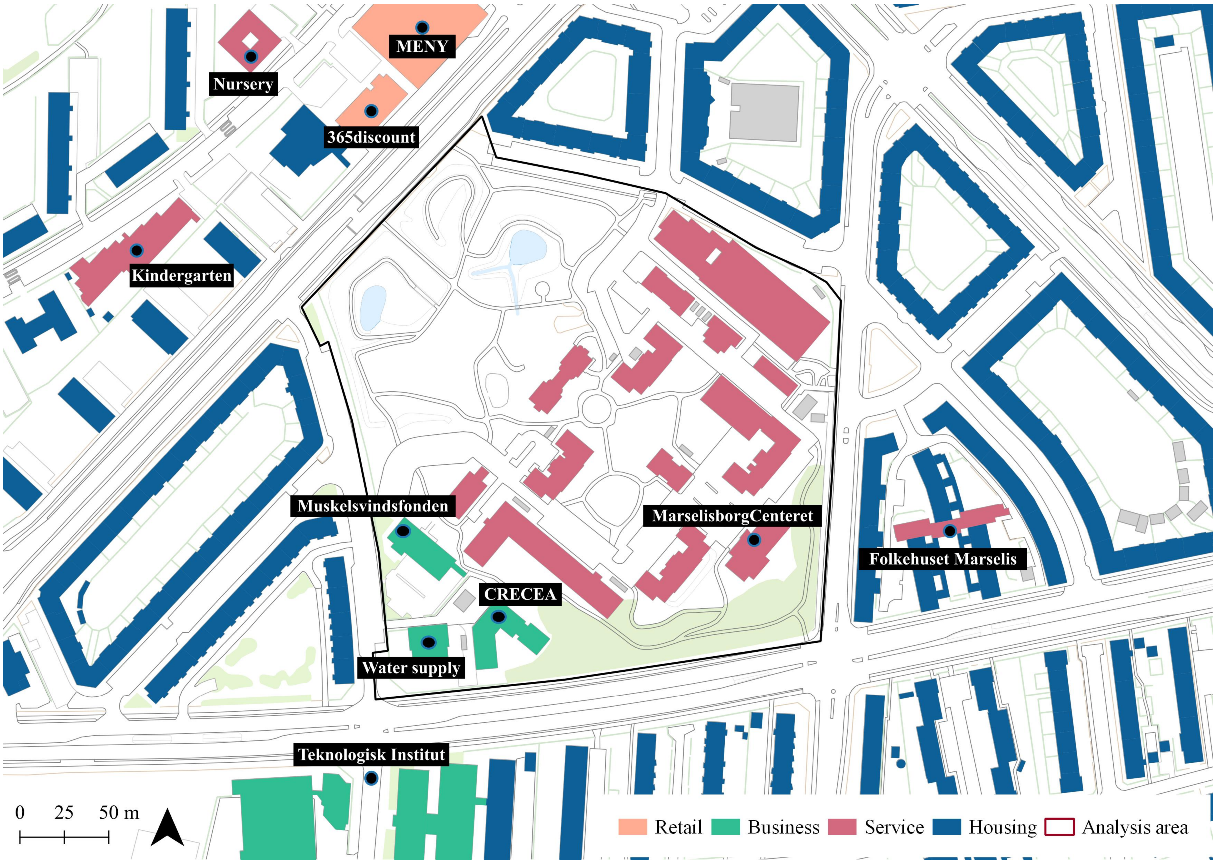

Figure 4.16. Building funktion in and around the SPARK-Park, own illustration in QGIS with inspiration from (Møller & Grønborg, 2015)

Functions in and Around the SPARK-Park

There are many different functions in and around the SPARK-Park, which is very typical for a densely built-up area (Møller & Grønborg, 2015, pp 9-11). Around the SPARK-Park, Figure 4.16 illustrates the existing functions in the surrounding area. It is evident that residential buildings constitute the primary building function in the area and directly border SPARK-Park. Around the SPARK-Park, both service and retail functions can be seen, which serve as central functions for the area, as they help attract people to the area (Møller & Grønborg, 2015, p 11). There are service functions both north and east of the park. Service functions include a nursery, a kindergarten and a community centre (own observation).
In addition to the service functions, business functions can also be seen in the nearby area around the SPARK-Park. The business functions are all located in the southwestern end of the park and all comprise educational institutions, the Technological Institute (own observation).

In the SPARK-Park itself, Figure 4.16 also illustrates a diversity of building functions in the area. The primary functions are service buildings associated with the Marselisborg Center, while individual commercial buildings are located in the southwestern part of the park. These commercial buildings include both private companies and a charitable foundation. 4.16.
The area in and around the SPARK-Park is therefore characterised by many different functions.

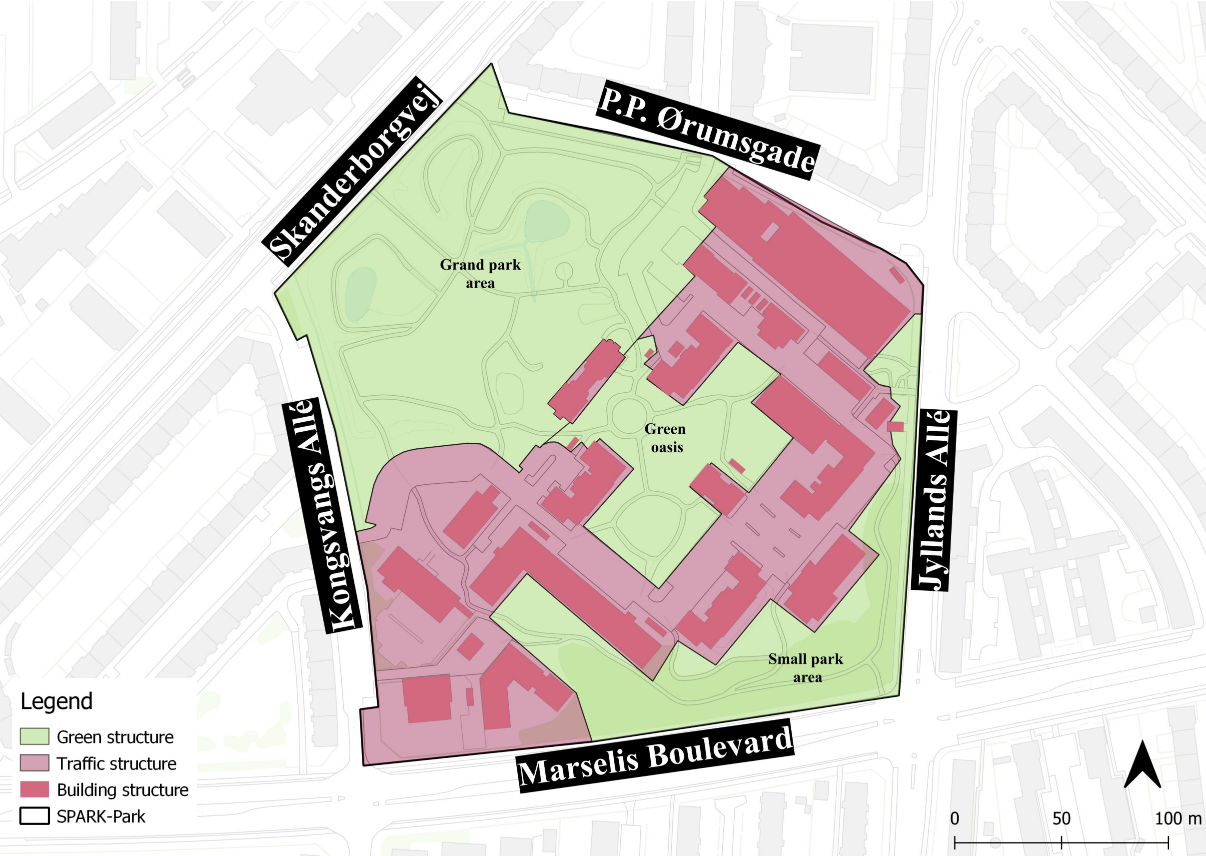

Figure 4.17. Stucture analysis over the SPARK-Park, own illustration in QGIS

The Structure of the SPARK-Park

Within SPARK-Park itself, a variety of structures and functions are present. The park is divided into structures that consist of green, traffic, and building structures (own observation). As illustrated in Figure 4.17, the green structures are divided into three different structures and are distributed throughout the entire area. The park should be understood as having a primary park area, a green oasis between buildings that connects to the primary park area, and a smaller park area in the southern part towards Marselis Boulevard (own observation). In the middle of the area, there are both streets and a parking area, as well as service buildings, as mentioned earlier.

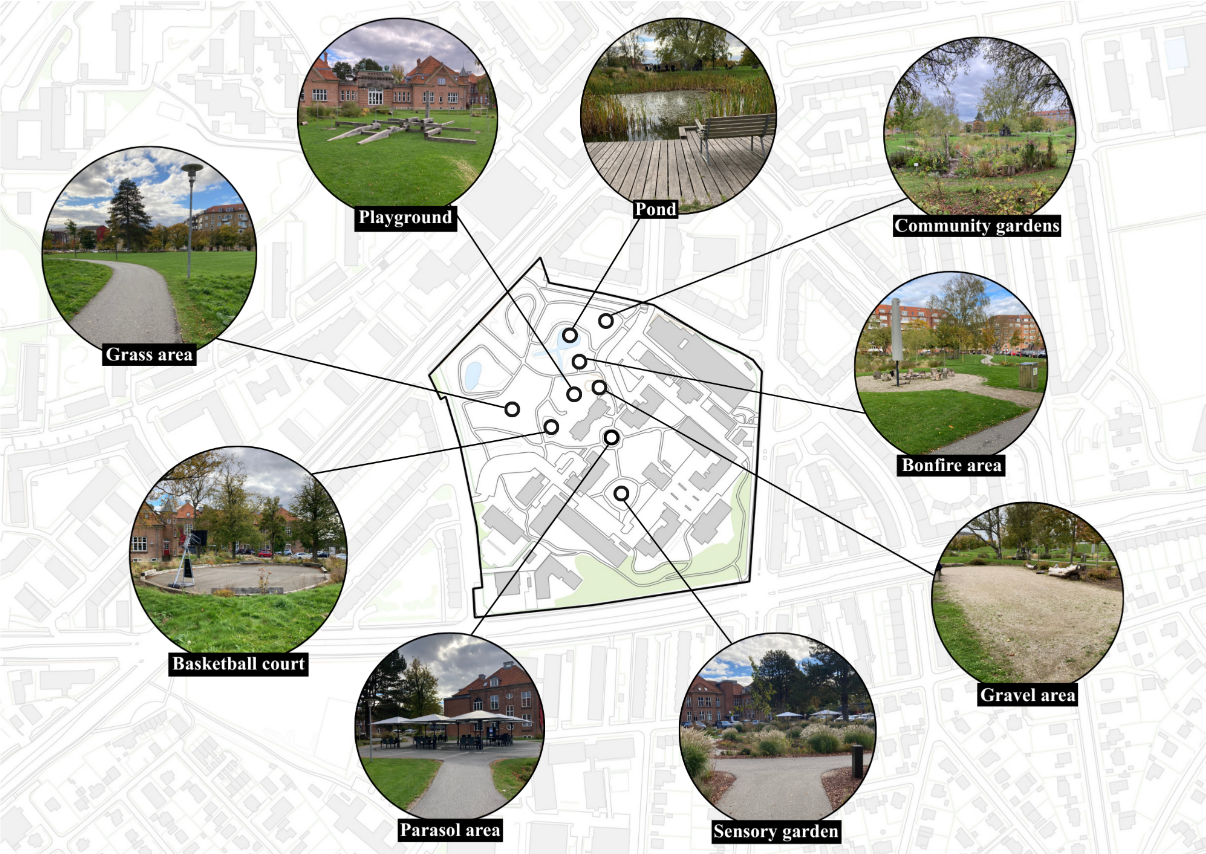

Figure 4.18. The different funktions inside the SPARK-Park, illustration made with QGIS and Canva with own pictures

The Design of the Park

Inside the SPARK-Park itself, various spaces with different functions have been created, primarily located in the park's green areas. Figure 4.18, illustrates the different functions in the park, which include both active spaces, such as the basketball court, the playground, and more passive spaces, such as the lake and the sensory garden (own observation). According to Johansen (pers. comm.) and Ramskov (pers. comm.), the early stages of the park's redesign process aimed to create outdoor areas that could function as rehabilitation spaces, enabling citizens to train outdoors in natural settings and terrain resembling everyday environments (MarselisborCenteret, 2015, p 3). One example from Ramskov (pers. comm.) is the playground in the park, which functions both as a recreational area and as a rehabilitation tool for training.

The overall design of the park is characterised by many level differences (own observation). The most dominant ones are found in the large park area, where two large hills have been created in the northern end of the park facing Skanderborgvej (own observation). In the small park area, there are also level differences, where the terrain slopes towards Marselis Boulevard (see Figure 4.17 to see the structure of the park).

In addition to these terrain slopes, a number of terrain depressions with different shapes and sizes have been established in various locations throughout the park (Kristine Jensens Tegnestue et al., 2019). According to Lausten (pers. comm.) these terrain depressions are central elements in the park's climate adaptation, which will be elaborated later in this analysis. Several of these depressions function as multifunctional recreational spaces, such as the sensory garden and the playground, serving both as areas for recreation and as temporary rainwater storage during heavy rainfall events, as noted by Ramskov (pers. comm.) (see Figure 4.18).

As mentioned by Johansen (pers. comm.), accessibility has been incorporated into the entire design of the park, both for wheelchair users and for blind/visually impaired individuals. Figure 4.19, illustrates the design of level differences and path connections, where both stairs and paths have been established on the elevations, allowing all people to move around the park, as stated by Johansen (pers. comm.). A very characteristic feature of the SPARK-Park is the pathway system with organic shapes that connects the park's three green structures, which can be seen in Figure 4.19. Most of the paths are asphalted, while some are made with gravel (own observation). Furthermore, Johansen (pers. comm.) also mentions that the park's surfacing is generally designed without curbs and major level differences, which increases accessibility, especially for wheelchair users. For blind/visually impaired individuals, a guiding line has been initiated in the park as an accessibility measure, which Johansen (pers. comm.) notes.

The park is overall dominated by grass, which is present throughout all the green structures, with the large grass area in particular containing a wide, flat lawn (own observation). The planting in the park is varied and consists of both tall and low vegetation. Numerous trees are present throughout all three park areas, with many of them providing screening from traffic and the surrounding streets (own observation).

(a) The organic-shaped pathway system in the SPARK-Park

(b) A pathway system leading to the top of one of the hills facing Skanderborgvej

Figure 4.19. Pictures of the pathway systems and the level differences in the SPARK-Park, own picture

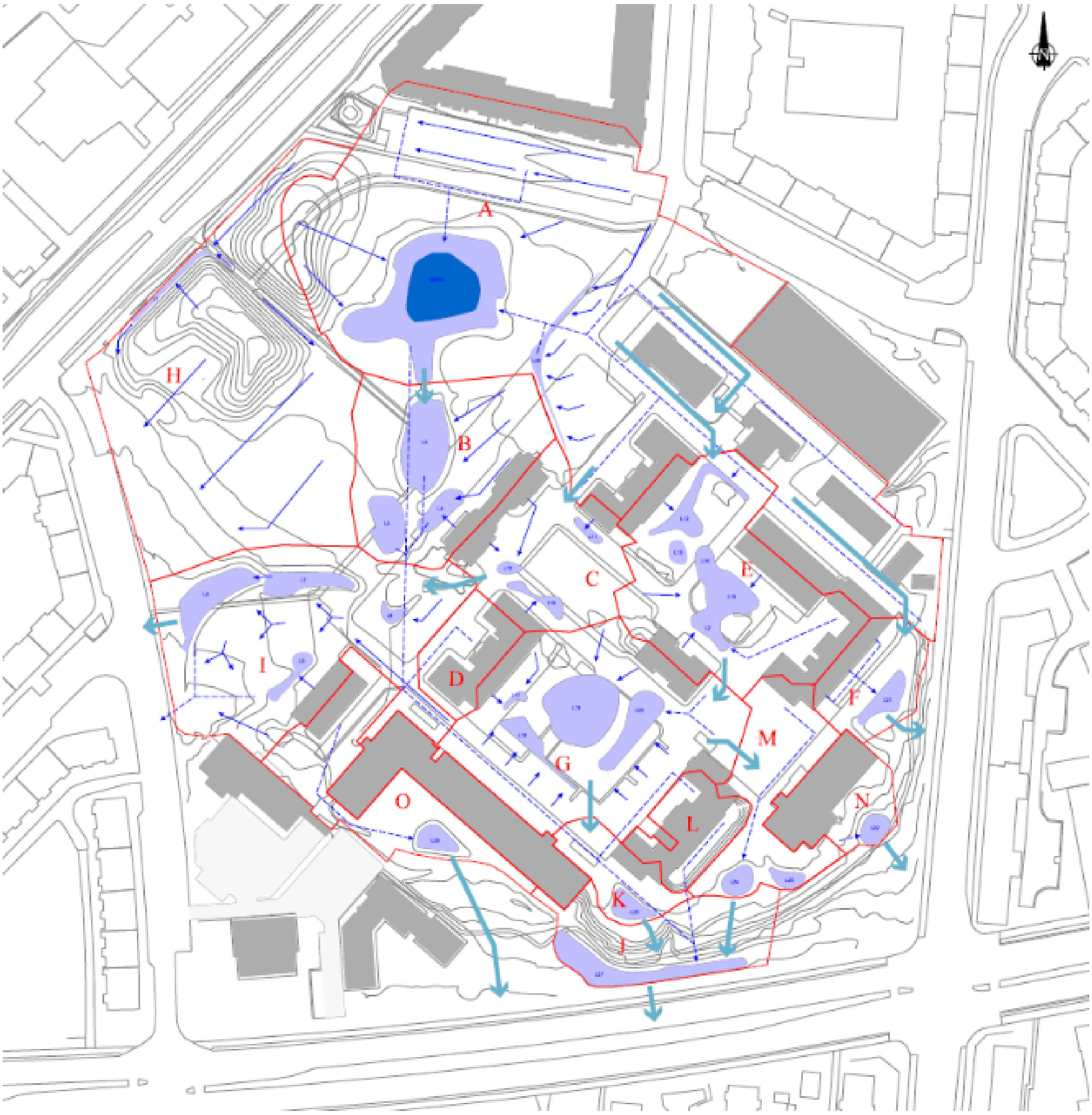

Figure 4.20. Illustration of the hydraulic surface solutions and flow paths in the SPARK-Park. The park is divided into areas A–O, marked in red. The dashed blue arrows show the pipe flows underground. The dark blue arrows show surface flow paths, and the wide light blue arrows show cloudburst flow paths, where larger amounts of water are directed across the terrain. The light blue surfaces mark the 27 constructed depressions that retain and delay rainwater on the surface, (Kristine Jensens Tegnestue et al., 2019)

Terrain and Hydraulic Structure

The SPARK-Park has been developed in collaboration with Aarhus Vand, where Aarhus Vand has helped handle climate adaptation in the park (MarselisborCenteret, 2015, p 5). According to Lausten (pers. comm.), Aarhus Vand had beforehand designated the park as a pilot project, where the park could function as a collection facility for cloudburst events in order to delay and collect downstream water for other areas. This is because the SPARK-Park is situated topographically higher in relation to the surroundings and therefore it is not an area that is exposed to flooding, as noted by Lausten (pers. comm.). As noted by Lausten (pers. comm.) the park was originally intended to function as a facility capable of managing a 100-year rain event. However, due to the geological conditions in the area, characterised by clay soil and fine sand–mixed clay soil, the intended water infiltration is limited. Consequently, the park is unable to accommodate the volume of rainwater that was initially assumed (Styrelsen for Grøn Arealomlægning og Vandmiljø, n.d.).

(a) Surface roof gutter from building and directs roof water into a depression in the SPARK-Park, own picture

(b) The lake in the SPARK-Park, own picture

Figure 4.21. Pictures of the implemented water management solutions in the SPARK-Park, own pictures

Figure 4.20 illustrates the implemented water management in the SPARK-Park. Here, both the surface flow paths, the pipe-based flow paths, the cloudburst flow paths, the depressions, and the areas with a permanent water table in the park can be seen. In addition Lausten (pers. comm.) notes that, soakaways have also been installed in various places in the park, for instance in area G, which collects the water. To understand the SPARK-Park's overall water management, the park ensures the retention of water from both the park itself and the buildings within the park, as well as water from the surrounding street, P.P. Ørumsgade, as explained by Lausten (pers. comm.). Figure 4.21 illustrates a surface solution for the handling of roof water in the park and one of the depressions in the park. During a rain event, Lausten (pers. comm.) explains that water is initially collected in the lake located in Area A at the northern end of the park. Here, water is collected from one of the hills, from P.P. Ørumsgade, as well as from roof runoff from the buildings along P.P. Ørumsgade at the western end of the park (see Figure 4.20). The roof water and the water from P.P. Ørumsgade are led to the lake through pipes, which are illustrated with dashed blue arrows in Figure 4.21. Lausten (pers. comm.) points out that the lake functions as a stormwater basin, where the water can infiltrate naturally (see Figure 4.21).

As explained by Lausten (pers. comm.), the water management system requires both depressions that can store water, as well as channels and terrain modifications that can direct the water around the park. During heavier rainfallevents, Lausten (pers. comm.) notes that when the water cannot infiltrate or evaporate in the lake (area A) or in the constructed depressions, the excess water is directed through the park and down to a large depression in area J in the southern part of the park by Marselis Boulevard (see image of the depression area J in Figure 4.22). Here, the wide light-blue arrows in Figure 4.20 illustrate the cloudburst pathways, where the water flows across surfaces through both traffic areas and the green structures in the park. Furthermore, Lausten (pers. comm.) also explains that the cloudburst pathways direct the water to the basketball court, where permeable asphalt has been installed, allowing the water to infiltrate into the ground, and further down to the large depressions by Marselis Boulevard and Jyllands Allé (see image of the permable asphalt in Figure 4.22). The depressions in the park can store different amounts of water due to their various volumes, but in total the depressions can store up to 2253 m³ of water in the SPARK-Park (Kristine Jensens Tegnestue et al., 2019). According to Lausten (pers. comm.), an addition was made after the construction was completed, in which a channel was created inside the park along Marselis Boulevard and connected to the stormwater system in area J. Lausten (pers. comm.) explained that this was due to overflow occurring in the system, and therefore the volume was not sufficient to store the stormwater, especially during the winter period when the groundwater level is higher and rainfall is more continuous.

(a) Depression in area J (see Figure 4.21), where the water ends up during heavy rainfall events

(b) Permeable asphalt on the basketball court

Figure 4.22. Pictures from the implemented water management solutions in the SPARK-Park, own pictures

4.4 Affordance Analysis of the SPARK-Park

To gain an understanding of accessibility in the SPARK-Park in Aarhus Municipality, an analysis is conducted based on the experiences of Pharao (pers. comm.), Bøgeskov (pers. comm.) and Gartmann (pers. comm.) of the park. Pharao (pers. comm.) and Bøgeskov (pers. comm.) are both electric wheelchair users, while Gartmann (pers. comm.) is blind/visually impaired. All informants have a connection to the park. Accordingly, the analysis is based on the informants' routes through and places of stay within the park. These routes and places of stay are analysed using the urban design tool derived from affordance theory, as presented in section 2.2. In order to support the experiences of Pharao (pers. comm.), Bøgeskov (pers. comm.) and Gartmann (pers. comm.) of the SPARK-Park, own observations are also included. First, the analysis of Bøgeskov (pers. comm.) and Pharao (pers. comm.) will be presented, followed by the analysis of Gartmann (pers. comm.).

4.4.1 Tours on Wheels

Tours on Wheels is an educational programme aimed at both people living with various forms of disabilities and, for example, politicians who wish to gain greater insight into accessibility solutions for wheelchair users. Børsgaard (pers. comm.) has sclerosis and uses a wheelchair. He is a volunteer at the Marselisborg Center and helps organise wheelchair tours in SPARK-Park, known as Tours on Wheels, together with Pharao (pers. comm.), who is also a wheelchair user. The Tours on Wheels route developed for Børsgaard (pers. comm.) has been created to highlight accessibility challenges for wheelchair users. The analysis takes its point of departure in Børsgaard's (pers. comm.) Tours on Wheels route, with a focus on four points of attention along the route, as illustrated in Figure 4.23. To gain a better understanding of the implemented accessibility solutions that have been made in the climate-adapted SPARK-Park, Børsgaard's (pers. comm.) Tours on Wheels route will be analysed through the urban design tool from the affordance theory in section 2.2. To support Børsgaard's (pers. comm.) Tours on Wheels route own experiences of the route in a wheelchair are added.

Along the route, Børsgaard (pers. comm.) encounters several challenges related to the park's climate adaptation solutions and overall design. These include terrain elevations and slopes, which make it difficult to control the wheelchair and require reduced speed. Likewise small level differences in pavement surfaces create a risk of losing balance and uneven pavements reduce comfort and stability. In addition, narrow paths with sharp turns make it difficult to pass other wheelchair users and challenge stable and continuous movement. These challenges form the basis for the following analysis.

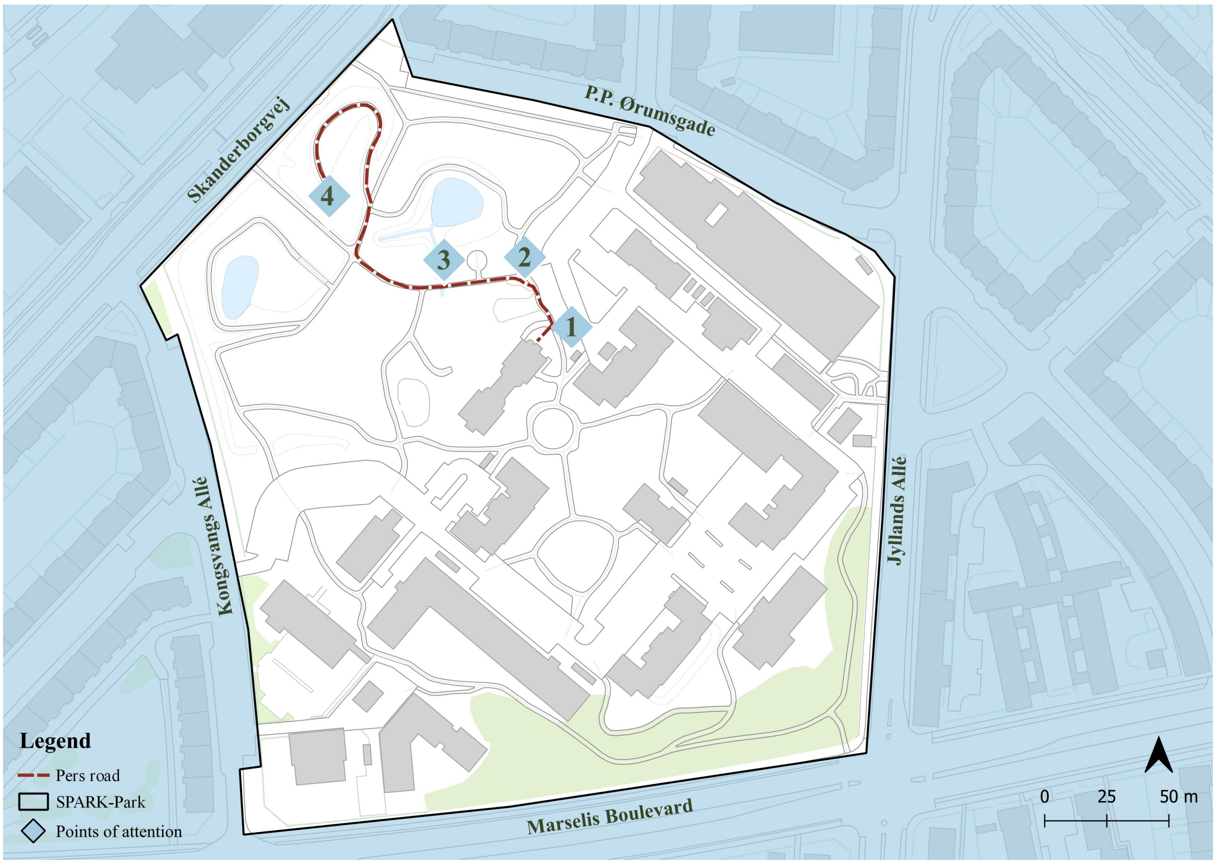

Figure 4.23. Børsgaard's Wheels on Tours street in the SPARK-Park, own illustration in QGIS

Experiencing terrain slopes at the first stop

When Børsgaard (pers. comm.) begins his Tours on Wheels route, he starts by driving to the green living room in the park (See Figure 4.23). The green living room is a meeting place where everyone is welcome for a chat or a cup of coffee. However, this is not the reason Børsgaard's (pers. comm.) route begins here; rather, it is intended to allow participants to experience the slopes in the terrain. Here, the first point of attention occurs, as illustrated in Figure 4.23, when the asphalted path transforms into a narrow incline leading up to the green living room. Although the asphalted path system gives Børsgaard (pers. comm.) a feeling of stability and control, where he can drive almost with his eyes closed without looking down at the surface, the path's firm surface also provides resistance when there is a slope on the path, which Børsgaard (pers. comm.) explains. My personal experience in a wheelchair, is that a slope in the terrain is more difficult to drive up and down when sitting in a wheelchair (own observation). Turning was particularly challenging, and it was only possible to turn the wheelchair once I reached the top of the small hill and entered the green living room (own observation). This shows how the material affordance of the slope can affect the possibility of the body in a wheelchair to follow the path as it raises upwards. Although the surface is even and stable, the incline of the narrow path alters the motor affordance, for example by limiting the possibilities for turning a wheelchair along the path.

(a) The wooden bridge on the path in the park

(b) The different types of pavement, such as cobblestones, tiles and gravel

Figure 4.24. The wooden bridge and the different types of pavements in the SPARK-Park, own pictures

Testing Pavement Types at the Second Stop

After the first stop, Børsgaard (pers. comm.) continues his route towards a corner of the asphalted path in the park. At this location the second point of attention occurs, as illustrated in Figure 4.23, as different types of pavement occurs, such as cobblestones in both round and square shapes, tiles, and gravel. Børsgaard (pers. comm.) starts by driving slowly over the first type of pavement, which consists of square shape cobblestones (see image in Figure 4.24). Here, Børsgaard (pers. comm.) notes that the square shaped cobblestones are irritating and uncomfortable to traverse when using a wheelchair. This experience shows how the material affordance limits the motor affordance, as Børsgaard (pers. comm.) reduces his speed as it becomes difficult to maintain even and controlled movement on the cobblestones. At the same time, a sensory affordance arises, where he experiences vibrations and shaking transmitted through the wheelchair when moving over the pavement. The next pavement Børsgaard (pers. comm.) drives over consists of wide tiles (see image in Figure 4.24). These tiles are not uncomfortable to drive on when you are a wheelchair user, but a point of attention, as Pharao (pers. comm.) explains, is that the tiles can easily shift since the ground beneath them is organic, and therefore height differences between the tiles can more easily occur, which can become uncomfortable to drive on. Next to the tiles, a section with gravel pavement has been made, which has also been used in several places in the SPARK-Park (own observation). Here, Børsgaard (pers. comm.) teaches how it is to drive on tiles while one wheel drives down into the gravel. This can be really difficult for many wheelchair users, and Børsgaard (pers. comm.) also mentions that the wheel can get stuck in the gravel. The difference between stable and loose pavements shows, as mentioned above, how the material affordance shapes the possibility for movement and control, where the gravel makes it more difficult to control the wheels on the wheelchair and there is a risk of getting stuck in the gravel with the wheel.

Børsgaard (pers. comm.) continues over the next type of pavement, which is a surface of round shaped cobblestones. Although the round shaped cobblestones are very beautiful, as Børsgaard (pers. comm.) mentions while he drives over them, they are very difficult to drive on. Here, Børsgaard (pers. comm.) mentions that this type of pavement is not a pavement for wheelchair users. The cobblestones are very uneven, and my own experience is that it can be clearly felt in a wheelchair when driving over them (own observation). This again describes a sensory interaction between body and material, where the cobblestones afford unpleasant vibrations and shaking when Børsgaard (pers. comm.) drives over them in his wheelchair. Here, a conflict also arises between the aesthetic and the functional in relation to the pavement types, where Børsgaard (pers. comm.) himself mentions that the cobblestones are really beautiful but not very good to drive over when sitting in a wheelchair.

Crossing the Cloudburst Channel at the Third Stop

A short distance from the different pavement types, a small wooden bridge is located along the park path, allowing water to flow beneath it towards the lake (see image in Figure 4.24). This marks the next stop on Børsgaard's (pers. comm.) route, illustrated by attention point 3 in Figure 4.23, where he approaches the bridge and stops in front of it. Here, he notes that it is important to cross the bridge perpendicularly, as the small edge formed between the asphalted path surface and the wooden bridge may cause a loss of balance and, in the worst case, tipping. It therefore does not take more than a small difference in level for a wheelchair user to lose balance, as noted by Børsgaard (pers. comm.). Here, the material affordance also becomes a challenge, as a small difference in level arises where a shift in the surface occurs. This difference in level creates a small edge that affects both the motor and the atmosphere for Børsgaard (pers. comm.), as he motorically has to drive perpendicularly across the edge to avoid losing balance, and the atmosphere makes the edge create a feeling of uncertainty, because Børsgaard (pers. comm.) risks tipping over in his chair if he either does not notice the edge or does not drive perpendicularly across it.

Experiencing Hill Paths at the Fourth Stop

To experience what it is like to drive up a steeper and more narrow slope, Børsgaard (pers. comm.) drives towards one of the large hills in the park. The next stop on his Tours on Wheels route occurs here, as illustrated by attention point 4, where an asphalted path leads up the hill in Figure 4.23 (see image in Figure 4.19). As explained by Johansen (pers. comm.), the path is intended so that wheelchair users like Børsgaard (pers. comm.) have the possibility to move around the entire park, also at the top of the hills, where one has a view and overview of the park. Børsgaard (pers. comm.) explains while ascending the path, that the limited width makes it difficult for wheelchair users to pass each other, despite the relatively modest incline. On the other hand, Børsgaard (pers. comm.) still thinks that it is easy to drive on the surface, as it is asphalted and therefore smooth and firm to drive on. The path up the hill has some sharp curves, and therefore one must be good at steering the wheelchair when driving both up and down the hill, as mentioned by Børsgaard (pers. comm.). Although Børsgaard (pers. comm.) says that it is not unsafe for him to drive on the hill, he is still aware of not accidentally driving into the grass next to the path. Børsgaard (pers. comm.) mentions that if a wheelchair happens to move onto the grass, a wheel may sink into the surface or, in the worst case, cause the wheelchair to tip over, which is not a pleasant experience. On the way down the hill, Børsgaard (pers. comm.) has to concentrate more, as he now has to both steer his wheelchair and brake at the same time to avoid losing control of the wheelchair on the way down. This is a challenge for both Børsgaard (pers. comm.) and other wheelchair users when driving down slopes, as one has to brake constantly. The path up the steeper slope in the park offers a smooth and stable surface to drive on for Børsgaard (pers. comm.) and makes it possible for him to drive all the way to the top of the hill. Although the surface has a positive material affordance, the slope and narrow shape of the path create a physical challenge where the motor affordance changes, as Børsgaard (pers. comm.) must adjust both speed and focus to maintain control and balance. This also means that an atmosphere arises, as the atmosphere is characterised by attention and caution, as Børsgaard (pers. comm.) does not want to risk getting his wheels into the grass next to the asphalted path.

Table 4.3 summarises Børsgaards (pers. comm.) affordance experiences along the route in the SPARK-Park, providing an overview of how the park's design enables and constrains her use of the space.

Affordance type	**Summary of experiences**
Material affordance	Firm and smooth pavements (such as asphalt) support a stable wheelchair movement Slopes, uneven pavements (cobblestones), narrow paths, sharp curves, and small level differences create challenging physical conditions that reduce accessibility along the route
Motor affordance	Smooth and wide paths support stable control and continuous movement, while narrow paths restrict passing other wheelchair users Slopes limit speed and control Uneven pavements limit the movement Small level differences can lead to loss of balance and require careful movements
Sensory affordance	Uneven surfaces and level differences are sensed through vibrations and tactile feedback channelled via the wheelchair Smooth surfaces provide a sense of stability, while slopes and sharp curves increase attention
Cultural affordance	The wide paths and even pavements without significant slopes signal ease of use and support independent mobility for wheelchair users

Table 4.3. Summary of Børsgaard's (pers. comm.) affordance in the SPARK-Park, own illustration

4.4.2 Recreational Spaces in the SPARK-Park

Pharao (pers. comm.) has muscular dystrophy and uses a wheelchair. She uses the SPARK-Park both professionally and privately, and her personal experiences of the park provide insight into how affordances create possibilities for action for people who use a wheelchair. To support Pharao's (pers. comm.) experience of the SPARK-Park, own observations and experiences of the two seating areas illustrated in Figure 4.25 . The analysis is therefore based on these two specific seating areas as empirical points of departure.

Pharao (pers. comm.) as a wheelchair user, experiences a number of recurring challenges in SPARK-Park related to the park's climate adaptation solutions and overall design. Unstable and soft surfaces, such as grass, increase the risk that Pharao (pers. comm.) may get stuck or slip with her wheelchair. In addition, long stretches that use surface materials such as gravel are challenging, as they are experienced as physically demanding to move across. Another challenge that Pharao (pers. comm.) expresses is the lack of lighting in the park, which can cause her to lose an overview of her surroundings and make it more difficult for her to orient herself. Due to Pharao's (pers. comm.) illness, both noise and weather conditions also constitute a disadvantage. As she speaks quietly, high noise levels can make it difficult for her to engage in conversations, and at the same time she becomes cold quickly, which limits her use of the park during periods of wind and lower temperatures. These challenges form the basis for the following analysis.

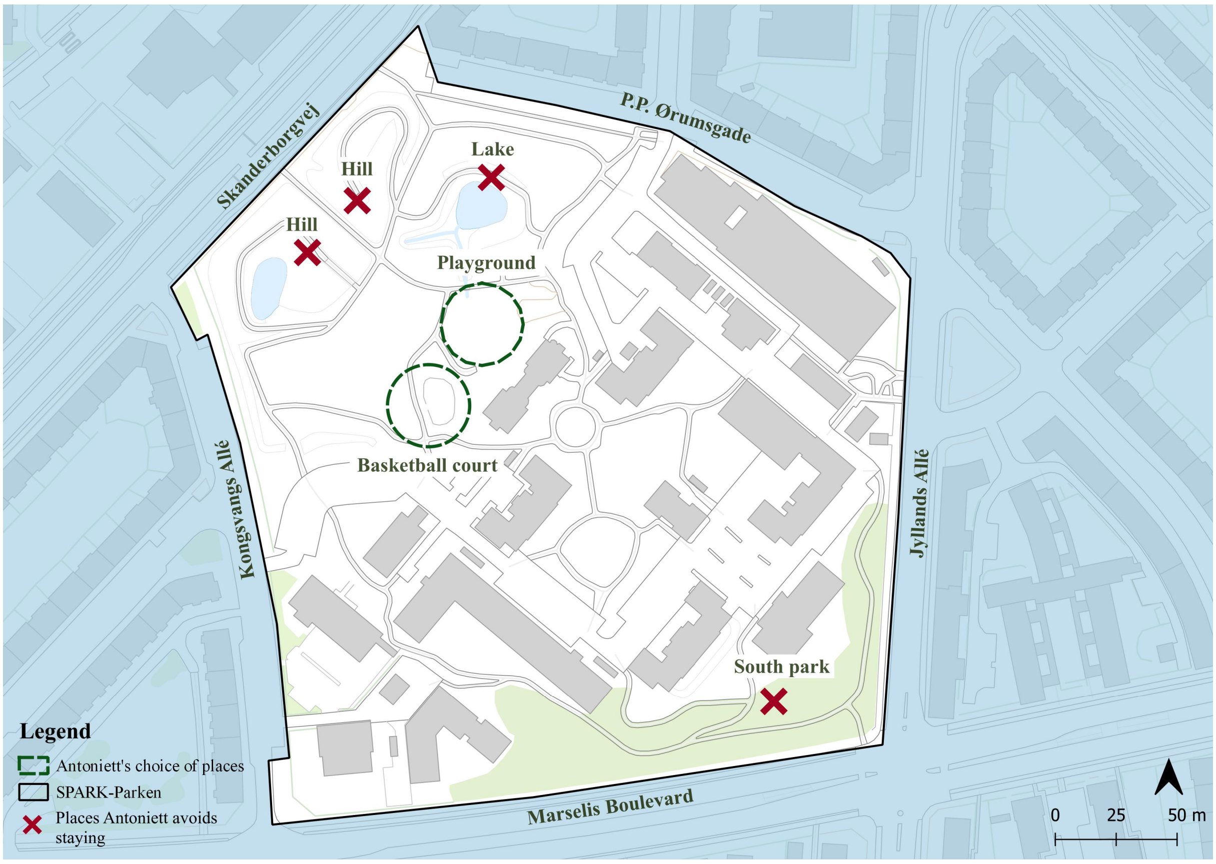

Figure 4.25. Pharao (pers. comm.) choice of spaces in the SPARK-Park, own illustration in QGIS

The Choice of Seating areas in the SPARK-Park

When Pharao (pers. comm.) visits the SPARK-Park privately, she particularly seeks out two places, which are the playground and the basketball court, as shown in Figure 4.25. Both spaces offer physical, social, and multisensory affordances that make the seating areas accessible and safe for Pharao (pers. comm.). Her choice of places depends to a great extent on the multisensory impressions in the park, especially regarding the weather, light, and noise level. Pharao (pers. comm.) explains that she quickly becomes cold because of her illness and therefore prefers to use the park when it is warm and calm. The weather therefore creates both a physical and atmospheric condition for where and when she uses the SPARK-Park. Therefore, Pharao (pers. comm.) mentions that she avoids the hills in the park, where there is more wind and thus cooler temperatures, and seeks out the more sheltered areas in the park, such as the basketball court and the playground, where terrain and planting create shelter and a calm atmosphere. Pharao (pers. comm.) also mentions that lighting affects her sense of safety. In low-light conditions, the park's surfaces are difficult to distinguish, causing her to rapidly lose sense of overview. Thus, the lack of light limits her affordance ability to read the surroundings and feel safe in the park. At the same time, sound also means a lot for Pharao's (pers. comm.) experience of the park. The traffic noise makes her avoid staying in certain places in the park, such as the southern part of the park along Marselis Boulevard (see Figure 4.25). In contrast, she experiences the central seating areas, the basketball court, and the playground located in the northern part of the park as calm spaces that provide opportunities for conversation (see Figure 4.25). This means that the seating area creates an affordance for togetherness and social interaction, which Pharao's (pers. comm.) describes.

(a) The basketball court in the SPARK-Park ***(b)*** The playground in the SPARK-Park

Figure 4.26. The two recreational areas in the SPARK-Park, which also function as seating areas, own pictures

The Basketball Court as an Accessible Seating Area

When Pharao (pers. comm.) uses the SPARK-Park in a private context, she often seeks out the seating area at the basketball court, which is illustrated as, Antonietts choices of places, in Figure 4.25. Pharao (pers. comm.) is unable to play basketball herself due to her disability, she nevertheless chooses the area as one of her favourite spots in the park. She therefore transforms the cultural affordance of the seating area, as the basketball court is designed as a place for physical activity. For Pharao (pers. comm.), the seating area becomes a space for social affordance, where there is a meeting place for social interaction with her friends and their children, which the image illustrate in Figure 4.26.

The basketball court is located in the central part of the SPARK-Park, surrounded by low hills, vegetation, and wooden beams at different levels (see image in Figure 4.26) . The terrain around the court forms a natural spatial frame, where the different terrain elevations, vegetation, and materials create a calm and sheltered space that gives a feeling of being protected from the traffic on the streets, but also from the cyclists who ride through the park (own observation). Although the area is sheltered, it still feels bright and open. The low terrain elevations provide a good view over the park, giving a sense of what is happening in the other seating areas, yet still being separated from them (own observation).

The constant noise from the traffic on the surrounding streets is muted, and this creates an atmospher, where the basketball court invites conversation and presence (own observation). Pharao (pers. comm.) explains that she prefers precisely this seating area because the noise from the traffic is low enough that she can have a conversation with her friends, even though she speaks quietly. In this way, the sound becomes part of the accessibility, as the noise level enables social interaction for Pharao (pers. comm.).

The basketball court itself is oval-shaped with a basketball hoop at one end of the court (own observation). The court is covered with asphalt with small holes, where green vegetation grows up through the holes, which makes it possible for the water to seep down through the surface, as noted by Lausten (pers. comm.) (see image in Figure 4.22). The asphalt material feels even, and Pharao (pers. comm.) describes how she can feel the difference between this surface and the asphalted path systems in the park. She describes that when she drives her wheelchair on the court, she can feel vibrations from the wheels on her wheelchair, but the asphalt on the basketball court is stable and without slope and curbs. This means that the seating area becomes safe for Pharao (pers. comm.) , as she can move freely. The seating area therefore enables a motor affordance that makes it possible for Pharao (pers. comm.) to move around the space with control and safety.

Along the edge of the basketball court are large rectangular wooden beams stacked at varying levels (own observation) (see image in Figure 4.26). For Pharao (pers. comm.), the wooden beams are an important part of the seating area, as she explains that her friends can talk to her at eye level by sitting on the highest beams. In this way, the physical difference is leveled out, and this can be seen as a social affordance, where the design enables relationships and togetherness across physical conditions. Pharao (pers. comm.) also mentions that the basketball court offers both social and sensory affordances, as she can be part of her friends' children's play by being present on the court and observing them while they play basketball, without being in the way of other users, thereby creating a cultural affordance for social acceptance and inclusion.

The Playground as an Accessible Seating Area

When Pharao (pers. comm.) spend time with friends who have children, the playground in the SPARK-Park functions as her primary seating area . From here, she can stay close to the children and watch them play, as illustrated by Antoniett's choice of places in Figure 4.25. The playground is designed as a seating area, where it is both a place for play and activity for children, but at the same time also functions as a rehabilitation training tool, as noted by Ramskov (pers. comm.). For Pharao (pers. comm.), the playground takes on a different meaning. She shows how the space can afford social presence and observation rather than physical play and activity. Although Pharao (pers. comm.) cannot use the play equipment herself, as she is in a wheelchair, she experiences the playground as accessible and inclusive. Here, she has the opportunity to participate and be part of a social interaction with both her friends and their children without being actively involved.

The playground itself is located in the middle of the SPARK-Park next to the basketball court and surrounded by green areas and differences in terrain (own observation) (see Figure 4.25). The playground consists of an abstract play structure made of wooden beams and metal, assembled in various ways, creating a sculpture that invites the users' own imagination (see image in Figure 4.26). In the playground, there are also five wooden poles placed close to each other away from the play structure (own observation).

The area is open but partially sheltered, as the playground is lowered into a flat green terrain where there is a low hill with vegetation around the seating area (own observation). This creates an experience of a framed space where it feels safe to be. Although there are terrain slopes down to the playground, a gravel path has been made that leads around the sloping terrain (own observation). This physical design of the place creates a motor affordance that allows Pharao (pers. comm.) to drive all the way down to the playground, where she explains that she can drive down the short gravel path and onto the grass and over to the play equipment where her friends' children play.

The use of the playground, however, depends on certain sensory affordances that vary with the weather. When the surfaces become wet, Pharao (pers. comm.) completely avoids driving on them because the gravel path and the grass become too soft, and she risks getting stuck with the wheelchair. Here, it can be seen that the material affordance has great significance for Pharao (pers. comm.), as rain not only makes it uncomfortable for her but can also be dangerous to drive on, as the surfaces change. Therefore, Pharao (pers. comm.) primarily stays in the seating area during the summer period when the weather is often better.

In the northeastern part of the SPARK-Park, another gravel path runs around a pound (see location of the pound in Figure 4.18). Pharao (pers. comm.) completely avoids driving on this gravel path, even when the weather is good and the surface is dry. The length and uneven structure of the gravel path make it uncomfortable to drive on because small slopes quickly form that are not visible to the naked eye but can be felt when sitting in a wheelchair, as Pharao (pers. comm.) mentions. When driving on a wet gravel surface, the wheels can easily start to slide or get stuck in the gravel, as Børsgaard (pers. comm.) also illustrated in his Tours on Wheels. Through my own experience in a wheelchair, I observed that the wheels of the wheelchair can sink into the gravel, and therefore one has to use more strength to get through the surface, which is not a pleasant experience (own observation). Pharao (pers. comm.) also mentions that the traffic noise in this seating area is not very loud, and it is more pleasant and calm to stay in this part of the park, hereby creating a cultural affordance for staying and togetherness. This again shows that the sensory affordance has great significance for Pharao's (pers. comm.) use of the space.

Table 4.4 summarises Pharoe's (pers. comm.) affordance experiences in the two seating areas in the Spark-Park, providing an overview of how the park's design enables and constrains her use of the space.

Affordance type	**Summary of experiences**
Material affordance	Soft surfaces (such as grass) create a risk of getting stuck with the wheelchair
Motor affordance	Short paths with pavements that are not firm (like gravel pavement) access to spaces easier Areas with low slopes and no curbs support easy movements and safety Long paths with uneven or unstable pavements are challenging the movements
Sensory affordance	Lack of lighting causes a loss of overview and makes it difficult to read the surroundings Uneven pavements (like the permeable asphalt) create noticeable vibrations in the wheelchair Due to Pharao's (pers. comm.) illness, high noise levels result in her having limited opportunities to participate in conversations Due to Pharao's (pers. comm.) illness, weather conditions such as low temperatures and wind cause her to become cold quickly and therefore avoids staying in areas where these conditions exist
Cultural affordance	The scale of the spaces supports social acceptance and enables presence for wheelchair users

Table 4.4. Summary of Pharao (pers. comm.) affordance in the SPARK-Park, own illustration

4.4.3 The Route to Work through the Park

Gartmann (pers. comm.) is practical blind/visually imparied, which means that he has a visual acuity of 0.25/60 and has very limited vision [1]. Under certain conditions, he is only able to perceive shadows and a few highly contrasting colours. Gartmann (pers. comm.) uses SPARK-Park exclusively for professional purposes in connection with his voluntary work at Specialrådgivning Aarhus. As part of this role, he follows a specific route through the park once every quarter, travelling from Skanderborgvej to the Specialrådgivning Aarhus building at the Marselisborg Center (see Figure 4.27). In this analysis, Gartmann's (pers. comm.) route will be described and analysed based on the urban design tool from Affordance Theory (see chapter 2, section 2.2). The analysis takes its point of departure in Gartmann's (pers. comm.) route from Figure 4.27 as well as the three points of attention along the route. To support Gartmann's (pers. comm.) experience of the SPARK-Park, own observations and experiences of the route are included. Gartmann (pers. comm.) experiences, as a blind/visually impaired person, a number of recurring challenges in the SPARK-Park that relate to the park's climate adaptation solutions and overall design. A central challenge occurs where the guiding line in the park is interrupted, requiring Gartmann (pers. comm.) to rely on multiple senses to navigate and orient himself, which affects both his navigation and walking speed. In addition, Gartmann (pers. comm.) experiences a particular challenge with the winding and organically shaped paths, which create confusion and make it difficult to maintain a clear sense of direction. Another challenge is the lack of edges or tactile warning surfaces at the transition to a new area, such as the parking area, as the change in space and function is not clearly signaled. These challenges form the basis for the following analysis.

[1] A person with normal vision has a visual acuity defined as 6/6. A visual acuity of 0.25/60 means that Gartmann (pers. comm.) can see at a distance of 0.25 metres what a person with normal vision can see at a distance of 60 metres (Instituttet for blinde og svagtseende, n.d.)

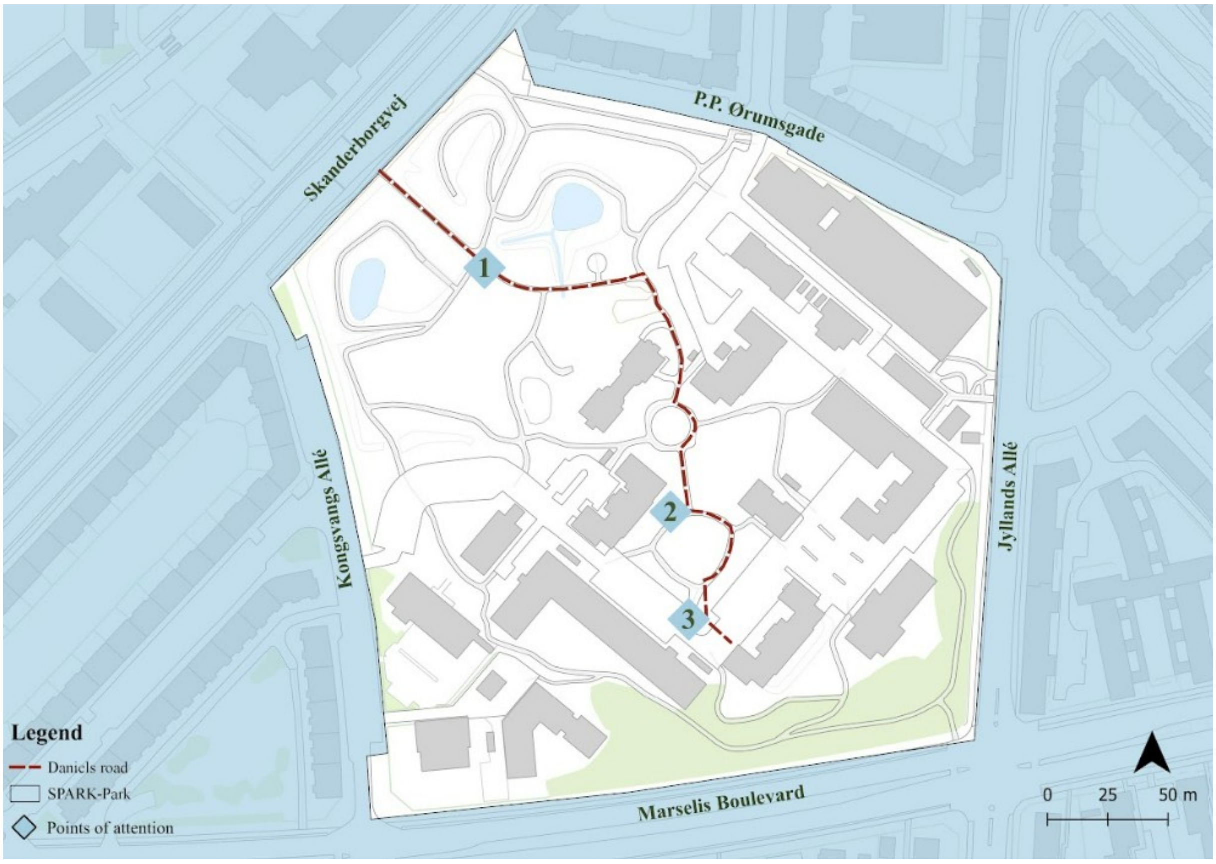

Figure 4.27. Gartmann's(pers. comm.) route through the SPARK-Park, own illustration i QGIS

Access and Entrance to the SPARK-Park

Garmann's (pers. comm.) route through SPARK-Park to his voluntary work begins when he alights from the bus on Skanderborgvej and crosses a signalised intersection to reach the park entrance on Skanderborgvej, as illustrated in Figure 4.27. The first thing Gartmann (pers. comm.) encounters at the entrance to the park is a tactile attention field and a newly established guidance line for blind/visually impaired people, an element that did not exist the last time Gartmann (pers. comm.) walked through the park (see Figure 4.28). Gartmann (pers. comm.) explains that the attention field indicates that something new is about to happen which requires attention. In this case, the new element is that he is entering the SPARK-Park.

When Gartmann (pers. comm.) follows the guidance line, he explains how he uses both his visual and tactile senses to orient himself. Although Gartmann (pers. comm.) is practically blind, he can, as mentioned above, still perceive certain strong colours and colour contrasts. The guidance line is white and laid on the asphalt surface, creating a strong colour contrast with the black path, which allows Gartmann (pers. comm.) to glimpse the white line while following it. At the same time, Gartmann (pers. comm.) uses his sense of touch to feel the guidance line with his feet. The time of the day will therefore affect Gartmann's (pers. comm.) navigation, as he would not be able to glimpse the guidance line in dark conditions. The guidance line on path allows Gartmann (pers. comm.) to walk at a steady pace, but this pace does not continue for long, as the guidance line stops and turns right down a path in the park (see image in Figure 4.28). This constitutes the first point of attention on the route, as illustrated in Figure 4.27. This illustrates how sensory and motor affordances are expressed, as the guidance lines in the park provide Gartmann (pers. comm.) with tactile and visual information that supports his navigation and guides his movement through the park, enabling him to move more quickly and safely. At the same time, a cultural affordance can also be observed, as the attention field and the guidance lines signal particular attention and accessibility for blind/visually impaired people.

Gartmann's (pers. comm.) route, which he has learned by heart, does not align with the guidance line; therefore, he reduces his speed and continues straight ahead along the asphalted path. The asphalted path is firm and smooth pavement, which is preferred when using a white cane, as uneven surfaces, such as raised paving stones, may cause the cane to become stuck, noted by Gartmann (pers. comm.) . This illustrates how the pavement has great importance for the motor affordance, as the even and firm surface of the path enables unobstructed and stable movement, while uneven pavements restrict Gartmann's (pers. comm.) movement.
On the asphalted path, Gartmann (pers. comm.) begins actively using his white cane to sense the surfaces in the park. The shift between asphalt and grass creates a natural guidance line, which he can detect through the cane when he taps it against the surfaces. This contrast between the soft grass surface and the hard asphalt surface is crucial for Gartmann's (pers. comm.) ability to orient himself. Gartmann (pers. comm.) explains that it would be difficult for him to feel and hear the difference if the surfaces had more similar firmness, such as loose gravel and grass, or concrete and asphalt.
Gartmann (pers. comm.) uses his sense of hearing by listening to the sounds produced when the cane hits the two different surfaces. By using these senses, Gartmann (pers. comm.) is able to determine his location in the park, as he can both feel and hear that he is on the asphalted path. This clearly shows how sensory and material affordances are interconnected. The material affordances found in the physical characteristics of the pavement create a natural guidance line, which Gartmann (pers. comm.) can sense and hear through his cane, illustrating the sensory affordances.

Crossing the Wooden Bridge

Gartmann (pers. comm.) continues along the path in the park by tapping his cane alternately between the asphalt and grass surfaces and stops when there is a change in the surface. A small wooden bridge assures him he is on the right track (see image of wooden bridge in Figure 4.24). The wooden bridge has been established to connect the path system, as a depression has been constructed in the park as part of the climate adaptation. This illustrates how sensory and motor affordances come into play once again. Fixed elements in the park are important for Gartmann (pers. comm.) , as they enable him to determine his location and orient himself within the park. The wooden bridge is a fixed element, and therefore it is one of Gartmann's (pers. comm.) landmarks, just as he also navigates by the traffic noise from the main streets around the park, which constitutes a constant auditory reference.
Upon reaching the wooden bridge, Gartmann (pers. comm.) uses his senses to confirm that he has arrived at the bridge. First, he taps his cane on the bridge to hear the sound of the surface; then, as he walks across it, he perceives the grooves between the planks. This demonstrates how material affordances play a significant role in Gartmann's (pers. comm.) movement, supporting both orientation and navigation within the park.

The Sensory Garden

One of the most challenging areas in the park occurs when Gartmann (pers. comm.) reaches the sensory garden, which constitutes the second point of attention, as illustrated in Figure 4.27

(see Figure 4.18). The sensory garden is located in the northern part of the park, where the red brick buildings surround the seating area. The sensory garden is designed as a circle, where the asphalted path system winds in a spiral shape towards the centre of the circle. In the middle of the circle, a circular seating area has been created with parasols, tables, and benches (own observation). The seating area is recessed, as it functions as a depression that can collect water as part of the climate adaptation in the park (Kristine Jensens Tegnestue et al., 2019). The recessed circular design also makes the seating area more sheltered, as there is a wide variety of vegetation that frames the space down in the middle of the circle (own observation).
Figure 4.28, illustrates the circular sensory garden, which contains several different path connections, making it difficult for Gartmann (pers. comm.) to to determine his location. For Gartmann, (pers. comm.) straight lines are significantly easier to navigate and orient himself in, s they provide a clearer overview of the space and make it easier to count the paths or routes he needs to follow. Therefore, this part of the route creates confusion for Gartmann (pers. comm.) . Here, it is clear that the material affordance has a negative effect on Gartmann's (pers. comm.) direction and orientation in the park, as the seating area is circular.
Gartmann (pers. comm.) is only able to find his way out of the sensory garden because the path material contrasts strongly with the surrounding grass and vegetation, which in turn functions as a natural guidance line for him. Additionally, a motor affordance is evident, as the spaceonly allows (pers. comm.) to follow the grass edge around the area. The physical design of the sensory garden therefore creates an atmosphere of confusion and uncertainty for Gartmann (pers. comm.), as the place does not support the action possibilities that he normally relies on to orient himself.

(a) The winding paths in the sensory garden and the contrast between the surfaces on the path and the surfaces surrounding the path

(b) Guidance line and attention field on the path in the park

Figure 4.28. Pictures of attention points from Gartmann's (pers. comm.) experience in the SPARK-Park, own pictures

Conditions Affecting Orientation in the Park

For Gartmann (pers. comm.), terrain slopes do not constitute a barrier for him in terms of navigating and orienting himself in the park, but as mentioned earlier, the pavements are of great importance, as Gartmann (pers. comm.) can orient himself using both tactile and auditory information. The weather can therefore have a major impact on Gartmann (pers. comm.) when he needs to orient himself by the sounds of the surfaces, as rain can create noise on the pavements and thus make it more difficult for him to orient himself. In this situation, it becomes clear how the sensory and motor affordance both enable and limit Gartmann's (pers. comm.) orientation and navigation in the park. For example, the climate-adapted terrain slopes do not create a barrier for Gartmann's (pers. comm.) physical movement possibilities, but sounds from the surroundings, such as rain, limit his ability to orient himself in the park.

Transition from Path to Parking Area

When Gartmann (pers. comm.) walks down the path from the sensory garden, he encounters another significant challenge, as the path continues directly onto a car park with parked vehicles. This location constitutes the third point of attention, as illustrated in Figure 4.27. There is no clear marking or curb indicating to Gartmann (pers. comm.) that he needs to be aware that he is walking into an area with traffic and cars. Gartmann (pers. comm.) therefore begins tapping his white cane against the asphalt surface and listens to the change in sound, which becomes more muted. This auditory cue indicates that he is approaching the Specialrådgivning Aarhus building at the Marselisborg Centre, which marks the endpoint of his route.

Once again, the sensory and motor affordances come into play. The motor affordance appears through the lack of markings or curbstones, which constrains safe movement, while the sensory affordance is expressed through changes in surface sound. Table 4.5 summarises Gartmann's (pers. comm.) affordance experiences along the route in the SPARK-Park, providing an overview of how the park's design enables and constrains her use of the space.

Affordance type	**Summary of experiences**
Material affordance	Strong contrast between surfaces types Firm and even surfaces Fixed elements in the park (such as the wooden bridge) are used for navigation
Motor affordance	Curved and circular parths limit clear direction Lack of curbs/markings at the parking area limits safe movements
Sensory affordance	Strong color contrast between the guidance line and the asphalt Contrast between grass and asphalt created a natural guidance line Sounds from surfaces used for orientation Weather like rain affects the soundscape and makes orientation more difficult
Cultural affordance	Attention field and guidance line signal special accessibility

Table 4.5. Summary of Gartmann's (pers.comm.) affordances in the SPARK-Park

4.5 Learning from the two Cases

To examine the similarities and differences between the two cases, J.O. Krags Park and SPARK-Park, a comparative analysis is conducted in this section. This analysis will highlight both similarities and differences between the two cases and emphasises the specific learnings that emerge regarding planning processes, the differing needs of wheelchair users and blind/visually impaired individuals, and the considerations required when integrating climate adaptation with accessibility.

Learning in relation to Processes

In the two climate adaptation parks, J.O. Krags Park and the SPARK-Park, both similarities and differences can be observed in their planning processes. A clear difference emerges already in the early stages of each project's origin and driving forces, as accessibility for people with disabilities has been considered and prioritised in different ways. J.O. Krags Park in Frederiksberg was initially conceived as a technical climate-adaptation project, where hydraulic objectives were the primary driving force in the process, as Muus (pers. comm.) explains. SPARK-Park, by contrast, developed in the opposite manner, as it originated as a rehabilitation and accessibility project, with climate adaptation incorporated only later in the process, as described by Johansen (pers. comm.) described. This means that in the planning of the SPARK project, a foundational design premise was that accessibility for, among others, people with disabilities had to be integrated into the project from the very beginning.
As a result, extensive early stakeholder involvement was carried out, where around 500 people were included in the process. According to Johansen (pers. comm.), this included users of the Marselisborg Centre as well as various organisations such as the Muscular Dystrophy Foundation and the Danish Association of the Blind.

In addition, the two climate adaptation projects were developed under different physical conditions. J.O. Krags Park is a smaller park with multiple functions and specific volumetric requirements, as noted by Muus (pers. comm.) . Muus (pers. comm.) also explains that this made the design and accessibility of the park more complicated. In comparison, the SPARK-Park had a larger area and more space to combine climate adaptation with accessibility.

Although J.O. Krags Park did not have accessibility as a design premise to the same extent as SPARK-Park, accessibility was nevertheless considered. The accessibility in J.O. Krags Park was incorporated without formal procedures or experts, as it depended on the Municipality and their advisers' knowledge of accessibility, including the needs of people with disabilities. Public involvement was carried out in the local area, and specifically wheelchair access was integrated into two of the park's functional spaces, namely the playground and the dog enclosure. However, during the planning phase, there was no dialogue with wheelchair users or the Disability Council in Frederiksberg Municipality, as Tapp (pers. comm.), the chair of the *Disability Council,* points out. Although the Disability Council is legally established and serves as an advisory body across all administrative areas in Frederiksberg Municipality, the Municipality has not been sufficiently successful in incorporating accessibility when working specifically with climate adaptation initiatives, as noted by Tapp (pers. comm.) (Frederiksberg Kommune, 2024*b*). The Disability Council should be consulted in all administrative areas regardless of project size, but the council is often overlooked and not involved in planning, which is something that also occurred in J.O. Krags Park, according to Tapp (pers. comm.). Although wheelchair users were taken into account, blind/visually impaired people were not included in the planning of the park. Muus (pers. comm.) explains that they only had experience with wheelchair users, but lacked experience with blind blind/visually impaired individuals, which they could draw on in the planning of J.O. Krags Park.

In addition to the integration of accessibility in the planning process, differences can also be seen between the projects at an overall level in terms of organisation, division of roles, and collaboration. J.O. Krags Park is a traditional municipal project, where the Municipality has a fixed framework agreement with consultants and contractors, as Muus (pers. comm.) explains. Here, the same consultants and contractors are associated with the Municipality for a number of years, according to Muus (pers. comm.). Niels Lützen was among the architectural firms with which Frederiksberg Municipality had an agreement and which won the tender.
In contrast to J.O. Krags Park, the area manager from the Marselisborg Center, Johansen (pers. comm.), explained that he initiated the SPARK project by establishing a dedicated project organisation. According to tool SCALGO LIVE (as shown in the cadastral map), the SPARK project is located on both municipal and regional land. The project group, therefore, consisted of Aarhus Municipality and Aarhus utility, Region Midtjylland, as well as two representatives from the Marselisborg Centre, as Johansen (pers. comm.) notes. The project organisation itself selected five architectural firms to participate in the competition for the design and transformation of the SPARK-Park, with the Kristine Jensen Studio winning the competition (Region Midtjylland et al., 2016, pp 1-6). Additionally, the SPARK project received financial support from both Realdania and the A.P. Møller Foundation (Realdania, 2017*b*). This also differs from the climate adaptation project in J.O. Krags Park, where the budget was limited, which influenced the park's development, as Muus (pers. comm.) explains.

The SPARK-Park had an early focus on accessibility, a systematic involvement of both disability organisations and people living with disabilities, as well as financial advantages. This has brought the project closer to meeting the needs of both wheelchair users and blind/visually impaired individuals in the planning process. In contrast, in J.O. Krags Park, accessibility was to a greater extent tied to the municipality's own knowledge and financial framework.

Learning in relation to the Challenges faced by Wheelchair Users and Blind/Visually Impaired

Based on the analyses 4.2 and 4.4, it becomes clear that there are general challenges experienced by the wheelchair users Pedersen, Børsgaard, and Pharao (pers. comm.), as well as the blind/visually impaired individuals Monggaard (pers. comm.) and Gartmann (pers. comm.), in both the SPARK-Park and J.O. Krags Park. Across the two selected groups, the analyses identify a set of shared needs among both wheelchair users and blind/visually impaired individuals that should be incorporated into the planning of climate adaptation parks.

A general need observed for both wheelchair users and blind/visually impaired individuals concerns the condition and firmness of the surfaces. Weather conditions can alter the condition of surfaces and paths. When this happens, it negatively affects the navigation and orientation of both wheelchair users and blind/visually impaired people. For the wheelchair users Pedersen (pers. comm.), Børsgaard (pers. comm.) and Pharao (pers. comm.), weather conditions such as rain and snow can make their physical propulsion on surfaces and paths more difficult when moving through the parks. For Monggaard (pers. comm.) and Gartmann (pers. comm.), who are blind/visually impaired, navigation in the parks becomes more challenging because weather conditions like rain and snow can affect their orientation. Monggaard (pers. comm.) and Gartmann (pers. comm.) find it harder to distinguish between different surfaces, as the textures and sounds may become more similar. In addition, rain can create high pitched sounds when hitting hard surfaces, which can make navigation more difficult since sound is an important part of their orientation strategies. This means that Monggaard (pers. comm.) and Gartmann (pers. comm.) experience sensory disturbances if the surfaces change their condition, and this can affect their motor movements within the parks.

Another need observed for both wheelchair users and blind/visually impaired individuals is a predictable design in the SPARK-Park and J.O. Krags Park. Predictable layouts in the parks create opportunities for stable movement and orientation. For Monggaard (pers. comm.) and Gartmann (pers. comm.), linear path layouts provide a sensory cue that enables easier orientation and makes it motorically possible to move more safely through the parks. For Pedersen (pers. comm.), Børsgaard (pers. comm.), and Pharao (pers. comm.), predictability is more strongly based on visual information, such as terrain changes or surface differences, which allows them to adjust their movements and navigate more safely in the parks.

Analyses 4.2 and 4.4 also show that there are different challenges and needs for both wheelchair users and blind/visually impaired individuals. This means that in the future planning of climate-adaptation parks, it is crucial to be aware that different types of disabilities exist. Therefore, one cannot involve only a single type of disability, as it is important to understand that different groups have different needs.

For the wheelchair users Pedersen (pers. comm.), Børsgaard (pers. comm.), and Pharao (pers. comm.), various affordance-related challenges are experienced in the climate adaptation parks. The firmness of surfaces is one of the key challenges, as wheelchair users struggle with uneven surfaces such as holes in the terrain or loose materials like gravel and soft grass. Such surfaces can cause wheelchair users to become stuck or slip. Therefore, firm and even surfaces, such as asphalt, are an essential need for wheelchair users. In addition, level differences are also a challenge for wheelchair users. This includes both large and small level changes, as it can be difficult to move up or across them. This is evident, for example, in SPARK-Park, where a wooden bridge along the path creates a small level difference between two surfaces, which may destabilise a wheelchair and, in the worst case, cause it to tip over. In J.O. Krags Park, the curbs along Solsortevej, which divides the park, created level differences that made it impossible to cross directly between the two park areas. Therefore, correct slopes and ramps are essential for wheelchair users.
Another challenge for wheelchair users occurs when paths or access routes, such as bridges, are too narrow. If passages are too narrow, wheelchair users cannot access certain areas or pass one another. In the SPARK-Park, the paths are therefore designed to be wide enough for two wheelchair users to pass each other. In J.O. Krags Park, a wooden bridge serves as the entrance to the playground; however, its limited width suggests that the passage is not accessible to wheelchair users. Thus, wide passages are a key need for wheelchair users.

For Monggaard (pers. comm.) and Gartmann (pers. comm.), who are blind/visually impaired, they also experience various challenges in the climate adaptation parks. One major challenge for blind/visually impaired people is the lack of clear and consistent guiding lines. Guiding lines are an important need for blind/visually impaired individuals, as Monggaard and Gartmann rely on them for navigation and orientation. Guiding lines can be natural guiding lines, where the line appears between two contrasting surfaces, as seen in both the SPARK-Park and J.O. Krags Park. Guiding lines can also be edges or tactile guiding lines placed on the path, as seen in the SPARK-Park. In J.O. Krags Park, Monggaard (pers. comm.) experienced that when standing in the open grass area within the detention basin in park area 1 (see Figure 4.4 regarding the park structure), she was unable to orient herself if she could not follow a natural guiding line. This indicates that blind/visually impaired people experience a need for clear and consistent elements that can act as reference points for their orientation within the parks.

Changes in surface materials can, for example, function as reference points for blind/visually impaired individuals, as they signal the transition into a new space or the presence of a new function within the park. This is experienced by Gartmann (pers. comm.) in the SPARK-Park, where the wooden bridge surface enables him to recognise where he is in the park, thereby strengthening his orientation. Similarly, Monggaard (pers. comm.) experiences a change in surface material at the playground in J.O. Krags Park, which tells her that she is entering a different space in the park. This supports the point that surface changes, guiding lines, and orientation markers together form an essential need for blind/visually impaired individuals. In addition to surface changes, fixed elements can also function as reference points for blind/visually impaired people. Fixed elements in parks can be used as landmarks for navigation. A challenge, therefore, arises when park elements change. This is experienced by Gartmann (pers. comm.), for example, when a guiding line had been installed that had not been there during his previous visit, creating temporary confusion about whether he was in the right place. Thus, fixed elements are a key need for blind/visually impaired individuals.

Another central challenge experienced by Monggaard (pers. comm.) and Gartmann (pers. comm.) concerns the design and spatial structure of the paths. Winding and organic paths make it difficult to maintain a clear direction and negatively affect the orientation of blind/visually impaired individuals. This is clearly seen in the SPARK-Park, where Gartmann (pers. comm.) has difficulty finding his way when the paths twist and turn. Additionally, narrow and clearly defined path systems provide a better sense of direction and navigation, whereas wide and open areas create difficult orientation conditions. Therefore, there is a need for linear, well-defined pathways that make it possible to follow the path system safely.

A challenge can also arise for blind/visually impaired individuals when sounds change or become too loud. Both Monggaard (pers. comm.) and Gartmann (pers. comm.) rely heavily on their hearing for navigation and orientation. Therefore, sound conditions are significant, and noise levels should be kept moderate, as excessive noise can impair the ability to perceive auditory cues, such as changes in surface materials or terrain ahead. This is seen in J.O. Krags Park, where Monggaard (pers. comm.) could hear that a change in the terrain was approaching near the cloudburst channel. A low noise level is therefore a need for blind/visually impaired individuals. However, sounds can also positively support orientation if they are consistent. This is seen in the SPARK-Park, where Gartmann (pers. comm.) used the constant noise from the busy streets, Skanderborgvej and Marselis Boulevard, as reference points for orientation.

Learning in relation to Climate Adaptation

Analyses 4.2 and 4.4 show that climate adaptation solutions create various accessibility challenges for both wheelchair users and blind/visually impaired individuals. When nature based solutions are integrated into parks, they introduce variations in terrain and surface materials as well as more organic path layouts. These elements are central to climate adaptation, but they do not always function well in terms of accessibility for wheelchair users and blind/visually impaired people. Looking ahead, the planning of climate adaptation parks should give special consideration to the implications of design choices for wheelchair users and blind/ visually impaired individuals

In the analyses, several different climate adaptation solutions are shown to create functional barriers for wheelchair users. When planning climate adaptation parks, special attention must be given to terrain variations. Terrain variations such as depressions and detention basins are necessary for collecting surface water in both climate-adaptation parks, which is mentioned by Muus (pers. comm.) and Lausten (pers. comm.). However, these terrain changes can create level differences that become inaccessible for wheelchair users. If the slope of a depression or detention basin is too steep, wheelchair users may be unable to access the area. This is clearly seen in J.O. Krags Park, where Pedersen (pers. comm.) cannot access the detention basins without assistance. Thus, analyses 4.2 and 4.4 highlight that terrain slopes require particular attention in the planning of climate adaptation parks, as the design of slopes directly affects whether wheelchair users can use and access the areas.

Both the SPARK-Park and J.O. Krags Park have primarily worked with nature based climate adaptation solutions. In both parks, climate measures such as permeable surfaces, grass, and gravel have been used to naturally absorb and infiltrate water. However, surface materials like grass and gravel can create accessibility challenges for wheelchair users. Pharao (pers. comm.) points this out in the SPARK-Park, as the gravel paths are not firm or even surfaces, making them more difficult and less safe to drive on, especially where slopes are involved. Furthermore, the detention basins in J.O. Krags Park are covered with grass, which challenges accessibility for wheelchair users. Grass is not a firm surface and requires more physical effort to move across, particularly on slopes. This means that material selection must be carefully considered in relation to wheelchair accessibility in climate adaptation parks.

It may be necessary to construct bridges as crossings in climate adaptation parks to direct water to specific locations. It is therefore important in the design process to avoid creating passages that are too narrow, making it impossible to cross the bridges in a wheelchair. A concrete example is the wooden bridge over the cloudburst channel in J.O. Krags Park, which was both too high and too narrow for Pedersen (pers. comm.) to use the passage. In addition, the width of the path system must also be considered in climate adaptation parks, as paths that are too narrow can make it difficult for wheelchair users to pass one another. Narrow paths can also create a risk of wheelchair wheels slipping off the edge and ending up on another type of surface. Børsgaard (pers. comm.) mentioned this when he was driving in SPARK-Park, where the path was narrow. Here, he was very aware of keeping his wheels from slipping into the grass next to the path, as this could risk tipping him over.

In analyses 4.2 and 4.4, several different climate adaptation solutions can be seen to create functional barriers for blind/visually impaired individuals. In both the SPARK-Park and J.O. Krags Park, the paths wind around the depressions and detention basins and follow the terrain. These paths, which twist through the landscape, make it difficult for blind/visually impaired people to navigate and orient themselves in the parks. Therefore, consideration should be given to planning path layouts that are more linear in climate adaptation parks.

Green depressions and detention basins, as seen in both J.O. Krags Park and the SPARK-Park, create large open spaces without edges. In these spaces, particular attention must be paid to the fact that blind/visually impaired individuals may lose their orientation when there is no edge, path, change in surface material, or fixed elements for them to follow. In addition, large open spaces provide fewer audible reference points, making orientation more difficult for blind/visually impaired users. Monggaard (pers. comm.) describes this in J.O. Krags Park, explaining that when a space opens up, it becomes difficult for her to navigate and orient herself.

In both J.O. Krags Park and the SPARK-Park, different surface materials such as wood, steel, asphalt, and gravel have been integrated. These surface changes function as important orientation points. Monggaard mentions this when walking the route in J.O. Krags Park, where the steel bridges can serve as an orientation tool for her if she visits the park again. Surface transitions should therefore be consciously incorporated into the design of climate-adaptation parks.

Although different surface materials have been integrated, J.O. Krags Park and the SPARK-Park primarily consist of nature based surfaces such as grass and gravel. For blind/visually impaired individuals, nature-based surfaces support navigation by providing auditory cues that indicate spatial location. This means that soft surfaces, such as grass, make navigation difficult for blind/visually impaired people, and therefore material choices must be carefully considered in climate adaptation parks.

5 Discussion

Through the analyses in chapter 4, it is highlighted that J.O. Krags Park and the SPARK-Park have had different planning approaches, which have impacted the design of the climate adaptation parks. Building on this, the discussion will focus on the prioritisation and inclusion of wheelchair users and blind/visually impaired people in the two climate adaptation projects.

The Dilemmas of Accessibility in Climate Adaptation Projects

Based on analysis 4.2 and 4.4 in chapter 4, it is clear that conflicts arise between the needs of wheelchair users and those of blind/visually impaired people regarding accessibility in climate adaptation projects. Specifically, the analysis of both climate adaptation parks, J.O. Krags Park and the SPARK-Park, show that wheelchair users need wide paths and areas without edges, whereas blind/visually impaired people benefit from narrow paths and defined edges that support navigation and orientation. This shows that affordances are not universal, but that affordance is relational, as it depends on the subject's body, sensing, and situation (Lanng and Jensen, 2022, p 47). Thus, wide paths and the absence of edges may be good design solutions for wheelchair users, while blind/ visually impaired people experience them as barriers in the design, as it becomes difficult for blind people to orient themselves when spaces have smooth surfaces and at the same time open spatial layouts.
This raises the question of whether the Universal Design principle can be realised in practice, as the analysis clearly show that wheelchair users and blind/visually impaired people do not have the same needs when it comes to accessibility solutions in climate adaptation projects (Frandsen et al., 2023, p 66). The value of the Universal Design principle is to ensure that everyone is accommodated in the design and that human diversity is acknowledged. The notion of creating a design for everyone, according to researcher Hamraie (2016), is an illusion and the design principle is difficult to fulfill in practice (Hamraie, 2016, pp 286, 302) (Frandsen et al., 2023, pp 9,12,15). In practice, the principle is difficult to realise due to many different interests and user needs. Both climate adaptation projects have experienced technical, political, professional, citizen-oriented, ownership and collaboration interests to navigate within. A concrete example is from the process in J.O. Krags Park in Frederiksberg Municipality, where the project manager, Muus (pers. comm.), mentions that they can not accommodate all citizens, and therefore specific priorities has been made by the Municipality. According to Muus (pers. comm.), one consequence of these prioritisation processes is that wheelchair users lack accessible entry to the rainwater basins in the park, as technical and political interests are given higher priority.

The Prioritisation in the Planning of Climate Adaptation Projects

It is relevant to discuss the different views on planning approaches, as these approaches may influence choices and decisions in climate adaptation projects. As mentioned in chapture 4, the climate adaptation parks, J.O. Krags Park and the SPARK-Park, have very different processes, especially regarding the involvement of people with disabilities, including wheelchair users and blind/visually impaired people.

In J.O. Krags Park, people with disabilities are not directly involved in the planning, as the planners of the park base their decisions on experience and knowledge regarding what they believe is necessary concerning accessibility for people with disabilities. This clearly illustrates that planners make "claims" to represent certain user groups. According to the theorist Saward (2010), "claim" means that certain people speak on behalf of others about something in a given context (Saward, 2010, p 37). In this context, the planners' "claims" are based on professional judgement, experience, and internal municipal decisions. There is no direct contact with people with disabilities or the Municipal Disability Council, which means that the representation of wheelchair users and blind/visually impaired people is created through the Municipality's perception of the citizens' needs.

According to the theorist Arnstein (1969), better planning outcomes are achieved when citizens, such as wheelchair users and blind/visually impaired people, are involved in the planning (Arnstein, 1969, pp 2-3). Through Arnstein's (1969) theory, it is illustrated how citizen participation can vary from having no real influence to full citizen control across eight steps on a ladder of participation in planning (Arnstein, 1969, pp 2-3). SPARK-Park included extensive citizen and user involvement and can be placed higher on Arnstein's (1969) ladder, though not at "citizen control," which is the highest level on the ladder (Arnstein, 1969, p 3)(Arnstein 1969, p. 3). Since the project organisation in the SPARK-Park made the decisions in the actual planning of the park, citizens did not have real decision making power and therefore did not exercise full citizen control. It can therefore be argued that the SPARK-Park's planning process falls within "partnership" on Arnstein's (1969) ladder, as wheelchair users and blind/visually impaired people were consulted but did not have any decision making power and citizen control in the planning process (Arnstein, 1969, p 3). In contrast to J.O. Krags Park, it may be argued that citizen participation is situated between "information" and "consultation" on Arnstein's (1969) ladder (Arnstein, 1969, p 2). There has been some dialogue with residents living in the area of J.O. Krags Park, which corresponds to "consultation" on Arnstein's (1969) ladder. However, there has been no dialogue with wheelchair users or blind/visually impaired people, which corresponds to "informing" on Arnstein's (1969) ladder, where citizens only receive information without having any influence on decisions (Arnstein, 1969, p 2).

The planning process of the SPARK-Park, indicates that "claims" have also been constructed based on the representation of people with disabilities. The SPARK-Park has a stronger "claim" than J.O. Krags Park, as they consulted directly with wheelchair users and blind/visually impaired people in the planning process, however it appears after the completion of the SPARK-Park that there is a lack of accessibility for blind/visually impaired people. Therefore, Johansen (pers. comm.) explains that supplementary solutions have subsequently been implemented for blind/visually impaired people. This may indicate that even with extensive citizen involvement in the planning, it does not necessarily lead to fully accessible solutions.

Lack of Knowledge about Accessibility in Climate Adaptation Projects

As mentioned in section 1, climate adaptation projects can help create new types of urban spaces and thus new affordances for wheelchair users and blind/visually impaired people in cities. However, the analyses of both J.O. Krags Park and the SPARK-Park show that there is a lack of knowledge regarding how people with disabilities should be included in climate adaptation. This is evident both from the landscape architecture firms, which did not possess sufficient knowledge about design needs for wheelchair users and blind/visually impaired people, as indicated by Johansen (pers. comm.) and Lützen (pers. comm.). In addition, Muus (pers. comm.), mentions that Frederiksberg Municipality previously had an accessibility auditor who acted as an advisor on projects regarding people with disabilities. Today, Frederiksberg Municipality depends on the knowledge of project managers and consultants concerning people with disabilities. This is supported by Stanfford (2022), who emphasises that there is a general lack of training, which means that people with disabilities are not sufficiently involved in the planning process (Stafford et al., 2022, p 107). This is further confirmed by the analysis of J.O. Krags Park and the SPARK-Park, which demonstrates a lack of established practices, procedures, tools, or systematic knowledge on how climate adaptation can ensure accessibility for people with disabilities, including wheelchair users and blind/ visually impaired people.

Conclusion 6

To answer the first sub-question, as referred to in section 3.1, it can be concluded from the research that climate adaptation solutions in J.O. Krags Park and in the SPARK-Park shape affordances for wheelchair users and blind/visually impaired individuals.

In J.O. Krags Park, affordances are largely shaped through the park's hydraulic priorities. The climate adaptation solutions mainly create challenges and limitations for both wheelchair users and blind/visually impaired individuals. For the wheelchair user, the large terrain displacements and soft surfaces, that change character when wet, limit ability to move independently and stay in parts of the park. Affordances for wheelchair users in J.O. Krags Park are to a large extent conditioned by level differences, surface materials, and situational conditions. For blind/visually impaired people, affordances are reduced as a result of the park's open spaces without clear edges, paths, changes in paving, and fixed elements, which limits opportunities for navigation and orientation. Affordances for blind/visually impaired individuals in J.O. Krags Park are therefore conditioned by legible and recognisable, clearly defined spatial structures.
The prioritisation of technical and hydraulic climate adaptation solutions in the design of the park limits accessibility for both wheelchair users and blind/visually impaired people.

In the SPARK-Park, affordances are shaped through fixed surfaces, integrated path systems, and limited level differences. The wide asphalted paths and level free transitions, support wheelchair users' ability to move around in most parts of the park. However, there are also individual solutions in the SPARK-Park, such as gravel surfaces and level differences, which reduce affordances for wheelchair users. In the SPARK-Park, there are clear changes in paving, fixed edges, and elements that support affordances for blind/visually impaired people in relation to navigation and orientation. At the same time, affordances are reduced, as the organically shaped paths can challenge blind/visually impaired people's navigation and orientation in the park.
When accessibility is considered early in the planning process, it is possible to integrate accessibility solutions that contribute to affordances for both wheelchair users and blind/visually impaired people.

With a view to answering the second sub-question, as referred to in section 3.1, the research shows that wheelchair users and blind/visually impaired people have different needs when climate adaptation projects are designed. This underscores that accessibility cannot be considered uniformly, but requires an understanding of the different needs that wheelchair users and blind/visually impaired individuals have, based on their experiences in J.O. Krags Park and the SPARK-Park. Based on the wheelchair users' experiences from the two climate adaptation parks, the research allow for the derivation of a number of learning objectives that identify key needs that should be considered in future climate adaptation projects:

- Level differences, and particularly terrain slopes, require special attention in the planning of climate adaptation parks, as steep gradients can limit wheelchair users' access to and use of these areas.
- The choice of materials for surfaces should be considered in relation to wheelchair users' accessibility in climate adaptation parks, as soft and uneven surfaces can challenge safety and mobility for wheelchair users.
- The consideration should be given to the width of path systems and sharp curves in climate adaptation parks, as paths that are too narrow and sharp turns can limit passage and freedom of movement for wheelchair users.
- Limitations in lighting should be considered in the planning of climate adaptation parks, as lighting conditions affect navigation and orientation and can help wheelchair users identify obstacles.

Similarly, based on the experiences of blind/visually impaired individuals from the two climate adaptation parks, a number of learning objectives can be derived to identify key needs that should be considered in future climate adaptation projects:

- Path systems with linear alignments should be included to support blind/visually impaired people's ability to orient themselves, while still allowing for organic and winding path layouts in climate adaptation parks.
- The design of large open spaces and paths without edges, changes in paving, or fixed elements should receive special attention, as such features function as tactile guidance; without them, blind/ visually impaired people may lose their orientation.
- There should be a conscious focus on changes in paving and clear transitions in climate adaptation parks, as blind/visually impaired people use these in their navigation.
- The use of soft materials, such as grass, can make it difficult for blind/visually impaired people to navigate, which should be considered in the design of climate adaptation parks.

It can therefore be concluded, based on the problem formulation, that affordances are rational and contrast dependent. This means that accessibility solutions are developed situationally in relation to both context and users and cannot be directly transferred from one project to another. The research highlight that accessibility in climate adaptation projects largely depends on priorities and the planning process rather than on individual solutions. The application of the urban design tool from affordance theory has expanded the understanding of how different bodies experience and use climate-adapted urban spaces. Based on the research conducted in J.O. Krags Park and SPARK-Park, wheelchair users' and blind/visually impaired people's use and experiences of these parks can serve as a learning basis for Frederiksberg Municipality in future climate adaptation projects, where accessibility and hydraulic framework conditions should be considered in an integrated manner to create more inclusive urban spaces.

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