RAKEB DUBALE DESTA

# Norwegian University of Science and Technology (NTNU) Campus Development and Impact of Landscape Changes on Users

A Case Study of Høgskoleparken area in the NTNU Campus Development Project

**NTNU**
Norwegian University of
Science and Technology

RAKEB DUBALE DESTA

# Norwegian University of Science and Technology (NTNU) Campus Development and Impact of Landscape Changes on Users

A Case Study of Høgskoleparken area in the NTNU Campus Development Project

Master's thesis in Natural Resources Management Specialization in Geography
Supervisor: Berit Therese Nilsen (Associate Professor)
May 2023

Norwegian University of Science and Technology
Faculty of Social and Educational Sciences
Department of Geography

NTNU
Norwegian University of
Science and Technology

# Abstract

This thesis examines the impact of the Campus Development Project (CDP) of the Norwegian University of Science and Technology's (NTNU) on the Høgskoleparken area, which was chosen because of its diverse uses for campus users. Qualitative research methods, including semi-structured interviews and document analysis, and Geographic Information System (GIS) remote sensing were used to gather data on user perceptions of the CDP and to illustrate the anticipated changes to the study area's landscape resulting from its implementation. Participants in the study included NTNU students, NTNU employees, Trondheim municipality, and neighbourhoods in the CDP area.

This study investigates the impact of the CDP on green areas, which play a major role as vital spaces for social activities, play, and leisure. The findings show that participants had varying opinions on the benefits and drawbacks of the project's impact on the green area and their attachment to it. Some users see it as a means to address sustainability, while others expressed concerns about potential negative impacts on parking and public transportation for users. The results of the Land Use and Land Cover Change (LULCC) analysis indicate that there will be a significant change in land use, which has raised unique concerns among users. The findings of this study highlight the importance of considering the perspectives of different users and stakeholders in the planning and design stage of the CDP. Engaging stakeholders, including end-users and local communities, can cultivate responsibility and ownership as well as ensure that their needs and perspectives are considered in the planning process. Effective communication can encourage stakeholders to support the CDP, leading to higher levels of satisfaction and sustainability of the CDP.

# Sammendrag

Denne avhandlingen undersøker innvirkningen av Norges teknisk-naturvitenskapelige universitet (NTNU) sitt campusutviklingsprosjekt (CDP) på deler av Høgskoleparken-området, som ble valgt på grunn av dets mangfoldige bruksområder for campusbrukere. Kvalitative forskningsmetoder, inkludert semi-strukturerte intervjuer og fjernmåling med Geografiske Informasjonssystemer (GIS), ble brukt for å samle inn data om brukernes oppfatninger av campusutviklingsprosjektet, og for å illustrere de forventede endringene i studieområdets landskap som følge av implementeringen. Deltakerne i studien inkluderte NTNU-studenter, NTNU-ansatte, Trondheim kommune og områdets nabolagsforeninger.

Resultatene undersøker innvirkningen av campusutviklingsprosjektet på grøntområder, som er viktige områder for sosiale aktiviteter, lek og fritid. Deltakerne hadde forskjellige meninger om fordelene og ulempene med prosjektet, dets virkning på grøntområdet og deres tilknytning til det. Noen brukere ser det som et middel for å løse bærekrafts problemer, mens andre uttrykte bekymringer for potensielle negative konsekvenser for parkering og offentlig transport. Resultatene fra landbruks- og landdekkeanalysen (LULCC) indikerer at det vil være en betydelig endring i arealbruk, noe som har ført til unike bekymringer blant brukerne. Funn i denne studien understreker viktigheten av å ta hensyn til brukerperspektivene og deres interessenter i planleggings- og designprosessen. Engasjering av interessentene, inkludert brukere og lokalsamfunn, kan fremme ansvarlighet og eierskap, i tillegg til å sikre at deres behov og perspektiver blir vurdert i planleggingsprosessen. Effektiv kommunikasjon kan oppmuntre de involverte til å støtte CDP, noe som kan føre til høyere tilfredshet og bærekraft i CDP.

# Preface

First and foremost, I express my heartfelt gratitude to the almighty GOD for his blessings. I extend special appreciation to my family, especially my grandmother Felekech Gerawork, whose tireless efforts have helped shape me into the person I am today.

This master's thesis is the original work of Rakeb Dubale Desta and was written to fulfil the graduation requirements of the MSc in Natural Resources Management, with a Geography specialization, at the Norwegian University of Science and Technology (NTNU). I am sincerely grateful to everyone who supported me throughout this journey. Moving to Norway during a global pandemic challenged my physical, mental, and emotional capabilities, and put my strength and resilience to the test. However, with your unwavering support, I was able to complete this thesis.

I express my special thanks to my supervisor, Berit Therese Nilsen, for her extraordinary support and guidance. Working with her felt like an ongoing dialogue, and I always felt inspired and motivated after our discussions. Thank you for your patience and constructive feedback, which were crucial in making this thesis successful. I feel incredibly fortunate to have had such an excellent supervisor and mentor, and I will always treasure the lessons and skills I acquired under her guidance.

To my research participants, thank you for your contribution and willingness to share your insights with me. Your participation in this thesis was essential to its success. I would also like to express my gratitude to the Department of Geography at NTNU, Michael Ogbe, and our writing group members, Afrida Iqbal, Stephanie Ojee, Amy McCormack, Benjamin Boateng, Julie McDowell and Fikremariam for initiating my study at NTNU. I extend my heartfelt gratitude to my friends, including team Emerging Scholars (Dessalegne, Kidist, and special thanks to Dawit Yekoyesew), Yonas, Tekle, Tulu, Betty, Aljona, Julie, Su, Peter, and Hajir, for providing valuable insights that contributed to the success of this thesis. I am also thankful to my best friends, Amy, and Rekik, for their unwavering support. Furthermore, my friends and family in Trondheim made me feel welcomed and at home during this journey. Although this paper cannot acknowledge everyone, I would like to thank all who supported and assisted me throughout the process. To everyone who played a role in this journey, I thank you all for your work and assistance. Your contributions were instrumental in helping me achieve this important milestone in my academic journey. እግዚአብሔር ይስጥልኝ!!!

# Table of Contents

# List of Figures

## List of Tables

# List of Abbreviations

**CDP** - Campus Development Project

**GIS** - Geographic Information System

**KAMD** - Kunst, Arkitektur, Musikk og Design (Art, Architecture, Music, and Design)

**LULCC** - Land Use and Land Cover Change

**NSD** – Norsk Senter for Forskningsdata (Norwegian Centre for Research Data)

**NTNU** – Norges Teknisk Naturvitenskapelige Universitet (Norwegian University of Science and Technology)

**SDGs** - Sustainable Development Goals

**UN** - United Nations

**VPOR** - Veiledende Plan for Offentlige Rom (Indicative Plan for Public Spaces)

# 1. Introduction

This master's thesis presents the perceptions of users[1] regarding the changes that will be made to the campus landscape as a result of the Campus Development Project (CDP) at the Norwegian University of Science and Technology (NTNU) in Trondheim, Norway. The study aims to determine the factors influencing users' perceptions and experiences of these changes through analysis of interviews and documents. This chapter outlines the background of the study, presents the statement of the problem and research questions, defines key terms, and explains the significance of this thesis. Finally, the chapter provides an overview of the organization of the thesis, which includes theoretical framework, methodology, findings, discussion, and ends with a conclusion.

The landscape of a university campus plays a crucial role in the creation of a sense of place (Buchanan, 2009). The CDP is a significant undertaking that has altered the physical appearance of the NTNU campus significantly (NTNU, n.da) . While such changes may be necessary to accommodate the growing needs of the university and the city, they can also have a profound impact on the users' perceptions of the campus environment.

Through an analysis of interviews and documents, this thesis examines the factors that shape users' perceptions of the campus landscape, including the use of outdoor spaces, accessibility, and visual appeal. Furthermore, it explores the impact of user perceptions on their sense of place and attachment to the study area and assesses the alignment of the CDP with the Sustainable Development Goals (SDGs).

## 1.1. Background

NTNU is the largest public university in Norway. The main campus of the university is in Trondheim, while regional campuses are located in Gjøvik and Ålesund (Vabø & Langfeldt, 2020).
NTNU was established by the King-in-Council in 1996 after a merging of the Norwegian Institute of Technology (NTH), the College of General Science (AVH), the Science Museum

---

[1] In this thesis, the terms "informants", "stakeholders", and "users" are used interchangeably to refer to individuals who possess knowledge of, work with, or have experience in areas related to the CDP, including students, employees, residents of the neighborhood, and members of Trondheim Municipality.

(VM), the Faculty of Medicine (DMF), the Art Academy in Trondheim and the Music Conservatory. On 1 January 2016, NTNU merged with Gjøvik University College, Sør-Trøndelag University College and Ålesund University College (NTNU, n.de).

Currently NTNU is engaged in a CDP with the objective of consolidating its academic environment from geographically dispersed areas to a single, centralized campus around Gløshaugen area in Trondheim (NTNU, n.dc). The collection of NTNU's campus in the area around Gløshaugen is one of the largest development projects in the university sector, as well as one of the largest and most complex construction projects in Norway (NTNU, n.da). This has a significant influence on the growth of urban areas. In addition, the CDP has developed green management spaces for the benefit of the faculty, staff, and students, with an emphasis on pedestrian and soft mobility networks. The planning for the new campus project has also involved a number of stakeholders (NTNU, n.da).

## 1.2. NTNU and Campus Development Project

NTNU is collecting part of its campuses into one, planning a future-oriented, unified campus that facilitates the realization of academic ambitions. NTNU's campuses development provides important knowledge, both for the campus project but also for other public developments in Norway (NTNU, n.da)

Figure 1:1 Illustration of planned campus location  (NTNU, n.da)

As shown in the above Figure 1:1, NTNU has planned to relocate parts of its campuses to one area around Gløshaugen. The academic communities at Dragvoll (humanities and social sciences), the heart of Trondheim's city center (art and music), Gløshaugen (technical and natural science communities), and Kalvskinnet (medical, health, and teacher education) will be relocated to the new campus as per the plan. All these external campuses and disconnected locations will come together in one place, moving from their current peripheral locations to a site next to the original location of the Gløshaugen campus (NTNU, n.da).

The figure below (Figure 1:2) shows the phases of the NTNU CDP, which was launched in 2017 with the aim of selecting a strategic direction for the development of the campus. The first phase was successfully completed, and the second phase, which lasted from 2017 to 2019, focused on creating a comprehensive proposal for the campus's design. This involved conducting studies on potential new structures for the university and determining the optimal placement of academic environments and necessary spaces for each building. The third and current phase of the CDP began in 2020 and will continue until the end of 2023. This phase involves the planning and design of each individual project, with a focus on meeting the needs

and requirements of each unit. The goal is to develop a cohesive, urban, and efficient campus that is both sustainable and lively. During this stage, a space and facility plan is being outlined to meet the needs of end-users. The objective is to ensure that all buildings and outdoor areas of the NTNU campus project are fully operational by 2028 (n.dd).
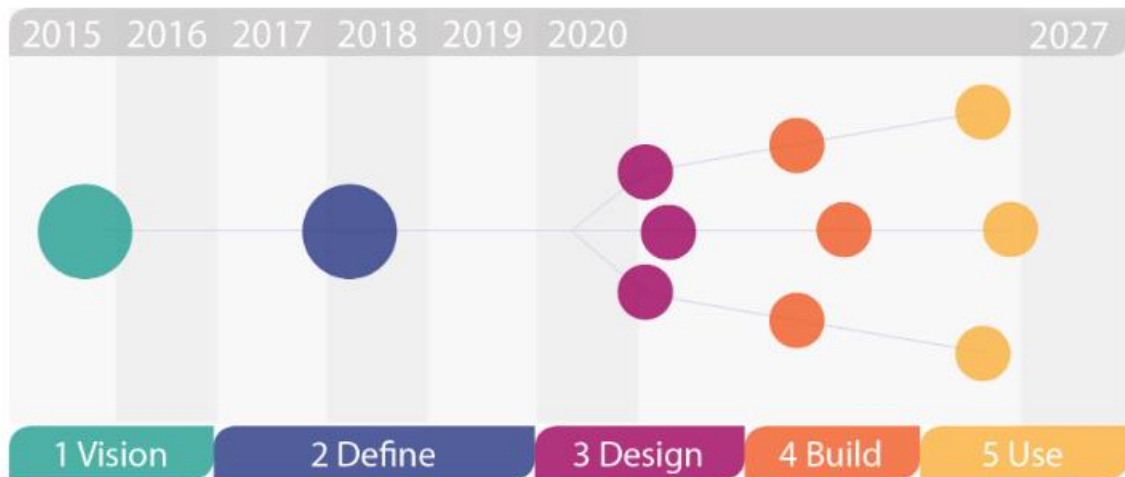


Figure 1:2 Phases of campus development (n.dd)

## 1.3. CDP and Sustainability

Trondheim is designated as a "Smart City" by the United Nations (UN). Having been officially recognized by the UN as being at the forefront of the organization's effort toward achieving its 17 sustainability goals. Trondheim's recognition by the UN as a leader in achieving SDGs is based on the city's comprehensive approach to sustainability, which includes a range of initiatives and projects aimed at reducing carbon emissions, promoting renewable energy, and creating more sustainable urban spaces. The NTNU CDP is one example of how Trondheim is working to achieve these goals (NTNU, n.df ).

NTNU has set its goals on developing a city campus that supports a sustainable urban environment, aligning with the objectives of Sustainable Development Goal 11. This goal, which is one of the 17 established by the United Nations General Assembly in 2015, aims to create "sustainable cities and communities" that are inclusive, safe, resilient, and sustainable (UN, 2015; UNECE, 2019).

As part of the NTNU CDP original plan, the university is committed to creating more sustainable and environmentally friendly campuses. The project includes a range of initiatives aimed at reducing energy consumption, increasing the use of renewable energy sources, and

promoting sustainable transportation options (NTNU, n.df ). The new campuses will be designed to be more energy efficient, with features such as green roofs, solar panels and zero emission buildings. The campuses will also be designed to promote sustainable transportation, with more bike paths and pedestrian areas, and fewer parking spaces (NTNU, n.da).

In addition to these specific initiatives, the NTNU CDP is also part of a larger effort to promote sustainability and environmental responsibility in the community. The university is working closely with local government and businesses to create a more sustainable and resilient Trondheim. This includes initiatives such as promoting the use of electric vehicles, reducing waste and pollution, and increasing public awareness of environmental issues (NTNU, n.df ). To achieve these goals, such as parks and other natural spaces, are an important component of sustainable urban development, as they provide a range of environmental, social, and economic benefits. In the context of the NTNU CDP in Trondheim, the creation and preservation of green areas is an important part of the effort to create more sustainable and livable urban spaces (Trondheim kommune, n.d). Green areas are defined as any area of land that is partially or entirely covered in grass, trees, shrubs, or other types of vegetation. Green areas physical characteristics and intended uses determine the ecosystem services they provide, which in turn provide benefits and values for people (Jansson, 2014). Green space in cities, urban areas include parks, community gardens, and cemeteries. Green areas provide social services as well as mental and physical health services (Chiesura, 2004a). When we come to health and wellbeing green areas seem to positively influence the health of all age and educational groups. Green areas provide engaging places, for formal and informal recreation as well as for socialization (Foellmer et al., 2021).

Campus green areas also play a role in students' wellbeing and could be used for refreshing the mind and recreation. Green areas, whether they are human-made or natural, have a beneficial effect on the health of students (Seitz et al., 2014). Universities' green space development and management have a positive impact on students' day-to-day life and on the aesthetic qualities of the campus. Urban structures greatly benefit from the presence of university campuses (Hami & Abdi, 2021). A well-designed campus can enhance a university's academic, activity, and service operations, including its learning services, leading to improved educational outcomes. Since students spend a significant amount of time on campus engaging in various activities, it requires constant attention. Campus landscapes can provide significant benefits, including restoration opportunities that aid students in mental and scientific engagement, as highlighted by Turk et al. (2015).

The collection of campuses is expected to undergo changes in their landscapes Landscape and Land use changes are some of the common factors affecting biodiversity (Bardalen et al., 2020). Land-use changes as the result of the construction of primary homes, holiday homes, and roads are currently a threat against natural diversity in Norway. Urbanization, intensification of agriculture, abandonment of land, and forest expansion are the most common causes of landscape change (Plieninger et al., 2016). According to Fongar et al. (2019), the preservation of green spaces appears to be under threat in municipalities of Norway. Therefore, it's important to study the landscape changes and benefits of the mega projects to users during the preliminary status so that it can contribute to the implementation stage of the project.

Urbanization causes several environmental challenges such as the loss of biodiversity, especially the loss of native species and pollution among others. Removing green areas and nature distracts the habitat of all kinds of animals and plants (Dover, 2015). This changes also restrain species movements and decreases opportunities for outdoor recreation and health benefits for humans (Davison et al., 2021; De Chazal & Rounsevell, 2009).

## 1.4. Statement of the Problem

Green areas are a crucial aspect of campus development, as they contribute significantly to creating a unique campus environment (Fawehinmi et al., 2020). The design of these spaces should be tailored to the needs of various campus users and the activities they engage in (Chiesura, 2004b). Hohmann (2006) also states campus landscape design recognizes the importance of outdoor spaces and involves students and academics in its development.

Green areas are essential for providing a comfortable and recreational environment for people. However, it is crucial to understand the impact of campus development on these spaces. This study aims to explore the local users' perception of the impact of the planned new NTNU campus on the parts of Høgskoleparken area. Høgskoleparken is one of the five sub-areas that will be affected by the construction and is a crucial area for CDP since there will be a significant construction over the park (Asplan Viak, 2021).

Green areas are considered multifunctional landscape service providers that offer essential benefits such as space for outdoor activities, rest, and psychological well-being (Shi & Woolley, 2014). The CDP aims to develop sustainable and environmentally responsible campuses, and each phase of the project presents unique challenges and opportunities (NTNU, n.da).

During the planning phase, the project establishes its goals and objectives, evaluates potential environmental impacts, challenges, and risks, and prioritizes the preservation of Høgskoleparken. In the design phase, detailed plans and construction designs are developed, including those for construction in parts of Høgskoleparken. After the designs are put into use, it is crucial to evaluate the impact of the changes made to the green areas, which hold significant value for the park's users. To address the challenges raised and to preserve Høgskoleparken benefits for both the surrounding area and the city, it is essential to consider the perspectives of different users. Therefore, the successful implementation of the project that contributes to the city's sustainability requires careful consideration of the users' perspectives, with necessary adjustments made accordingly. As NTNU's campus development progresses, changes to the surrounding green areas are inevitable and could affect the local community's perception of their benefits and challenges. Therefore, it is crucial to investigate the specific types of landscape changes that will be implemented and how they will impact the users. This study aims to provide valuable insights into the potential benefits and challenges of the CDP by addressing these research questions. Furthermore, the study objects to ensure that the project is designed and implemented sustainably.

## 1.5. Objective of the Study

The purpose of this study is to determine how users perceive the benefits and challenges of changes to green areas caused by the development of NTNU's campuses. Specifically, the study aims to investigate the types of landscape changes anticipated to occur during the implementation phase of campus development, and the relationship between the CDP plan and sustainability concerns. The primary objective of this study is to assess the impacts of CDPs and landscape changes on campus users. The study focuses on NTNU CDP features of Landscape change and impacts on the users.

## 1.6. Research Questions

The main research question that this thesis addressed is: How does the CDP impact the green areas and surroundings of Høgskoleparken area and its benefits and challenges to the users? To answer this main question, the following sub-questions were addressed:

1. Why is the green area important for the study participants?
2. What are the expected landscape changes in green areas and parks during the implementation phase of NTNU's CDP?

3. What are the perceptions of participants regarding the benefits and challenges of the CDP?
4. How can users' involvement ensure sustainability in the NTNU CDP?

## 1.7.  Definition of Terms

**Campus Landscape:** Dober defines the campus landscape as "the green environment that positions, serves, and represents higher education (Dober & Dober, 1992, p. xv)."

**Experience:** Thiel characterizes experience as "a combination of continuous, simultaneous, interconnected, and parallel sequences of actions, emotions, and thoughts, in which the individual's feeling of participation in an immediate and present dynamic process is a key aspect (Thiel & Hartley, 1997, p. 117)."

**Landscape change:** on this thesis landscape change represent to the change on the study area due to the CDP.

**Perception:** In this study, it is defined as the attitude of the study participants about the impacts of the CDP on the green area which they use for different purposes.

**Sense of Place:** describes the emotional and psychological connections that people have with a particular geographic place. It involves the meanings and symbols associated with the place, the practical and functional aspects of the place, and the emotional and psychological attachments that people have with the place (Hashemnezhad et al., 2013).

**Triangulation:** In qualitative research, "triangulation" refers to the practice of developing a comprehensive understanding of phenomena by utilizing a mixed methods approach and sources of data (Carter, 1969; Fusch et al., 2018).

## 1.8.  Significance of the Study

This study was conducted at NTNU CDP, focusing mainly on qualitative data to gather perceived responses from students, academic staff, neighborhoods, experts, and stakeholders. However, the degree of responsiveness in reporting requested questions varied and was subjective based on respondents' perceptions. Thus, the study's findings may only represent this specific location. The significance of this study is in demonstrating users' perceptions of their involvement in the CDP, allowing their desires to be incorporated into the future campus' land use plan. Moreover, the study promotes further research on the impact of land-use change and the role of green areas for the users. By providing valuable information to the NTNU campus development team, the study enables adjustments to the project based on different

users' perspectives. Ultimately, this research highlights the importance of the Høgskoleparken area in the CDP project to better serve its users.

## 1.9. Organization of the paper

The thesis consists of six fundamental chapters, each serving a distinct purpose. The first chapter provides an introduction to the study, encompassing aspects such as the study's background, problem statement, general objective, research questions, scope, and organization. The second chapter discusses the theories and relevant literature, while the third chapter details the research design and methodology employed to accomplish the study's goal. The fourth chapter presents the findings and results, while chapter five discusses the findings and is segmented into different sub-topics. The final section is chapter six, which presents the conclusion and recommendations for future research work based on the findings of the study. As presented in Table 1- 1 below.

Table 1-1 Reader's Guide.

| Chapter 1: Introduction | Presents the background information of the study, research questions, defines key terms, explains the significance of the research, and outlines the organization of the thesis. |
|---|---|
| Chapter 2: Theory | Presents the theories, conceptual framework and literature review that is added reason for discussion in Chapter 5. |
| Chapter 3: Methodology | Gives an introduction to qualitative research method, Geographic Information System (GIS) and presents the research process in its entirety where an account is given of methodological choices, trade-offs, challenges and opportunities. |
| Chapter 4: Findings | The research question, sub-questions are connected to the empirical evidence gathered from the interviews and documents. |
| Chapter 5: Discussion | Compares the research findings with the theoretical framework to answer the overall question of the research paper. |
| Chapter 6: Conclusion | Responds to this thesis main question and briefly outlines some recommendations. |

# 2. Theory

## 2.1. Introduction

To answer the questions that are introduced initially in the thesis, The chapter begins by examining theoretical perspectives on landscape, providing a foundation for understanding the various ways in which landscape can be conceptualized and studied. Next, it explores the Systems Theory of Landscape, considering the complex interactions between different components of a landscape and how changes to one component can impact the entire system. In addition, the section reviews the Time and Landscape Theories, recognizing the dynamic nature of landscapes and how they evolve over time due to natural and human-driven processes. "Landscape can be a common-sensical concept that remains implicit in research, or a concept at the very heart of methodological frameworks (Granö & Paasi, 1997, as cited in Germundsson et al., 2022, p. 119)." In this thesis, the term "landscape" is used to refer to the specific study area, which is parts of Høgskoleparken. The focus of the study is on the changes that are expected to take place in this area as a result of the implementation of the CDP. The section also discusses place attachment and sense of place, delving into the emotional and psychological connections individuals and communities develop with a particular place and how these connections could influence their behaviour and attitudes towards the place. Finally, the application of Landscape Place and Physical location in this thesis is discussed. By examining these theories, the section provides a comprehensive understanding of the theoretical underpinnings of the research conducted in the thesis and highlights the relevance of these theories for understanding the impacts of CDPs on the users. The conceptual framework on human landscape perception is also discussed to outline the fundamental concepts and theories related to human perception of landscapes and to identify and the key factors that influence the different users of the CDP.

## 2.2. Theoretical Perspectives on Landscape

The word landscape is derived from the old German term "Land Schaft" a small piece of cultivated land (Olwig, 1996). The term "landscape" became widely used in the late 16th century, specifically in reference to a popular Dutch style of painting rural scenery. By the 18th century, the term had evolved to include the landscape gardens that were a prominent feature of the growing estates of the wealthy. These gardens were designed to provide viewing points for a carefully arranged sequence of vistas, reflecting an idealized and culturally specific way

of looking at the world. Within academia, the word landscape has currently come to describe a highly charged, patrician controlled, ideological view of nature (Bender & Winer, 2020). Studies with landscape, Bender (2006) research on landscapes proposes that they are intricately tied to social relationships and are always shaped by historical contexts. According to Williams (1983) the term "landscape" can be understood within the context of the specific place and time in which it originated. In the Nordic countries, when geography was officially established as a discipline in universities during the late 1800s and early 1900s, the term "landscape" had multiple meanings and implications, the definition of landscape has evolved over time, and thus influenced by changing historical circumstances, such as its interrelation with political, cultural, and scientific processes (Germundsson et al., 2022). Germundsson et al. (2022) also note that the concept of "landscape" has had significant importance throughout its extensive history and varying definitions, particularly in Nordic contexts and beyond the field of geography. The landscape concept has evolved for over a thousand years, beginning with the landscape laws and the Icelandic sagas. "landscape" remains a multifaceted and intricate concept with various meanings both in the past and in contemporary times. It is productive, dynamic and requires interpretation, making it a concept that engages people.

## 2.3.  Systems Theory of Landscape

The Systems Theory of Landscape is a holistic approach to the design and management of landscapes that takes into consideration the complex relationships and interactions between various elements, such as natural systems, social systems, and technological systems (Naveh, 2001). This theory is based on the idea that landscapes should be understood and designed as interconnected and dynamic systems, rather than as isolated and static entities. In this approach, the landscape is seen as an integrated system of entities and relationships that function through interrelated parts. The origins of systems theory can be traced back to the work of the German biologist, Ludwig von Bertalanffy, who developed the theory of General Systems in the 1930s. Since then, systems theory has been applied to a wide range of disciplines, including landscape design, where it has been used to improve the integration and sustainability of landscape projects (Von Bertalanffy, 1972).

The concept of 'system' which provides a means of identifying manifestations of natural phenomena and processes that meet certain general conditions may be described as structure consisting of interconnected parts and the connections between them (Laszlo & Krippner, 1998). According to Laszlo and Krippner (1998), a system is defined as "a structure consisting

of interconnected parts and the connections between them. A similar definition made by Motloch (2001) also highlights that a system should be understood as consisting of entities, relationships, and functions, which work together to produce a desired outcome. In the context of the landscape, entities are the different components of the landscape, such as the trees, the green areas, the water, and the people, while relationships and functions refer to the interactions and roles that these entities play within the landscape system.

The key principles of systems theory in landscape design are interdisciplinary collaboration, stakeholder engagement, and integration (Jones, 2020). Murphy (2016) argues that landscape designers must take a comprehensive approach and take into account the various ecological, physical, psychosocial, technological, political, and socioeconomic systems that exist within a landscape. Additionally, designers should strive for integration between their designs and broader environmental, human, and technological systems to promote a positive and mutually beneficial relationship between people and their surroundings.

The application of systems theory in landscape design has been successful in a number of projects, where it has been used to improve the integration, sustainability, and quality of the landscapes. In this thesis system theory of landscape is applied to understand the potential changes that may occur as a result of a CDP and how it may affect campus users. From a systems perspective, the campus can be seen as a complex and dynamic system composed of interdependent components, including buildings, bridge, and human activities. The CDP may introduce new elements into this system, such as new buildings, roads, or parking areas, and may alter existing elements, such as green areas.

However, applying systems theory to landscape design also presents a number of challenges and limitations, such as the difficulty of integrating diverse systems, including ecological, social, and cultural systems as well as complex stakeholder engagement and the necessity for interdisciplinary collaboration (Murphy, 2016). To address these challenges, landscape designers must be equipped with a deep understanding of systems theory, as well as the skills and knowledge required to engage with diverse stakeholders, collaborate with interdisciplinary teams, and integrate multiple systems into the design process (Haggis, 2008; Murphy, 2016). In addition, landscape designers need to possess the abilities to effectively communicate with various stakeholders, such as government agencies, local communities, and non-profit organizations. They should be equipped with the necessary skills to engage with these groups and address their diverse needs and concerns (Motloch, 2001). The changes made under the

CDP have the potential to bring both favourable and unfavourable effects on the campus system and the individuals who utilize it. For example, the addition of new facilities may improve access to resources or services, while the removal of green areas may reduce opportunities for recreation or social interaction. Likewise, Motloch (2001), argues that landscape designers should be systems thinkers in order to integrate diverse systems and should employ principles and pursue directions that respond to these ecological, physical, psychosocial, technological, political, and socioeconomic systems. Therefore, by deriving from the conception which considers landscape as a system, and considering what Murphy highlights, I can infer that systems theory can be related to the CDP that is designing of the landscape which, itself, is a system with the users and interactions to it.

To effectively manage and plan for the impacts of a CDP, it is important to adopt an interdisciplinary approach that considers the multiple components and scales of the campus system and engages with diverse stakeholders and users to understand their needs and concerns. This approach can help to identify potential balances and interactions among the users of the CDP, and to develop strategies that promote sustainability, equity, and resilience over the long-term.

In conclusion, the systems theory of landscape provides a holistic and integrated approach to the design and management of landscapes that takes into consideration the complex relationships and interactions between various elements. By applying this theory on this thesis, CDP planners can improve the integration, and sustainability of the CDP, and create harmonious and mutually supportive relationships between the users and the possible changes on the landscape (Laszlo & Krippner, 1998; Motloch, 2001; Murphy, 2016).

## 2.4. Time and Landscape Theories

The concept of landscapes being temporal and process-based is related to time theory in that it acknowledges the dynamic nature of the world and the constant changes that occur over time (Tress & Tress, 2001). Landscapes are not static, but instead, they are always in a state of flux and subject to ongoing processes of transformation (Tilley, 2006). This notion aligns with the perspective that time is not a static concept, but rather a continuous process of transformation and development. Moreover, the fact that landscapes are shaped by human agency and intervention is also relevant to time theory. It implies that people have the power to influence the course of history and shape the world around them through their actions. This view aligns with the belief that human actions and decisions have a significant impact on the course of

history and the development of society over time (Ingold, 1993). Overall, the concept of landscapes as temporal and process-based reflects a broader understanding of time as a dynamic and ever-changing entity that is shaped by human activity and agency (Bender, 2002). "A very personal reason why it is worthwhile to study landscape theory: it adds another dimension to one's fascination with landscape" (Kühne, 2019, p. 6). in relation to the physical foundations of landscape: Landscape is time materializing: landscapes changes with time, it creates out of the human understanding and engagement like time, never stand still (Bender, 2002). Bender (2002) suggests that recognizing the ways in which indigenous peoples have historically shaped and interacted with the landscape can provide important insights and knowledge for present-day land use and management. By incorporating traditional knowledge and practices alongside contemporary approaches, we can develop a more nuanced understanding of the landscape and its potential uses and challenges. In this study the theory applies how the CDP will bring changes throughout time and this has different definitions on users' perspective.

The study of landscape theory is valuable because it adds another dimension to the appreciation of landscapes and helps us understand the physical foundations of landscapes as time-materializing entities (Kühne, 2019). As the same place can undergo different transformations over time, it is important to consider the perspectives of different CDP users, as their experiences and understanding of the same landscape may vary significantly. In the same context Tilley (2006) argues the same place at the same moment can be experienced differently by different people. Similarly, the same place at different moments can be experienced differently by the same person. Furthermore, People may have opposing opinions about a location at any given time. These subjective experiences of landscapes and time are not solely a result of cultural relativity. Rather, they are rooted in specific historical moments, complex social relations, and deeply ingrained ideologies. The meanings that we attach to time and place are not just reflections of these relationships but also carry their own attachments and social charges (Ingold, 1993).

In other words, in the field of landscape theory, landscapes are viewed as dynamic and ever-evolving entities that are shaped by the awareness, perception, and interaction of human beings with their surroundings (Stephenson, 2007). This highlights the subjective and temporal nature of landscapes. The cultural meanings and ideologies attached to a place are also integral to the perception of landscapes and they play a crucial role in shaping the landscape (Tilley, 2006). Furthermore, the landscape's change over time is a complex process that involves continuous

removal and construction of new landscapes to meet the changing demands of society. This requires the effective management of landscapes, considering the changing preferences and perceptions of different users over time. This can be challenging, especially since preferences and perceptions change dramatically over time (Sanders & Stappers, 2008). This thesis explores how users have perceived changes in the landscape over time and the challenge of managing a landscape to accommodate these varying perspectives. It is uncertain whether all generations will share the same preferences for landscapes as the present generation, as landscape preferences and perceptions change over time. A significant portion of landscape research has focused on the study of historic landscapes, which argue that the current landscape is the result of a long-term process of removing old landscapes and constructing new ones, typically to prepare the land for future uses (Antrop, 2005). This means if there are changes in the campus landscape it can have an impact on the users of the campus. The seasonal variation in landscapes can also affect the way users perceive and use of the campus throughout the year.

In terms of landscape theory, the impact of campus landscape change on users emphasizes the significance of considering the subjective and temporal nature of landscapes, as different users may have varying preferences and perspectives on the changes. Effective management of campus landscapes requires seeing the changing needs and user's preferences over time, as well as the complex interplay of factors that shape the campus landscape.

## 2.5. Place Attachment and Sense of Place

Place attachment is comprised of both, place identity, and place dependence. Place identity is a concept that relates to the way people develop a connection to a specific place, whether it is a physical location or a more abstract sense of place. It refers to the symbolic and cultural connections that an individual or community has with a particular place. In other words, place identity is the way in which a person or group defines themselves in relation to a specific place or environment (Raymond et al., 2010). The term place dependence pertains to the degree to which a physical environment facilitates a particular function or undertaking (Raymond et al., 2010). Similarly, it is defined as the degree to which a place is designed and adapted to meet the needs of the people who use it (Alrobaee & Al-Kinani, 2019). The notion of "place attachment" highlights the emotional and psychological connections that people have with particular landscapes and how these connections can influence their perceptions and behaviour (Lewicka, 2011).

The sense of place is a concept contributed by humanistic geographers like Tuan, who argue that a place is more than just a physical location and carries different meanings for different people. In his book Space and Place, Tuan (1977) explains how these concepts shape human experiences and perceptions of the world. He argues that space is an abstract concept that refers to the physical dimensions of the world, while place is a more subjective and personal concept that reflects the human experience of being in a particular location. Tuan suggests that people's sense of place is shaped by a range of factors, including their culture, memories, and emotions, and that it plays a vital role in shaping human behaviour and identity.

Anderson (2016)'s theory also emphasizes the importance of the historical and cultural context in shaping a sense of place. He argues that places have symbolic meanings and associations that are rooted in the historical experiences of individuals and communities. These symbolic meanings and associations are important for understanding how people develop emotional and cognitive connections to places (Scannell & Gifford, 2010). Overall, sense of place theory highlights the complex and dynamic nature of people's relationships with the physical environment, and emphasizes the importance of understanding the social, cultural, and historical context in which sense of place is created and maintained. The changes in campus green areas can be categorized and explained in terms of how the changes may impact users' place identity and place dependence. Understanding these will help to better recognize the complex ways in which changes to green spaces can impact users and their connection to the campus green areas.

The importance of understanding the subjective experiences and meanings that people attach to particular places is emphasized by the concept of 'sense of place' (Proshansky et al., 2014). This emotional and psychological attachment that people have to certain places is also relevant to the idea of landscape as a place for sharing and learning (Farnum, 2005). The attachment to a place can influence people's behaviour and experiences (Ujang & Zakariya, 2015). Rajala et al. (2020) also shows how physical landscape can play an important role in shaping people's sense of place and can contribute to a shared sense of identity and community. The expected changes in the CDP that I described earlier can be understood as changes to the experiential dimension of space and place, as argued by Tuan (1977). These changes can affect the sensory, emotional, and cultural experience of campus green areas for different users based on their personal experiences, social status, and cultural background. According to this theory, people derive a sense of self-worth and social identity from being part of a particular social group, which can include a campus community. In the context of the CDP, if the changes made to the

campus green areas do not align with the values and expectations of the surrounding users, it may negatively impact users' place attachment and sense of belongingness to the campus. Conversely, if the changes are made in a way that is consistent with the user's values, norms, and expectations out of the CDP, it may enhance users' place attachment and sense of belongingness.

## 2.6. Landscape Place and Physical location

Landscape, place, and physical location are interconnected concepts. Landscape refers to the visible features of the land, including natural and human-made elements, that are shaped by interactions between human activity and the physical environment (Jones, 2003). On the other hand, place is a broader concept that encompasses the physical location and cultural, social, and historical meanings attached to it (Cosgrove, 1998). According to Rishbeth and Powell (2013), The physical location is a crucial aspect of both landscape and place since it provides the context for human interactions and experiences. They continue to argue that physical location is an essential aspect of place attachment and memory. It suggests that the physical environment can shape one's attachment to a place and influence the memories that are associated with it. This highlights the importance of social and cultural meanings attached to the physical environment in shaping place attachment and memory.

According to Ingold (1993), the features of landscape shape the physical environment, while the social and cultural meanings attached to the place influence the way people interact with it. At the same time, human activity, such as construction and urbanization, can alter the landscape and modify the cultural and social meanings attached to the place (Cosgrove, 1998). Cosgrove (1998), states that landscapes are not just mere reflections of human actions and agency but are also shaped by them. The interaction between human beings and their environment has a spatial and historical dimension, where memories are embedded in the landscape, and landscapes can evoke emotions and influence actions (Ingold, 1993).

In the field of place and landscape theory, the concepts of place identity and place dependence are closely related to the concept of landscape as place identity refers to the cultural and symbolic connections that individuals or communities have with a particular place (Raymond et al., 2010), while place dependence refers to the degree to which the physical environment supports an intended purpose (Alrobaee & Al-Kinani, 2019). These concepts emphasize the importance of the relationship between people and their environment in shaping their perceptions and experiences of a place or landscape. Together, the concepts of landscape, place,

and physical location illustrate that the landscape is not just a physical entity but a dynamic and evolving entity that is shaped by human interactions and perceptions, as well as cultural and historical meanings attached to it. In the research, the physical environment of the CDP will be analyzed in terms of its landscape features and how these features interact with human activity. The concept of place will be used to understand how users perceive and attach cultural and social meanings to the CDP area.

## 2.7. Land Use and Land Cover Change

Land use and land cover change (LULCC) is a complex and dynamic process that involves a wide range of environmental, social, and economic factors (Turner et al., 2007). According to Turner et al. (2007), land use refers to the human activities that take place on a particular area of land, such as agriculture, forestry, urban development, and transportation. It also includes the management and planning of land resources for various purposes. On the other hand, land cover refers to the physical and biological features of the Earth's surface, including natural and human-made features such as forests, grasslands, water bodies, buildings, and roads. Land cover can be classified into diverse types based on their characteristics.

Human activities such as urbanization, agriculture, mining, and forestry can lead to changes in land use and land cover that can have significant impacts on the landscape and the services they provide to people. For instance, a building or landscaping project on a campus can still result in changes to the land use and land cover in the area, which can be considered as LULCC (Liang et al., 2012). Changes in land use resulting from development projects, such as the conversion of a natural area to a built-up area, or the conversion of a parking lot to a green space, can also result in changes in the landscape services provided by the area (Nuissl & Siedentop, 2021).

LULCC is considered as an essential first step to assist the identification of driving forces to landscape (Bürgi et al., 2007). Nowadays there is a growing body of research on LULCC and its impacts, and a number of organizations and initiatives are working to promote sustainable land use and conservation (Nedd et al., 2021). Development projects can result in significant changes to the land use and land cover in an area, which can have impacts on the environment and human well-being. Therefore, it is important to carefully consider the potential impacts of development projects and to implement measures to mitigate these impacts and promote sustainable land use practices (Roy et al., 2022). This study aims to understand and visualize the possible impacts of the planned campus development project on the surrounding area and

its users by mapping the land use changes in the Høgskoleparken area from now until after the project is completed. The results of this study will help in gaining a more comprehensive understanding of the effects of the CDP.

## 2.8. Conceptual Framework on Human Landscape Perception

According to Jessel and Tobias (2002) impression is the result of the interaction between two perspectives: the 'object perspective' and the 'subject perspective'. The 'object perspective' refers to the physical characteristics and features of the landscape, such as its topography, vegetation, and built environment. These features are objective, can be measured, and observed. This also refers to a way of understanding an environment or space that emphasizes its physical and tangible characteristics. It is a perspective that focuses on the objective, measurable aspects of a space, such as its size, shape, location, and physical features. viewing a space from an objective perspective, the focus is on the external and observable features of the environment to understand the physical and functional aspects of a space, such as its layout, materials, and design.

The objective perspective is contrasted with the subjective perspective, which emphasizes the individual and personal experiences of people within a space. The 'subject perspective', on the other hand, refers to the individual's personal and subjective experiences, emotions, and attitudes towards the landscape. These experiences are shaped by factors such as culture, experiences, and personal preferences. This also focuses on the meanings, emotions, and perceptions that people attach to a space, rather than its objective features.

The interaction between these two perspectives, the 'object perspective' and the 'subject perspective', leads to the formation of a perceived landscape impression. This impression is the individual's interpretation and understanding of the landscape based on their subjective experiences and the objective characteristics of the landscape. This conceptual framework suggests that the formation of the perceived landscape impression is the result of the interaction between the objective characteristics of the landscape and the subjective experiences and attitudes of the individual which offers different ways of understanding the same space, and both are crucial for obtaining a comprehensive knowledge of the environment.

**"Object perspective"**
Real constructed environment and landscape with image inducing components (e.g. relief, vegetation, water, utilization structures), as well as components of the social environment (other people, existing user groups)

**Visual landscape**
Assessable via criteria such as "elements" (diversity of landscape on the level of elements), "characteristics" (shape level as the expression of the individuality of the landscape), "character" (as the holistic impression of space)

**"Subject perspective"**
Beholder in his/her subjective state
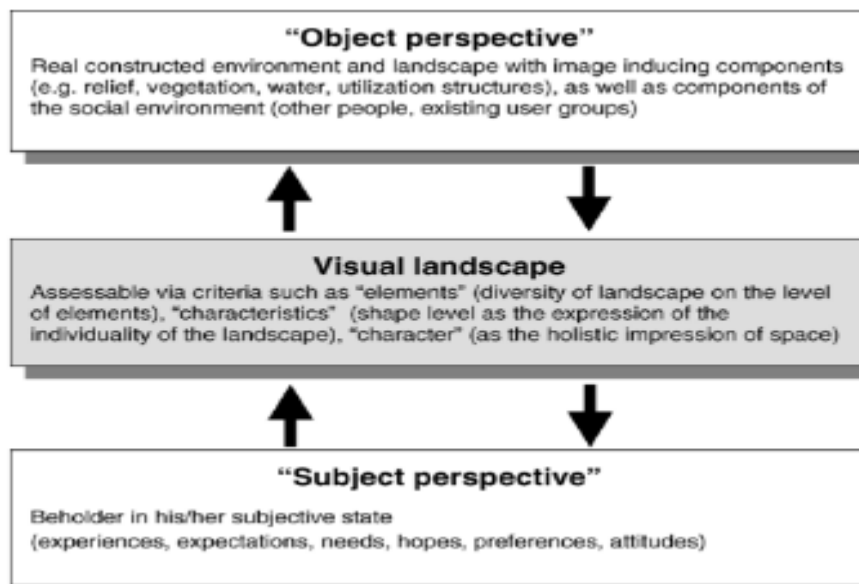(experiences, expectations, needs, hopes, preferences, attitudes)

Figure 2:1 Formation of the perceived landscape impression as a result of the interaction between the 'object perspective' and the 'subject perspective (adopted from Jessel & Tobias, 2002, p. 217)

In my thesis Campus green areas are considered the object perspective in this context this includes the physical characteristics of the green areas. On the other hand, users of the campus green areas, which are the students, employees and neighbourhoods bring in the subject perspective. This includes their subjective experiences, emotions, and attitudes towards the green areas of the CDP. Factors such as their previous and current experiences with green areas and personal preferences can shape their subjective perspective the objective and subjective perspectives also highlights the importance of considering the diverse opinions and experiences of different campus users when undertaking a CDP particularly in relation to changes in green areas. The interaction between the object perspective and the subject perspective of campus green areas leads to the formation of a perceived landscape impression. For example, the expected changes due to the CDP on green areas, a user may perceive a particular calming and relaxing because of the presence of green areas and a quiet atmosphere. Alternatively, another user may perceive the change on green areas as unwelcoming and inconvenient.

Therefore, the perceived landscape impression of campus green areas is formed through the interplay between the objective physical characteristics of the green areas and the subjective experiences and attitudes of the users. This interplay can help landscape designers and campus planners create green areas that are appealing and functional to the users and meet the needs and preferences of the users.

The conceptual framework described can also be applied to the methodology of this study, particularly using a mixed-methods approach that combines qualitative methods (as the subject perspective) to provide insight into the subjective experiences, attachments, and attitudes of the users towards the green areas in the CDP. The subject perspective can uncover how users perceive and experience the CDP, while GIS as the objective perspective provides objective data about the physical characteristics of the CDP. By combining these two types of data, a more comprehensive understanding of the campus green areas and their perceived landscape impression can be gained. Taking both perspectives into account, a more nuanced understanding of the perceived landscape impression of the CDP can be obtained.

## 2.9. Summary

In this chapter, I discussed how the application of systems theory could improve the integration, sustainability, and quality of landscapes. I also emphasized the importance of understanding the changing needs and preferences of users over time, as well as the complex interplay of factors that shaped the landscape. The chapter applied Theories of Landscape to understand the potential changes that might have occurred because of the CDP and how it could have affected campus users. The Place Attachment Theory discussed to highlight the importance of understanding how changes to green areas could impact users' place identity and place dependence. It also shows that the relationship between people and place, as reflected in the landscape, was a product of the interaction of the natural and cultural components of our environment. in this section further The CDP could have affected the sensory, emotional, and cultural experience of campus green areas for different users based on different factors Therefore, I argued that it was important to consider the diverse opinions and experiences of different campus users when undertaking a CDP, particularly in relation to changes in green areas. LULCC is also discussed an essential first step in identifying driving forces to landscape change, as this study aims to understand and visualize the potential effects of the planned CDP on the Høgskoleparken area by mapping land use changes. I also discussed in the final section of this chapter Jessel and Tobias (2002) the perceived landscape impression to interplay between the objective and subjective perspectives could help landscape designers and campus planners create green areas that were appealing and functional to the users and met their needs and preferences.

# 3. Methodology

## 3.1. Introduction

This section of the thesis presents a comprehensive outline of the study's research design and methods. It includes an explanation of how the study area was selected, a detailed description of the research design, sampling methods, data collection and analysis techniques, a plan for managing the data collected, and an evaluation of the methodological choices made. These components are all critical to the project and its outcomes. Additionally, a matching matrix of research questions, study participants, and data collection and analysis methods is presented, which illustrates how the project was designed to address the research objectives and issues at hand. The section provides a step-by-step description of the research process, beginning from the planning stage and proceeding through data collection, analysis, and the presentation of findings.

## 3.2. Research Design

It is widely understood that the type of research question determines the research design and method to be applied (Creswell & Creswell, 2017). According to Creswell and Creswell (2017), using a combination of qualitative and other methods provides a more comprehensive understanding of research. Combining qualitative research methods and GIS analysis can offer a powerful approach for exploring spatial relationships, patterns, and phenomena. By integrating qualitative data with GIS analysis, researchers can gain a more complete understanding of the spatial patterns and relationships that exist within a research area (Cope & Elwood, 2009).

Dunn (2021), also emphasize the advantages of qualitative methods, which involve exploratory research utilizing open-ended questions. These types of questions have the potential to elucidate participant responses that hold significance and cultural relevance, were unexpected by the researcher, and are detailed and explanatory in nature. Furthermore, the research design specifies the necessary data, the data collection and analysis methods, and how these will be used to address research questions. In this regard, I decide to employ a qualitative research methodology to explore and unfold the users' perspective and gain further insights into the campus users and probe them further on how the CDP will affect their lives. I am also inclined to use this method since it is one of the conducive ways of establishing rapport with my research subjects in a way that does not restrict them to be bounded by already stated choices of answers.

It is also a way of making them dwell into different points and ideas about the CDP. GIS data includes LULCC, information on the landscapes, resources, and events, as well as other environmental and social factors. Spatial patterns and visualization of landscapes allow for the creation of spatially precise maps and visualizations, which provide a clear and accurate representation of landscape changes over time (Michalak, 1993). GIS facilitates spatial analysis and allowing researchers to simulate and predict future landscape changes based on current trends and scenarios (Chung & Fabbri, 2003). Due to its unique feature of spatial patterns and landscape visualization, I find it necessary to address one of my research questions: "What are the expected landscape changes in green areas and parks during the implementation phase of NTNU's CDP?" While qualitative methods can provide valuable insights into people's experiences and perceptions of landscape changes, GIS analysis is preferred for its ability to provide precise, quantitative measures of landscape change and its capacity to analyse complex spatial data sources (Michalak, 1993).

## 3.3.   Decision on the Selection of the Study area

There are two contexts that have drawn my attention to develop an interest in working on CDP and specify the research topic. To begin with, I was writing my thesis about the socioeconomic impacts of water hyacinths in Lake Tana, Ethiopia. However, due to the ongoing war in Ethiopia's northern region, I was not able to gather first hand data from my study area. As a result, NTNU has restricted fieldwork in Ethiopia's northern region in accordance with the Ministry of Foreign Affairs (Regjeringen.no). Due to this coincidence that happened in December 2021, I had to search for alternative research areas to develop my master's thesis. While looking for alternative research areas, I came across a Facebook research call posted by "Fremtidens Campus" or "Campus of the Future" to do research related to the CDP. Fremtidens Campus is a research and development program that follows NTNU's work with CDP. It is founded and administered by NTNU Social Research. A key objective of this program is to encourage students and researchers to work on topics and research related to the NTNU CDP, mainly on issues that facilitate its implementation. Thus, I find it indispensable to work on topics that benefit my academic career, NTNU, and the Trondheim Municipality as it provides remedies to the challenges of implementing the project. On top of this, I believe it is necessary to investigate the modifications in green areas and users' perceptions of the benefits and challenges of these changes once the project is finalized. This examination of landscape changes is timely and relevant to academic research.

Secondly, the workshop in Studio KAMD, which I attended with 65 architecture students and 20 participants from different academic backgrounds, broadened my understanding of the project and its dimensions, as well as the areas of concern by implementing stakeholders. This workshop maximized the feasibility of my research area. The concerns of participating students about the greenery and biodiversity implications of the project and the ways in which the design integrates these issues helped me to identify the research or knowledge gap from the natural resource management theme and geographical perspectives. Furthermore, on this day, the project advisor's tour presentation on the buildings through a historical lens and the future of the campus collection project assisted me in deciding on the specific study site on the parts of Høgskoleparken area. Additionally, I was active whenever I saw public hearings about the CDP, and one of the discussions in the events with planners from Trondheim Municipality also enabled me to ground the study within the dimension of the project. By attending open office days for the CDP, participating in public hearings, and engaging in debates organized by Trondheim Municipality, I was also able to access study participants for my research. Furthermore, my positive rapport with Trondheim Municipality facilitated my field entry to research neighbourhood concerns about landscape changes resulting from the relocation and development of NTNU campuses.

The selection of a specific study area is crucial to address the challenges of deteriorated green areas and landscapes that have visible effects. In this context, one of the five sub-areas called sub area 2 for NTNU CDP, namely Høgskoleparken, has been chosen due to its significant importance for city and outdoor life, its size, and its several experience qualities (Asplan Viak, 2021; Kommune, 2022). Moreover, the area is used as a sledding area for children in winter and provides an exciting play area for unorganized play all year round. Due to the lack of traffic, the area is considered a safe place for children to play, and its favourable lighting conditions and picturesque views make it an ideal location for passive activities like grilling, dining, reading, relaxing, and contemplating (Asplan Viak, 2021).

## 3.4.  Study Area

In Trondheim, parts of Høgskoleparken are one of the five sub-areas called Sub-area 2 for NTNU CDP. Sub-area 2, Høgskoleparken is located in sloping terrain between the Gløshaugen plateau and lower-lying buildings towards Elgeseter gate in the east, Høgskoleveien, and Christian Fredriks gate in the north. The Sub-area 2 parts of Høgskoleparken hold significant importance for city and outdoor life, both because of its size, but also because of its several

experiential qualities. Furthermore, the park area serves as a major route for pedestrians and cyclists (Kommune, 2022).
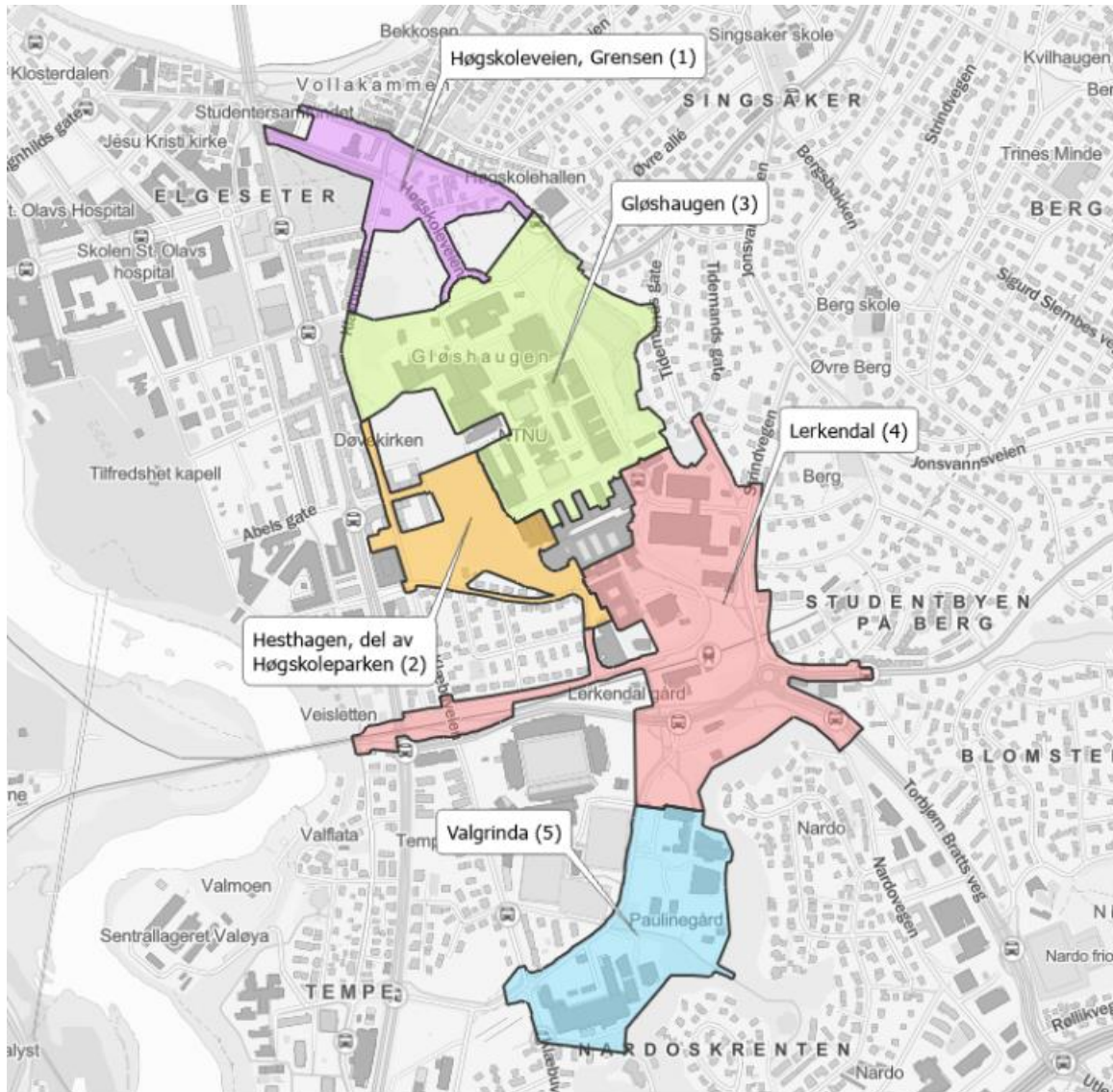


 Figure 3:1 Five planning areas will be regulated for NTNU's campus collection (NTNU, n.db).

The above figure 3.1 shows the planning delimitation of the external geographical framework for the zoning plan work. Høgskoleparken is divided into the following three sub-areas: 1. Vestskråningen 2. Høgskolehagen 3. Elgeseter park. The entire Høgskoleparken is a transport route for students and staff at the University, as well as for cyclists and pedestrians to and from the city centre. Moreover, the park area is usually used by walkers, dog walkers, and runners from the surrounding areas. It is also used for events associated with NTNU, and the landscape supports the experience of Gløshaugen as a symbolic "Castle of Knowledge" (Asplan Viak, 2021).

Apart from this, the park is a thrilling area for children and young people, which is used as a space for free play and life development that also provides insights into everyday nature. The area is bounded by the Gløshaugen plateau with the university area in the east, and towards residential buildings and some industry in the west. The area is long and narrow, and due to the height difference, the steepest parts of the park are in this part. The western slope has varied vegetation that contains both forest areas with undergrowth, as well as open lawns with free-standing trees (Asplan Viak, 2021; Kommune, 2022).

## 3.5.  Sampling Techniques and Selection of Study Participants

As noted previously, I have selected parts of Høgskoleparken as the study site. Project stakeholders, including NTNU students and employees, neighboring communities, and people from Trondheim Municipality who have been involved in the CDP, have purposefully been chosen to participate in this research. This purposive sampling of study participants was necessary to select those who will be affected by changes in campus area development and users of parks and green areas in the Høgskoleparken area. The interview with Trondheim Municipality was conducted mainly to understand how the municipality evaluated the extent to which the project would contribute to the sustainability targets of the city.

Convenience sampling was used to select students and employees while they were studying, playing with friends, and parking their cars on the ground. Participants were also recruited from the stakeholders who came to see the proposed plan and participated during the open office days and hearings arranged by Trondheim Municipality. This sampling design allowed me to access users who could not be identified otherwise (Bryman, 2012). The neighboring communities were chosen through snowball sampling due to the challenge of accessing local individuals without the aid of networking and building trust with the first person in the neighborhood. However, following a phone conversation with the representative of the neighbors, they referred me to use the documents they had been sending to Trondheim Municipality and granted me access to those documents. As a result, I used these documents to capture their perspective on the CDP based on their recommendations.

Snowball sampling, also referred to as chain-referral sampling, is a non-probability method of selecting a sample in which individuals are chosen based on their possession of unique or uncommon characteristics (Goodman, 1961). The researcher chose this sampling technique

because it is believed that tracing and finding study participants is not easy without communicating with different individuals. This sampling technique was suitable for this research because valuable data could be gathered by selecting respondents who have practical knowledge and important experience related to the study (Parker et al., 2019).

During my data collection, I conducted a total of ten individual and group interviews with different informants. Participants in the study came from the Gløshaugen and Dragvoll campuses of NTNU. All these students currently live or have lived in close proximity to sections of Høgskoleparken as well as sections of the surrounding communities. Participants included employees from NTNU, employees from Trondheim Municipality involved in the CDP was also among the participants.

## 3.6. Data Collection Methods

### 3.6.1. Primary and Secondary Sources

According to Creswell and Creswell (2017), primary sources are original materials that provide direct evidence or first-hand accounts of an event, person, or subject. They include interviews, surveys, and raw data, and are usually created by witnesses or participants in the event or subject being studied. On the other hand, secondary sources are works that interpret, analyse, or summarize information from primary sources. Secondary sources include textbooks, scholarly articles, biographies, and historical analyses. These sources rely on primary sources to present an interpretation or analysis of the information, rather than presenting first-hand evidence or direct accounts of the event or subject.

Primary sources of information were used to gather first-hand information from selected samples of respondents, including students, employees, and experts from Trondheim Municipality who are involved in the CDP. In order to complement the data from the interviews and to uncover the neighborhood's perspective about the CDP, letters and report documents that have been discussed by the neighborhoods in Subarea 2 were mainly used. Secondary data added information about the perspective of landscape changes due to the CDP at NTNU. The sampling in this case was purposive, and it included texts from NTNU's website as well as texts from digital news outlets focusing on issues related to the CDP. In some cases, these documents were used to describe background and context about the CDP, but a few were also used as data. The documents used as data to unfold the perspective of the neighborhoods are listed in Table 3-3. This thesis also employs secondary data to supplement the analysis where

necessary to strengthen or challenge it. Secondary data was used to see what previous studies have found out and to identify gaps about the CDP and landscape changes on CDP. Useful secondary sources were consulted to make this research more valid and useful.

### 3.6.2. Semi-structured Interview

Semi-structured interviews were conducted with NTNU students, employees, and Trondheim Municipality to examine their perspectives about the CDP on the landscapes in the green areas of the study area. Semi-structured interviews were useful as they enabled the participants to articulate their perspectives and opinions about the CDP with some opening questions. I established a friendly space and obtained their trust by participating in events and giving my insights to the hearings, which helped minimize the power difference, and the interviewees were able to express their perspectives freely without any influences (Dunn, 2021). I did not provide any comments or influence on their views during the interview process, except to probe some points for which I wanted a detailed description. To supplement more data, I conducted group interviews with students and people from Trondheim Municipality, which is presented in the following section of this thesis.

### 3.6.3. Group Interview

Group interviews can help stimulate discussion among participants, leading to a more in-depth exploration of a topic (Gaskell, 2000). Group interviews were conducted with NTNU students and Trondheim Municipality to explore their views on the manifest function and unintended consequences of the project on the green areas of the project site. They allowed me to obtain group perspectives that were not addressed by individual interviews. The collective thoughts from group interviews contributed to the current study, unlocking contradictory views. The discussions I had with both groups provided an opportunity to obtain their suggestions on how some of the changes in the landscape would be managed.

Both group interviews carried out for this thesis were initiated by the corresponding informants. They preferred to participate in the group interviews with their colleagues, as they believed it would enable them to better reflect on the questions being asked and debate topics that were more pertinent throughout the interview. The groups consisted of triads of four students and two individuals from Trondheim Municipality. I ensured that everyone had an equal opportunity to share their opinions, allowing me to obtain authentic opinions from the participants.

## 3.7. Geographic Information System and Remote Sensing Techniques

GIS can be used to examine land-use changes by comparing different geographic layers over time, which enables the identification of spatial patterns and trends (Michalak, 1993). According to Cheong et al. (2012) in the field of land change research, GIS methods are advantageous in combining both qualitative and quantitative data due to their multiple tools for seamless integration and visualization. This approach visually highlights the integration, which is not as straightforward in other areas of research. GIS method has been used to identify the landscape changes in green areas as a result of the CDP. The outcomes from this landscape analysis were essential to specify the changes that would happen while the project is being implemented, and this will enable me to identify the landscape components in the study area. GIS is employed to know green areas; the areas that will be changed to build up, i.e., built environment, roads, or used for other purposes; and green areas that will be preserved the same as their existing landscape.

The remote sensing technique is used to generate a map that visualizes the potential changes that will occur once the CDP is implemented. The map is also being used to gather input from study participants on the likely changes to the current state of the landscape. During data collection, when informants are unclear about the illustration plan, maps are used to show them. One map shows the existing landscape of the project area, while the second map illustrates the changes based on the designed plan of the CDP. To create the map, remotely collected data and a Landsat satellite image are being utilized, applying classification and GIS analysis techniques.

To assess LULCC in a specific area, researchers typically use a combination of remote sensing data, GIS, and field observations (Fonji & Taff, 2014). This approach involves comparing satellite imagery or aerial photos taken before and after a development project to identify changes in land cover and land use and using GIS software to map these changes This will help to validate the findings and gather additional data on the impacts of the development project (Treitz & Rogan, 2004).

Remote sensing is fundamental in analysing LULCC since it offers researchers the capability to observe changes in land cover and use over time through satellite and other data sources. Through remote sensing techniques, researchers can obtain valuable information on the spatial

and temporal trends of LULCC, as well as the factors that drive these changes (Hassan et al., 2016; Turner et al., 2007). Remote sensing also allows for more precise and detailed monitoring of changes in land use and land cover over time (Lambin et al., 2003). The classification system used in LULCC analysis is designed to be adaptable to different remote sensing data sources, providing greater consistency and comparability across different datasets (Anderson, 1976). For this study Norway's national mapping authority, Kartverket, offers a broad collection of geodatabases and shape files through their platform, Geonorge.no. The latest orthophotos of Trondheim municipality from 2022 provided by Kartverket have been used as the base map to differentiate between the different land use types in the study area.

Table 3-1 Matching of research questions, research participants and data collection methods.

| Research questions | Research participants | Data collection methods | Data analysis methods |
|---|---|---|---|
| What are the expected landscape changes in green areas and parks during the implementation phase of NTNU's CDP? | | GIS, remote sensing by using Orthophotos. and ArcGIS Pro software | Unsupervised classification |
| Why is the green area important for the study participants? What are the perceptions of participants regarding the benefits and challenges of the CDP? | Students, Neighbourhoods, Employees, Trondheim Municipality | Semi structured interview, Group interview, Document analysis | Thematic analysis of interview transcripts and Document analysis |
| How can users' involvement ensure sustainability in the NTNU CDP? | Trondheim Municipality, Employees | Semi structured interview, Group interview, Document analysis | Thematic analysis of interview transcripts and Document analysis |

The table above presents the primary matching of research components: research questions, research participants, and data collection methods to outlines how the research questions align with specific data collection methods and the participants from whom the data will be collected.

However, it is important to note that the research questions were also discussed with other research participants under specific conditions. This was done to ensure that the research questions were explored from a variety of perspectives, and to capture a more comprehensive understanding of the research topic. The specific conditions of these discussions were the participants' backgrounds, areas of expertise, and the types of questions that were asked.

Table 3-2 Description of research participants

| Type of Interview | Affiliation | Background | Place where interview held |
|---|---|---|---|
| Group Interview | Trondheim Municipality | Employee and involved in the CDP | Bøker og Bylab |
| | | Employee and involved in the CDP | Bøker og Bylab |
| Individual | Trondheim Municipality/ NTNU | Employee that involved in the CDP | NTNU Gløshaugen campus |
| Individual | Trondheim Municipality | Employee and involved in the CDP | Bøker og Bylab |
| Group Interview | NTNU | Student and living in the CDP neighbourhood | NTNU Gløshaugen campus |
| | NTNU | Student and living in the CDP neighbourhood | NTNU Gløshaugen campus |
| | NTNU | Student | NTNU Gløshaugen campus |
| | NTNU | Student | NTNU Gløshaugen campus |
| Individual | NTNU | Student | NTNU Dragvoll campus |
| Individual | NTNU | Employee | NTNU Gløshaugen campus |

## 3.8. Data Analysis Methods

According to Dunn (2021), selecting an appropriate method of analysis is a critical decision for researchers embarking on a qualitative study. There are various analytical methods in qualitative research, each of which provides distinct insights into the research question at hand. Cope and Kurtz (2016), the process of qualitative analysis entails the interpretation of data and identification of themes in order to gain insight into the phenomenon under investigation.

Prior to analysing the audio-recordings of a participant's account, it is necessary to transform the recordings into transcripts, which is a time-consuming task. The views and opinions of

study participants were represented through this tool of analysis. Transcription is more than simply converting audio-recordings into written text forms; it involves many challenges (Bryman, 2016). The data was reviewed and then deconstructed by categorizing and coding the transcriptions. According to Forman and Damschroder (2007), empirical codes are generated through a process of close reading and analysis of data, capturing specific details or characteristics. In this study, empirical codes were used, emerging directly from the data itself rather than being predetermined by the researcher (Kelle, 2007; Linneberg & Korsgaard, 2019).

During the process of coding, various new codes surfaced from the transcriptions and documents. To streamline and reduce the number of codes, categories were generated to represent broader themes. Thematic analysis, a widely adopted method for qualitative data analysis, was used (Bryman, 2016; Cope & Kurtz, 2016), was employed to derive meaningful findings from the participants' perspectives.

The study used categorizing, codifying, and drawing conclusions to develop the themes of "social activities, users' priorities, sustainability, and risk minimization." The process of thematic analysis enabled the research objectives to be addressed, with the larger themes identified serving as the basis for the subsequent findings and discussion as suggested by Attride-Stirling (2001).

### 3.8.1. Organizing Coding and Themes

Coding

The coding process can be performed using computer programs designed for that purpose, or simpler tools such as pen and paper (Cope & Kurtz, 2016). During my thesis, I used Microsoft Word and Microsoft Excel, which I was already familiar with. Considering the amount of material, I believed that implementing an advanced program that would require time and resources to learn would be inefficient. As a result, the process itself was more manual, but this was an advantage because I gained a thorough understanding of the data material as stated by Cope and Kurtz (2016).

During the coding phase, I engaged in a thorough examination of the transcribed data, reviewing each line and identifying significant analytical units and code themes. Within each category of thematic areas of interview transcripts, I grouped together those codes that pertained to the same information. For example, these empirical codes were "Exercising vocals, playing music, hanging out, sliding on hills, Using Park for sun and shade, Using Park for

parking, Using Park for recreation, Using park for relaxation, Using park as a teaching tool, Using park as a research tool, Using park as a meeting space, Using park as a place to move and exercise, Using park as a place to find peace"

Themes

During the analysis process, I grouped the code categories together to form a smaller number of parent categories. According to Tjora (2018), this helped me to explore the relationship between empiricism and theory in the thesis. I then reviewed these code groups once more and grouped them in a way that made it easier to select the main themes that will present the project's findings. This step was more analytical and moved away from a purely empirical focus, allowing my choices to have a greater impact on the further design of the analysis. After determining the code groups, I reviewed them again and designed the main themes. For instance, I used the codes from the previous step to identify and group related themes. One of the themes I identified was "Social Activities". Among the themes I identified such as sustainability and risk minimization were also grouped into larger themes. These themes provided the basis for the findings and discussion section.

Steps of data analysis

Throughout the data analysis process, I try to conceptualize and understand my data by listening to the recorded audio, transcribing it, and reading through it to think about how I categorize, analyse, interpret, and draw conclusions. I annotate the transcripts and carefully read and understand each step of the analysis, taking a grounded approach to segment the data based on similarities in views, ideas, and perceptions related to research questions, themes, and concepts. While segmenting the data, I look for subcategories, relationships, and cause-effect. To analyse the data, I produce descriptive reports step by step and go through them until they give me meaning. I provide summaries and concluding remarks at the end. As noted in the above codes and theme segmentation, I link each theme with concepts and theories as the principal components to establish a foundation that helps me interpret the data and propose explanations.

The selected theories which area elaborated on chapter two helped me provide new insights into and ways of understanding an issue related to development and green areas effects on surrounding communities, campus users, and students. This increased the credibility of research findings and facilitated the development of new concepts and their generalizability as stated by Leung (2015). I also linked the empirical studies with my thesis findings and the

selected theories. I relied on concepts and theories to substantiate my data. This supported and confirmed the study findings, showing what has been done before on the ground, what my findings looked like, and what theory says about them. Figure 3.2 shows an example of how I analysed the data from my excel workbook, with themes in one column, different informants represented by colours in the next column, and the corresponding statements of the informant with empirical codes in the third column.



Figure 3:2 Exported from Excel workbook with empirical codes/code categories. Colours represent different informants.

### 3.8.2. Document Studies

To generate data for this research project, interviews were the primary method used. However, additional data was also collected from various documents, as indicated in Table 3-3, While most of these documents were originally written in Norwegian, I used translation applications to ensure that the original meaning was preserved.

Table 3-3 Description of documents reviewed

| | Document Type | Modified Date |
|---|---|---|
| 1. | Planning program Input-1 Folkeaksionen | 2018-04-04 |
| 2. | Planning program Input-2 Folkeaksionen | 2018-05-13 |
| 3. | Note connections without buildings for the entire campus | 2018-11-09 |
| 4. | Letter to Byplan | 2020-08-18 |
| 5. | Folkeaksionen's input to Statsbygg's Alternatives in partial rezoning | 2021-02-22 |
| 6. | Inspill Framtidsbilder 2050 from Folkeaksionen Bevar Høyskoleparken | 2019-10-15 |
| 7. | Record VPOR city campus | 2019-01-21 |
| 8. | Alternative assessment - summary of comments on input received Subarea 1 and 2 | 19-10-2021 |
| 9. | Input to the Planning program for the combined campus in Trondheim - public inspection | 4-04-2018 |
| 10. | WSP Norge AS, on behalf of NTNU and Trondheim Municipality | 13-5-2018 |
| 11. | Letter from the People's Action Preserve the University Park | 17-8-2020 |

### 3.8.3. Steps for Land Use and Land Cover Change Mapping

To map and show changes in the study area, several steps were undertaken using ArcGIS Pro software. The first step to map the current landscape of sub area 2 (Høgskoleparken) was to open the orthophoto from Kartverket in ArcGIS Pro, which is a raster data. The raster was then clipped using the study area polygon that represents sub area 2. An unsupervised classification with the default schema was applied to the clipped raster. Next, the raster was converted to a polygon, and unique values were selected for the symbology. The field name was set to class name, and classes such as Buildings, Grasses, and Trees were named. Finally, each polygon

was manually corrected for its class by checking the attribute table to ensure that the class name was correctly classified. If necessary, the class name was compared with the orthophoto and imagery-based map to confirm accuracy.

To create a future illustration map of the CDP in the study area, I received shapefiles that contained the geometry for the illustration plan for sub-area 2 from Asplanviak. These shapefiles were then applied to the orthophoto using ArcGIS Pro software. This allowed for the LULCC to be visualized both as it currently exists and as it will exist after the completion of the CDP. By combining the shapefiles with the orthophoto, a map was created that illustrates the proposed changes in land use and land cover for sub-area 2.

### 3.8.4. Triangulation

The purpose of using triangulation in a study is to increase its validity and reliability by utilizing multiple approaches, data sources, theoretical perspectives, and observers to better understand and explain the intricacies of human behaviour. Triangulation helps researchers to gain a more comprehensive and accurate understanding of the phenomenon under investigation by combining various perspectives and data sources (Bryman, 2016).

 As Cohen et al. (2017) explain, triangulation is an attempt to provide a more comprehensive understanding of human behaviour by studying it from different viewpoints. Researchers can enhance their confidence in the accuracy of their findings and gain a deeper understanding of the phenomenon under study by merging various viewpoints and data sources. Triangulation is a powerful tool that can help researchers to strengthen the rigor and validity of their study (Cohen et al., 2017).  In this study, triangulation involves using multiple methods and data sources, such as interviews, relevant documents, and GIS analysis, to obtain a thorough understanding of the CDP landscape and users.

### 3.8.5. Challenges in Methodology

The CDP project faced several uncertainties and disputes, particularly concerning budget reduction, which hindered the viability of the CDP concept, causing oscillation in the CDP plan. Language barriers also posed a significant challenge, as most of the information and documents are in Norwegian, necessitating the use of translation applications that produced some inaccurate translations, which challenges the study's scope. Despite starting the project before significant changes, the CDP underwent significant transformations during the study period due to budget cuts, affecting the project's direction.

Moreover, the mapping process using ArcGIS Pro was daunting, with overlapping and extensive data that made it difficult to identify shapefiles. Additionally, the data being in Norwegian required assistance from a friend and translation applications like Google translate to ensure full comprehension of each line, leading to a delay in the mapping process. There were limitations in accessing the data for the planned CDP, requiring contacting multiple parties such as Trondheim Municipality, AsplanViak, NTNU, and Statsbygg, which made the process challenging. Despite these challenges, the study's objectives were achieved through perseverance and the use of various resources, resulting in valuable insights into the research topic.

## 3.9. Ethical Considerations

### 3.9.1. Informed Consent and Anonymisation

It is important to note that obtaining informed consent from study participants is an ethical requirement in research (Dowling, 2005). In this study, informed consent was obtained from participants through both oral and written means before their participation. It is also commendable that participants were given the freedom to withdraw from the study at any time without giving any reason, and the information they provided was kept anonymous to protect their privacy. However, oral consent may not be as legally binding or robust as written consent. It is therefore recommended that researchers obtain written consent whenever possible, as it can provide a more secure and legally binding record of participants' agreement to participate in the study (Hay, 2016).

Dowling (2016) asserts that anonymizing informants is crucial to alleviate the burden of participating in research projects. In my study, I opted to conceal the participants' identities to encourage them to speak openly about their experiences related to the CDP. Anonymity can also serve as an effective tool to reduce the reluctance of individuals to participate in such research. Prior to the interviews, the participants were informed about the study's purpose, who will have access to the collected data, and their rights as informants. This is a crucial aspect of scientific projects that collect, and process data related to individuals. However, it is important to note that complete anonymity can be challenging in geographically limited study areas and specific projects like CDP therefore, it is important to be careful when using parts of interviews to support the study's finding to minimize the possibility that people associated with the place may recognize certain individuals or situations described in the interviews.

### 3.9.2. Subjects and the Intersubjective

Dowling (2016) argues that personal opinions are a natural part of qualitative studies because data collection and meaning interpretation happen through interactions with others. The relationship between subjectivity and intersubjectivity is important to consider in qualitative research, as it can impact the interpretation and analysis of data and, consequently, influence different phases of a research project. This interplay between subjectivity and intersubjectivity contributes to the construction of a shared understanding of phenomena. In my research project, this is demonstrated through several instances, such as developing interview questions in consultation with my supervisor and discussing interview topics with CDP users.

### 3.9.3. Harms and Benefits

No psychological or physical harm occurred to any of the participants during this study. Interviews were conducted at a time and place convenient for each participant and were arranged through prior email communication and discussions. The insights gained from this study are intended to inform the ongoing CDP, highlighting the views of users, and drawing attention to important considerations for the project's implementation phase.

### 3.9.4. Privacy and Confidentiality

The privacy of the participants was respected and protected from any potential risks. The personal data and views they provided are kept confidential as stated in the NSD protocol.

## 3.10. Self-reflection

As I reflect on the process from the start until the end of this study, I would describe it as an intensive learning period. I realized how subjective qualitative research can be and felt incredibly fortunate to have had Berit as my supervisor for this thesis. She has been patient and encouraging throughout the process. During my thesis, I not only gained an understanding of research but also of what NTNU represents in a practical and specific manner.

I would like to note that interdisciplinarity was a key aspect of this research project, given that I am from Ethiopia and my supervisor is from Norway. This collaboration presented a valuable opportunity for me to learn and consider different perspectives, approaches, and practices, which are shaped by diverse knowledge gaps and backgrounds. I have also engaged in regular discussions with my supervisor and have considered the possibility of consulting with colleagues from my home country for additional perspectives. Overall, I believe that the

collaborative and reflective nature of this research project has contributed to my development as a researcher and increased my awareness of the importance of cross-cultural collaboration in advancing scientific knowledge.

Furthermore, I would assert that the CDP is a highly localized project from my perspective, necessitating stakeholder presence. Nonetheless, I am pleased to have had the opportunity to participate and contribute from an external perspective. In conclusion, it was a gratifying experience to explore and investigate the implications of NTNU and the CDP.

Next, I will present and analyze the study's findings in the following section.

# 4. Findings

## 4.1. Introduction

As presented in the methodology part of this thesis employees, students, neighborhoods that are near to the development areas and Trondheim Municipality were the participants in this study. When analyzing data and presenting the findings it is important to remember that each of these stakeholders has their own needs and priorities. Trondheim Municipality aims to develop the city sustainably, and the CDP is viewed as a crucial step in achieving this goal. However, neighborhoods and employees may have differing opinions on the matter. While some may support the CDP, others may wish to retain the current parking and green areas, which are proposed for development under the CDP. It is possible for employees to be in favor of city development while opposing the CDP. For instance, an employee may argue that although the CDP could benefit the city, it would have a negative impact on them by reducing their access to parking space.

In this context this chapter presents the findings from the interviews with CDP users and the review of documents produced by the neighborhood while attempting to preserve the university park (Folkeksjonen Bevar Høyskoleparken). The focus of these documents are CDP developments in the Høgskoleparken area. Additionally, this chapter presents the results of LULCC on the study area. The main findings of this study involve the users and stakeholders' perspectives on the CDP that include the benefits, drawbacks, and sense of the place attachment. This chapter is split into five main sections identified through the data analysis as particularly interesting with regards to my research questions. The sections discussed in this chapter are interrelated, however they are each discussed as standalone and can draw upon the insights of other sub sections to provide an objective perspective. The following figure 4:1 illustrates the overall structure of the main findings and subsections from interviews and documents discussed in this chapter.
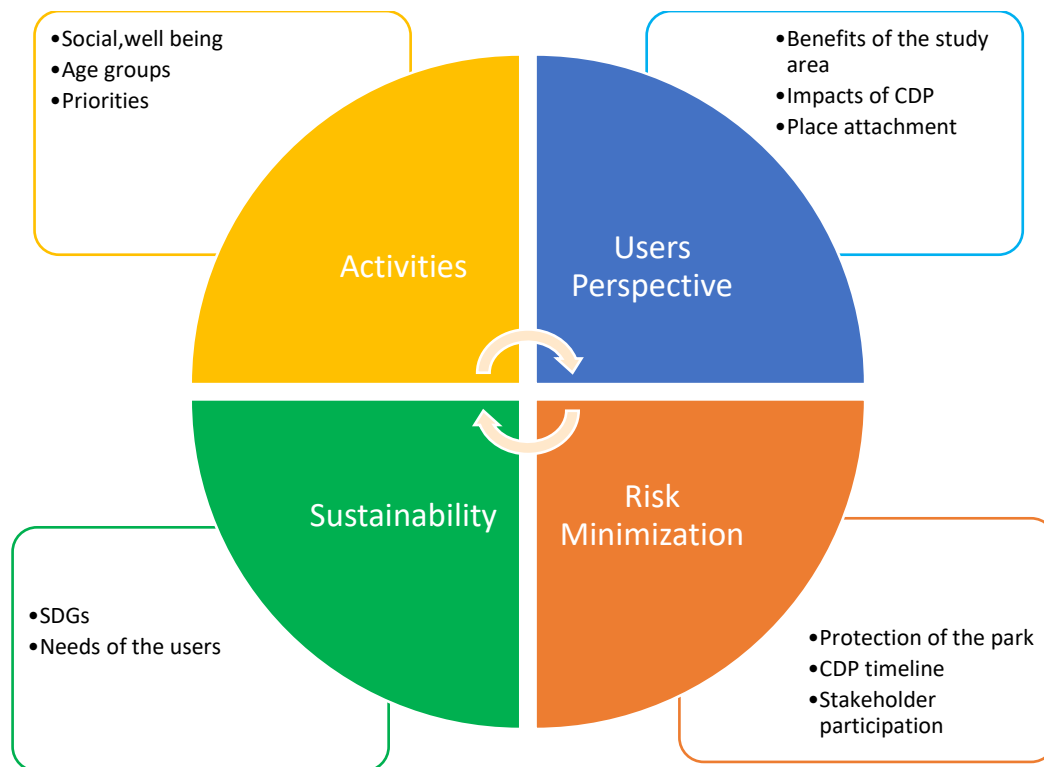
Figure 4:1 The structure of the findings

Referring to Figure 4.1 above which is the structure of the findings. The next section therefore provides a description of activities that were performed in the green area.

## 4.2. Social Activities and Users' Priorities

The study revealed social activity as an important aspect of green areas, which were used by various groups of people. However, It is a common thread that connects all users of these areas. It is not unusual to see group activities taking place in these areas. I have observed groups of people using the green areas for activities such as vocal exercises, music playing, and having fun with friends, particularly on weekends and during off-class hours. Interviews revealed that most people enjoy entertaining themselves and others through their activities.

An employee informant noted that "People around here are dependent on the parking because we come like for 40 kilometers away." This shows that employees have priority concerns about the activities in the parking lot. Meanwhile, according to the data obtained from a group interview of students, the study area provides different opportunities and experiences depending on the season. In the summer, the park is a popular spot for sunbathing and social activities. The informant from the students described the green area's summer atmosphere as "Very lively and energetic environment" In the fall, the changing colors of the leaves make it

a beautiful place for a walk or meet outside. During the winter, the green area is also ideal for children sledding.

The study area amenities cater to people of all ages. Informants (Students and neighbourhoods) highlighted how children can enjoy the playground and parents can relax in the park while watching their children play. The green area is also popular among students for social activities. For students the area gives the timeless nature of some recreational pursuits and their ability to bring joy to people of all ages. A student interviewee said: "We were just hanging out outside, and, in the winter, we used the hills and to slide. Also, we see that children use it for sliding during the winter until now." The narrative above is consistent with the following quote from the group interview of neighboring resident students:

> "It's very nice to look at the afternoon sun in the park; a group of people also come and sit, playing music, and having fun with friends especially over the weekend and during off-class hours it's one of the major parks for social activities in Trondheim except for Festningen."

The use of the green areas by the community, particularly during winter, clearly reflects the importance of the place for both students and neighboring communities. Though such insight has been provided by the students who might only use the place for a few years of their education, when it comes to children in the neighborhood it's a place where they spent their day to day activities and childhoods. Explaining this A student interviewee who has childhood memories in the area mentioned that "it is quite common to see children engaged in activities around the park, especially during weekends." In an interview with a student, it was discovered that children in the area frequently engage in recreational activities in the natural setting during weekends. This suggests that the area serves as a vital space for play and leisure, and children may feel a strong emotional connection or attachment to it. Similarly, as noted by one of the residents of the neighborhood:

> "The university park is for pleasure and benefit, and as a living laboratory for teaching, play and recreation; we also need green parks, airy urban spaces, and proximity to attractive outdoor areas where we can meet, move, and have fun or find peace in everyday life."

In the following paragraphs, I will describe the perspectives of users regarding the green areas and the impacts of the CDP.

## 4.3. Users' Perspectives

The CDP can signify a variety of things depending on who is using it. Each user of CDP owns a unique level of comprehension, and as a result, each of the CDP's practices and attachments carries a special significance for each individual user. This can be interpreted in diverse ways depending on the perspective of the user. This sub-section therefore discusses the benefits of the green area and the positive and negative impacts of CDP on green area and place attachment of users.

### 4.3.1. Perspective on the Benefits of the Green Areas in Høgskoleparken

Place of Sharing

The data obtained from the group interview with students indicate that the Høgskoleparken area is a place where every student can meet without having to make an appointment. This means that anyone attending school on the campus can meet at any time they choose. According to these participants the green areas serve as a place where students meet, share, and learn. The group interview participants agree that any significant changes to the green areas would have a negative impact to less socialize to the people around and students. Figure 4:2 below shows people engaged in individual and group activities, which may not be possible in a residential community where only a small group of residents participates.



Figure 4:2 People with their private and group activities (Høyskoleparken, 2018)

In contrast to the group interview with students, the group interview participants from Trondheim Municipality explained the role of the CDP and expressed their belief that the CDP change on the green areas would benefit the green area as there will be modifications, which would make it more attractive and comfortable for users. During sunny weather and lunch breaks, student participants have utilized the parks to relax. The beautiful, green landscape of the area made them develop the habit of walking around the green areas, which they say may

have resulted in positive health benefits. The physical movement around the greenery areas refreshes the mind of the employees and students, encouraging them to be active in their work and get relief while they get out of the locked physical settings of their offices and classrooms. One might link this with the all-encompassing sustainable future goal of Trondheim city by making these places comfortable for work and mobility. Most of the student participants prefer to engage in activities such as walking, talking, eating, and reading in the park, particularly in the afternoon. The lack of high-rise buildings allows for the sunlight to reach the ground and the people using that area.

## Social Gathering and Learning

People are making a daily habit out of playing and walking in the greenspaces, furthermore it is a public place where people socialize. One can draw from this that the importance of green areas is that they are not private places. Private places can be polarized. Public spaces are important as they are where people share views and experiences, and they are not monopolized by one in-group or corporation. These places are more than areas of recreation, they are stages where people learn and relearn and are essential in the local population's daily interactions with sunlight. The experiences in Norway demonstrate how ample sunlight can have a positive impact on health, well-being, productivity, and sustainability. This highlights the benefits of sunlight and how it can improve different aspects of life, especially during the extended period of sunlight in summer.

Student participants highlighted the green areas of the park have a role in social gatherings, including the important introductory period of new students, known as "Fadderuka," where grilling and consuming alcohol is standard. Another important role identified, those places serve as the place for 'self-isolation', where they detach themselves temporarily from their friends, class and even working environments. This draws one's attention to the psychological wellbeing of users which may be improved by utilizing this space. This is particularly important in academic environments where psychological stress may be brought about because of engagements in difficult subjects, dense readings, and long office hours. The green areas are not only places for adults but also for children. The documents and the interview findings from the group interview indicate that families and their children were playing by sledging on the snow during the winter on the hill.

### 4.3.2. Perspectives on the Impact of CDP on Green Areas

I have discussed the participants' perspectives on the opportunities and challenges and perceived measures associated with the CDP's impact on green areas. The participants were questioned about their views, and the following sections summarize these findings.

Opportunities

Users discussed that the green area provides benefits, including opportunities for exercise and relaxation. They have continued to mention that the green area offers aesthetic value. Student participants noted that the green area has implications for their teaching and learning experiences. That is, according to them, they have used the green area as a location where they relax after classes and ready for the next sessions and to have a refreshed mind and active participation in the class. In a similar fashion participant from the neighborhoods strongly argued that their daily life in one way or another was connected to the green area. Because it was a place where they interacted with others, form friendships and shared their experiences with others. According to interviews conducted with participants from Trondheim Municipality, the CDP helps address the sustainability challenges facing Trondheim. They were concerned about the city's growth, the concept of a connected and unified city, and campus accessibility. They viewed the CDP to help solve these issues.

According to the participants from Trondheim Municipality, the users might miss some of the landscapes that were being used for different purposes. Alongside the merging, the CDP plan in the study area allows, in one or another form, new buildings in the area (See the proposed plan on figure 4.3). A new building could have many potential uses and the impacts may be significant. One of the informants from Trondheim Municipality for example, mentioned that it is important to take care of the changes that the project would incur over the landscape highlighting the essentiality of understanding the full consequences of and the magnitude of the impacts. One of the informants from Trondheim Municipality said, "The CDP will give more benefits for the users when its implemented." This view complements the statements of another informant who said that: "The views that the society were enjoying from where they are found will be blocked by the new building but meanwhile the new buildings might also create different views." The construction of new buildings, walking on the bridges and sideways that are planned in CDP might give different and exciting opportunities and views. Still another informant from the Municipality also underlined that: "The project should lead to

the creation of a digital and model landscape that would have multipurpose, such as a landscape used as a center for recreation than it is."

<center>Challenges</center>

When they explained the negative impacts of the CDP on the green areas, students explained that they are primarily concerned with the benefits of the green areas for their personal interests. This means that they do not want the CDP to disrupt the role of the green areas in terms of social activities with their friends and relatives, in addition, overcrowding and construction noise are major concerns outlined by themselves. Besides, they described that the gathering of many students in the collected campus would create a lack of space for readings that directly affects the teaching and learning environment. One of the students said that "I expect the students who are coming from Dragvoll would occupy our reading spots. People around the campus may face difficulties to find reading places and if that gets harder, I may think social suffocation might be perhaps the expected impact." The above quote informs a lot about the impact of CDP on the academic success of students and their mental wellbeing. This suggests that the CDP may be against their personal interests. A similar perspective was reflected by the employee participants. They said that the merging of large numbers of staff in one office may also lead to an uncomfortable working environment. From this one may say that overcrowding in the workplace could affect the efficiency of employes. These may suggest that CDP needs to proactively plan and implement solutions to solve the current staff crowding. Furthermore, it seems that there is a requirement to plan and construct for the expansion of existing programs with a particular emphasis on accommodating outdoor areas. Additionally, potential challenges related to offices, classrooms, and reading rooms should also be addressed. Therefore, they may not be concerned with the CDP and its main objectives as long as it contradicts with the benefits they receive from the green areas.

In addition to the above, more negative impacts were also outlined by an employee who has reservations about the CDP and is worried about the practical challenges of consolidating multiple campuses into one central location. They are concerned that the new center may be overcrowded and lack the resources to support a larger population. The neighborhoods surrounding the proposed CDP are also concerned about preserving the existing Høgskoleparken and its construction. They want to ensure that the park is not altered or destroyed as part of the CDP. As noted by the employee participant the CDP could negatively affect the services that roads and roadsides provide for the users. Connected to one participant

stated that users of parking might face difficulties in parking their cars because of the changes in the landscapes associated with the implementation of the CDP. This issue was explained by in the words of a participant's as follows,

> "With the CDP, so many students might move and rent at the new sites of NTNU. This may lead to high traffic jams and a shortage of parking. This would, in turn, exert big pressure on the municipality. It would become a big challenge to ease traffic jams and minimize parking slots. Therefore, all the users and neighboring communities should also be considered in the project planning and implementation."

The above narrative has been shared by other participants from Trondheim Municipality. However, participants from Trondheim Municipality have a different idea. They have argued that when the number of parking slot are reduced people try to minimize the use energy high consumption cars and this leads to achieve the sustainability of the city.

Another area of concern which was shared by both students and employe participants was that blockage of the sun by new construction plans and the total or significant loss of recreation areas, which have been used by children and adults of the neighboring communities and beyond. However, Trondheim Municipality had a different perspective regarding the construction center of innovation center on the parking ground. while the students are fine with the big innovation building plan on the parking slot, it is a challenging issue for employees and people who uses the parking ground because that is the only parking slot, they have nearby in the whole Gløshaugen area (See Figure 4:3, 6B).

Figure 4:3 Proposed plan for study area Subarea 2 - Hesthagen/part of Høgskoleparken (Delområde 2 - Hesthagen/del av Høgskoleparken)

In the document analysis of new shadow reports, possible challenges were observed as solar and shadow effects are not emphasized for the replacement area mentioned in the CDP Physical Plan. Most of the areas are flat areas to the north, with 4-5 long buildings to the south and east, and a 3-5 long building in Høgskoleparken south will shade large parts of the Western slope, which today has sun all winter due to the openness to the south. This highlights the need to assess and provide solar conditions of urban spaces and park areas, including considering the winter season. Referring to the neighbourhood, it is also important to ensure functions such as goods delivery, technical infrastructure, and bicycle parking. This was also reflected in the documents.

<div align="center">Perceived Measures</div>

While informants expressed their views on the plan of constructing a bridge (See Figure 4.3 above on 6C) which interconnects buildings inside the study area, many of the informants have advocated the construction of bridges. For instance, a participant from Trondheim Municipality said that: "The construction in the parts of Høgskoleparken will create connections; having this bridge and elevator (according to the plan) will enable users to take advantage of not having to walk the whole hill away because it's quite a hassle." However, other informants have

suggested that this bridge should not affect the green space. One of the neighborhoods noted this by saying.

> "It is important to take into account that the park is an important recreation place for families and students. A bridge will affect and potentially disrupt the opportunities to enjoy the park (sun conditions, access to trees). When building a bridge, it would be gentler if the bridge were built as close as possible to one of the sides of the park."

According to the neighborhood, the design should consider the natural landscape of the study area. On the other side, the students argued that the green area and the bridge should be big enough not to get crowded, including all forms of outdoors and buildings the CDP should include. This suggests the contradiction between users interests and different priorities on the CDP. This has implications for the sustainability of the city in terms of meeting the needs of the people and whether the CDP works towards this objective. An informant from Trondheim Municipality stated that.

> "During the merging process, it is important to try to balance it up. What are the positive impacts and what are the positive sides of the CDP? How can we as politicians and municipality make sure that this is possible to not    make unnecessary obstacles."

The people involved in the CDP planning shared their views with the other informants about the benefits of the project mentioned above. They have acknowledged the view that the CDP must avoid loss of ecosystems, plant species damage, and bio-ecosystem services within the campus and in the neighboring communities. Other informants from Trondheim Municipality also shared this perspective, stating that the project should not result in the depletion of the campus' ecosystem and biodiversity. They emphasized that once an ecosystem has degraded, it can be challenging to restore through replanting and regeneration.

Development projects are not apolitical. Political decisions are required for the funding of such projects. In relation to this, one of the informants from Trondheim Municipality explained that:

> "These parks and green areas (directing at the plan for the CDP) are politically important. They are important for the users' and society's well-being and for the environment. It is vital to peacemaking, particularly for

the vulnerable and needy. The design of the CDPs should consider such issues. Such actions offer opportunities to encourage visitors to value and protect biodiversity and understand its role in supporting human flourishing."

The above quote is supported by one of the informants from Trondheim Municipality, this explained that:

"Though politicians already decided on the implementation of the project, they were eager to get professional comments from us. So, I participated and evaluated the project in that I and some others evaluated what the quality of buildings should be, so we minimize damages and unwanted expenses in the future. We engaged in adjusting the nature of the buildings. That is, strictly evaluating the nature of buildings, we commented on it not to cut so many trees in the area where the project would be implemented."

The above quote shows how the implementing bodies of the project were interested in considering the views of the users and other concerned stakeholders regarding the loss of green areas.

The timeline of involvement is also important for stakeholders to have a say in the planning process. For instance, the informant from Trondheim Municipality stated that:

"Building in the free area or in a green space would be much easier than renovating however the neighborhoods and others have a very strong opinion and this will be considered during the decisions for the plan CDP was planned in quite a lot of buildings in green spaces and that was a process after a while it had sent very clear message back to it where they are insisted to modify the project plan of constructing a lot of buildings on the green space. As a member we can say that well this is a NO goal, so you must change the project in order to make it approved by the city council, so I mean it's trying to balance it."

These divergent views from these informants show that there are differences in views about the merging and benefits of the CDP. From an interdependent perspective, one may draw from this that merging of campus has unintended consequences for people working on the campus. The merging could foster social bonds among faculties and staff members and avoid

segregation of different campuses. Yet, the merging could result in a scarcity of the common places where people meet in large numbers, i.e., social gatherings. The typical identities and histories of the campuses may be dissolved. This has implications for the identities of places, which in one way or another identify the culture and lifestyles of the people living and working there. Therefore, as informants have suggested, the CDP should reconsider these diverse views, which would be used in the implementation of the design.

In line with the above subject, I describe the issue of place attachment observed in the study area in the following sub section.

### 4.3.3. Place Attachment and Dependency

Green areas as identity refers to a collection of ideas that link the green spaces to how participants perceive themselves as individuals, neighborhood, and a municipality. In this study findings a student participants described the study area as the place you belong towards or meet your fellows "it's a place where we meet without any appointments". Users have memories, emotions, affections, and feelings to green areas. As the study reveals, participants have a sense of attachment to the study area. The users highlighted the importance of the park's history and cultural significance, with the neighborhoods stating, "Høgskoleparken area is everything for us" That is, it's a place where they have been using these places to meet friends, share ideas, and share daily experiences. The data obtained from the neighborhoods shows that they are skeptical about the CDP, as it requires changes to these emotionally important places. Furthermore, the neighbors have mentioned that it may threaten the park's landscape and affect the ecosystem around it. Therefore, they have noted, the project could erode our attachment to the green area where they developed emotions as they have frequent contact with it and the people in the green area. Regarding the CDP implementation they noted that "It's very important that we still can have Høgskoleparken as it is." Therefor the quote indicates that they didn't want any intervention which would change the existing structure of the green area. The comment by the neighborhood in the above quote shows their strong attachment to the place as a recreational area. Trondheim Municipality also emphasized the importance of green areas in defining the town's identity, particularly for residents of the neighboring city of Trondheim. The quotes from the neighbourhoods in the above paragraph also linked with the user's wellbeing in terms of getting sense of belonging which they have developed while they interact with the place and the other users, creating shared experiences. As described by an employee informant, "The merging of campuses involves more than just the collection of individual

buildings. It also means the merging of people with diverse professions and working cultures." This implies that the campus collection has implications for the existing working environments. In other words, individuals bring their attitudes, values, emotions, and feelings to the new workplace, which may influence their work efficiency and the organization as a whole.

Place attachment of the users refers to the emotional bond people form with a particular place. The study reveals that the users have a strong attachment to the green area, which has historical and cultural significances. All the users use the green areas in their preferences this could be as a social space to connect with others either to share experiences, which creates a sense of emotional importance and attachment. However, the proposed changes to the green areas may threaten this attachment and erode people's emotional connections to the place.

## 4.4. Sustainability

The study also explored the sustainability issue of the CDP, which was reflected by various research participants, in differing ways. While an employe participant illustrated concerns for possible congestion and reduction of parking areas, informants from Trondheim Municipality responses reflect the city government's plan to reduce the number of cars by public transport and prioritize the more sustainable option of bicycles, yet adequate consultation with employees and other stakeholders who may be affected by CDP needs to be done further.

The merging of campuses to one at Gløshaugen may create a large burden for local public transportation systems and other services such as libraries and study rooms. These concerns were raised by research participants in response to proposed conceptualizations for the area. Specifically, during the group interview with students, it was noted that any future expansion of the CDP must prioritize the preservation of existing landscape features and the protection of the human ecosystem both on and off campus. Additionally, participants emphasized the importance of providing adequate study and refreshment areas for students outside of traditional classroom and library settings. Despite these challenges, the development of the campus in one site is expected to yield benefits for staff, students, and surrounding community members in the pursuit of common goals centered around research, innovation, and the provision of community-based services that also benefits the city to promote sustainability.

A significant part of the reasoning behind funding the CDP is to assist the sustainable development of Trondheim city. Due to Trondheim's efforts to create a sustainable future, the city was named as a UN Centre of Excellence in 2019. According to the interviewee from

Trondheim Municipality the link between SDGs and CDP is reflected as follows: "There is no doubt regarding the direct link between SDGs and the CDP. One of the goals of the project is to ensure sustainable ecological services." According to Trondheim Municipality informants, all the buildings designed for the campus project considered zero greenhouse gas emission, so that they would help to meet SDGs, particularly in relation to the environment and climate. Correspondingly, the group interview participants in Trondheim Municipality have mentioned that CDP and sustainability are interconnected in a way that they minimize negative impacts on the environment and society, while also ensuring long-term viability and resilience. The aim is to ensure that the CDPs of NTNU align with the principles of sustainability and contribute to a more sustainable future in Trondheim by ensuring sustainable development guidelines. Sustainability is important on the CDP, to create a city that is sustainable both environmentally and socially. Moreover, Trondheim Municipality wants to make sure that the green area is accessible and enjoyable for everyone, while also ensuring the preservation of the natural environment. This was expressed by one of the interviewees from Trondheim Municipality by saying: "Sustainability has lots of goals and goals on the sub goals under that to define what are we, what do we expect to obtain from this project." While discussing the CDP, the participants from Trondheim Municipality noted that the construction plans for parts of the Høgskoleparken area, despite presenting a challenge for employees and students who use the parking ground in Gløshaugen, are aligned with the principles of sustainability and represent a positive step forward in promoting sustainability of Trondheim city. One interviewee from Trondheim Municipality supported this by saying that.

> "The one that's most important for innovation and infrastructure is one in the planning area of Høgskoleparken that has really held up high building and this is innovation building it's also important when it comes to making Gløshaugen more available with constructing a bridge and elevator here (referring to the plan) that will help out with having more bicycle parking than has been planned for it before."

In general, the importance of the CDP plan lies in promoting sustainable development of the city of Trondheim, which includes the preservation and development of green areas and outdoors. Additionally, according to Trondheim Municipality informants, the CDP plan meets the increasing need for collaboration among scientists, engineers, innovators, and socioeconomic stakeholders for sustainable development of the city. These informants believe

that the CDP will connect all the users, including NTNU Campus and Trondheim city, and involving the neighboring communities, students, and staff in the project activities has great benefits, such as mutual understanding and creating shared values for all.

### 4.4.1. CDP and Needs of the Users

The CDP is a development project that is decided upon by the political machinery. It involves not only the merging of campuses and rearrangement of services within it, but also an assessment of the needs of the users. For instance, the informants from Trondheim Municipality shared the view that the project should not destabilize the teaching and learning activities. They have linked the built environment with the decent working and learning environment at NTNU. This is linked with Goal 8 of the SDGs which seeks to "Promote sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all," in the sense of promoting and enhancing the working performance of workers and students. Stated otherwise, the good working and learning environments would help users and Trondheim city to aspire for their future through reassessing their performance in these environments. Buildings, parks, and green areas are not simply open spaces, they also have aesthetic elements. Informants from the municipality have explained that "these areas are not simply objects that we decorate using different materials. Rather, they have contributed to their quality of education" which is one of the 17 goals of the sustainable agenda for 2030 this is the one of the priories for the Trondheim Municipality.

Besides the priories in outdoor spaces focusing on the inner spaces such as classrooms and other closed spaces, interviewees said that the open spaces, which have entertainment values, did not receive much attention. This view is a point where we locate the perspectives of informants about their conception of educational places as more than a fixed place only for executing office activities. Thus, more open spaces are needed. One of informants from students responded that: "There has to be enough square meters per student, like enough reading spots and outdoors including green areas; now some of us have to sit in a cafeteria to study and there are not enough places to sit so I just hope they are not crowding this place by this project." The statement emphasizes the importance of reassessing the balance between working offices and green areas in a project. It implies that the balance may be insufficient, and that the CDP should reassess it. The significance of including green areas in a project is being underlined. This is most likely due to the numerous benefits that green areas bring, such as improved air quality, less noise pollution, and increased well-being for those who live or

work in the area. The project can aim to produce a more sustainable, healthy, and comfortable environment for those who will utilize it by evaluating the balance.

## 4.5. Measures for Consideration

The findings show that CDP is not meant to collect only campuses together; rather it also has sustainability plans derived from SDGs. This takes the project not just to develop sustainability plans but also to predict and examine pathways to reduce risks. As discussed in the above sections, different groups of participants have reflected their view regarding the project impact in the surrounding communities. These impacts have been expressed negatively and positively. Yet, there is still a need to further dig out strategies for risk minimization thereby enhancing the sense of ownership of the project for stakeholders.

In general, all the interviewed students expressed excitement about the entire plan, including the bridge, buildings, and reconstruction work. However, they did not expect to have more reading places per student or changes to the current setup. One student taking COVID as a context reflected on this, stating:

> "especially when a building phase is completed, even though there is expectation to replace buildings, more reading spots, and other refreshment places, it is also expected to be for good, even if our batch expected to complete the study program between 2022-2027 where two/three years has been affected by COVID and now the CDP construction period noise is going to double it: even though the next generation who will join the university after the implementation phase will be benefited."

The above quote implicitly carries the question: how COVID-like health pandemics can be handled in combined buildings that may contribute to further exacerbation? For questions such as these, the design of CDP needs to have something to address. In this case student participants suggested that early identification of such concerns might give some the potential of accommodating some of the insights from stakeholders.

In the other side group interview with student participants suggested the construction of buildings during the summer during which there are no classes. This minimizes the risk (noise), and it is advisable to consult all the campus communities to be tolerable as the project has limited phase and expected to be completed in due course. Another student from this

background suggested the idea of giving every student a noise-canceling headset. These might be done after having consecutive consultations with different stakeholders' students, employees, and the neighborhoods. It is advisable to consult the surrounding communities to have a common understanding and share the issue. Doing this helps everyone to cooperatively act and is aware of the project's final goal to share the issues associated with the project risks. The reflections of student participants reaffirm the importance of attending these concerns in the following quote: "The construction phase should not be in the exam period and should have a break during the peak periods to minimize risks on the students' life." Moreover, all student informants also suggest the construction phase at the summertime, at the beginning and during the Christmas break and start of each semester. CDP and the design are pervasive in the users' endeavors, our landscapes are shaped by designers, as are the structures built on that land.

Students are concerned about the noise during construction. They find it difficult to be in this campus with construction noise and this may impact the daily activities of the campus employees and neighborhood. However, they suggest as long as this project is for the better outcomes and brings insights, it is essential to raise awareness of and take into account the potential consequences that the CDP may have for the users.

The neighborhood provided a direct comment on the potential means to reduce the risk of the CDP, as stated "The total impact can be reduced by leaving the park untouched." According to the neighborhood, they strongly believe that real participation is required in the CDP, when people take part in a process, their ideas should be taken seriously, incorporated into the plan if it is determined that these provide a superior solution, and their questions should be answered. Alternatively, their rationale should be presented when they choose not to pursue their ideas. As stated in the letter the neighborhoods have emphasized the importance of taking into account the input received from the meetings and hearings before making a decision. "a brief description of input and information meetings is not participation in itself it is important to take in consideration of the inputs than just the participations." The sentence suggests that politicians should consider the negative effects of the CDP on the users that could result from their decision, it emphasizes that informed decision-making is crucial, and that taking inputs into consideration is more important than just participating in meetings.

In general, findings of CDP in one site have both merits and demerits on the employees, students, and neighbor communities in social, economic and in human environment relation. This is because the campus consists of different project phases and users. The CDP values not

only vary among all users but the scale of consultation with the users too. Having the perceived performance of the Trondheim Municipality interviewee shows that it has a great benefit towards the integration of different academic functions to cooperate with each other. Similarly, the participants from Trondheim Municipality pointed out and discussed the construction of buildings and the bridge to be implemented in a good time and should be completed in due to time per project lifetime. As one of the informants from Trondheim Municipality said one of the best solutions for CDP is also to minimize the impact on the users: "Avoiding project delays has a common benefit for all and has to be believed by the communities and stakeholders who wish to see the project completed in 2028." As mentioned by the participants from Trondheim Municipality, the collection of the entire campus community at a single center is a critical goal that requires the shared commitment of all stakeholders, as it contributes significantly to the betterment of the city. The positive outcomes of this project are visible in the consolidation of previously dispersed campuses into a single location, facilitating the improvement of the teaching and learning programs through collaboration in research, innovation, and the establishment of advanced facilities such as a comprehensive database center, innovation center, laboratories, and digital resources for teaching and learning. Furthermore, this initiative also seeks to enhance the relationship between academic institutions and the surrounding community, providing a stronger bond between them.

To summarize while the above insights on risk minimization are not exhaustive, they, provide space to rethink some of the issues and make further assessments by concerned bodies of the project to enhance both sustainability as well as a sense of community ownership. Ensuring sustainability without a community's sense of ownership is difficult to materialize.

As discussed with Trondheim Municipality group interview participants, campus development (gathering) has been discussed between users for the last 20-30 years. The notion of merging NTNU campuses is not just a sudden decision but rather a process and it has been planned for decades that merging campuses would give combined effect, good opportunities for new research. Furthermore, it would allow for both NTNU and Trondheim Municipality to improve their sustainability.

Regarding the CDP and merging of campuses, one of the Trondheim Municipality informants outlined the changing conversation about university campuses as follows:

"In the 1960s and 1970s, nearly all campuses were planned outside the city centers because academics could be there, and they could do their educational research on their own. But now, the universities have changed when it comes to their set of thoughts about the impact and the education, and the research should be merged with the society and do more impact on the society and do more cooperation."

This view suggests that merging campuses is one of the dominant plans of the CDP. On the other hand, local and municipal level desires for the area may need to be compromised if the project is going to be fully implemented and all NTNU campuses merged.

Gaining stakeholders approval for the project was not a simple or short task. As the employee from Trondheim Municipality working on the CDP stated, "There were long processes to approve the project, especially by the politicians as they are the final decision-makers of the plan and design of the project before implementation." This insight gives us through a lengthy approval process the politicians take in to account the teaching and learning environment in the CDP that need to be accompanied by safe and attractive situations. This then influences the performance of the actors, in this case the students and employees. With their emphasis on the conception of green areas as far more than trees, gardening, development, lighting, parking, or passage and access, informants in group interviews stated that green areas have multiple benefits to the people in Trondheim Municipality. However, it was their main suggestion that the campus project should meet the needs of the people's expectation by considering what they expect to get from such kind of project.

The informants from Trondheim Municipality also asserted that the project is assumed to meet the expectations of the public, as a public hearing was held on the proposed plans. Thus, they continued to argue, the project should examine whether the merging of the campuses in one place contradicts the needs of the people in the city.

## 4.6. Land Use and Land Cover Change

LULCC analysis reveals the potential landscape changes on green areas during the implementation phases of the CDP. The two maps below Figure 4:4 and 4:5 show the land use changes in the study area, with a description of each map provided underneath. As the maps indicate, the green areas will be affected, although new trees will be planted after the completion of the project. The two maps depict the LULCC that will occur on green areas

during the implementation phases of the CDP, specifically in sub area 2 of the study area. As shown on the maps, the proposed development project would involve the removal and plantation of some green areas within the study area, while most of the existing green areas will remain unchanged. However, it is important to note that the construction of new buildings and a bridge within the study area may potentially interfere with the remaining green areas.



Figure 4:4 Map of study area showing the possible affected areas by the CDP (source: author)

The map illustrates the current landscape features of Sub Area 2, which is the study area of this study. The area is comprised of green areas, parking lots, buildings, and roads. As highlighted in red on Figure 4.4, some of the green areas will be impacted by the CDP. Additionally, the parking lot visible on the map covers an area of approximately 4560 square meters out of the total area of 50509 square meters will be removed. Assuming a typical parking spot size of 2.4 meters by 4.8 meters (which is the standard size), one can calculate the number of parking spots that can fit on 4560 square meters as follows:

Total area available for parking = 4560 square meters

Area per parking spot = 2.4 meters x 4.8 meters = 11.52 square meters

Number of parking spots = Total area available for parking / Area per parking spot

Number of parking spots = 4560 square meters / 11.52 square meters per parking spot

Number of parking spots = 395.83 approximately 395 cars parking spaces will be removed. However, it is important to note that this is only an estimate and the actual number of cars that can fit may vary depending on the specific circumstances.

Green areas cover around 3307 square meters of the total study area. From these, 767 sq. meters will be removed, and 546 square meters are at risk of the total green areas in the study area. Upon examining the map, we can observe that certain green areas are marked in blue colour on the legend, indicating that they may be impacted by the CDP. However, there is no conclusive evidence on the map to suggest that the green areas will be entirely removed. Nevertheless, it should be emphasized that the green areas fall within the construction zone and will therefore inevitably be affected by the CDP. In summary, the map provides insights into the current landscape features of Sub Area 2 and the potential impact of the CDP on the green areas and parking lot. While some areas are at risk of being affected by the project.



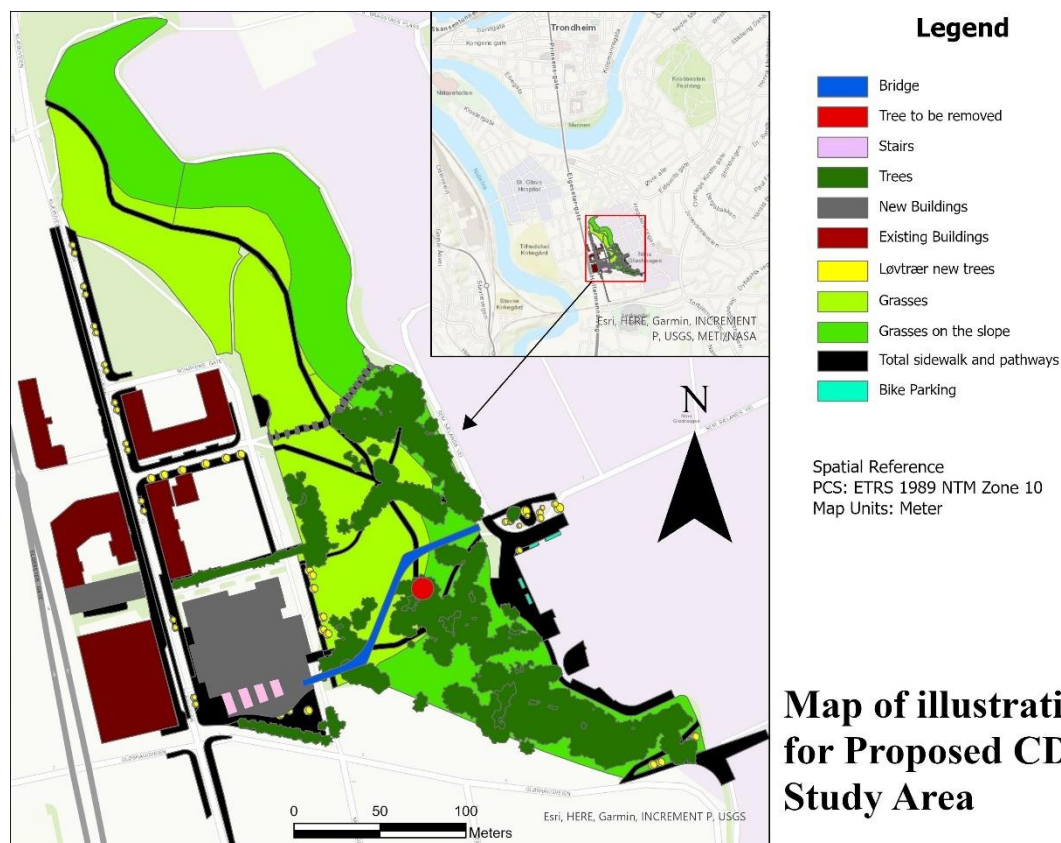Figure 4:5 Map of study area showing the proposed illustration plan of the CDP (source: author)

The construction of the CDP will bring about several changes to the landscape of the study area, as depicted in Figure 4.5 The map shows various new features such as green areas, an overpass bridge, stairs following the bridge, buildings, trees, roads, and bike parking areas.

From the above map we can see that new changes to the landscape of the study area include the construction of the bridge, stairs, and new buildings, which are represented by the colour grey. Additionally, there are new trees labelled "Løvtrær" on the map.

Moreover, the bike parking areas depicted in the illustration were previously car parking areas. Hence, the bike parking areas are a new addition to the area, which will serve as an alternative to car parking. In summary, the map depicts various features of the study area, showcasing notable changes such as the construction of a bridge, stairs, and buildings including in place of the previous parking area. It also shows the addition of new trees and bike parking areas. Furthermore, the map highlights the proximity of the proposed developments to the neighbouring community, emphasizing the importance of carefully assessing and considering the potential impacts of the CDP.

## 4.7. Summary

The findings from interviews and documents conducted with various users involved in the CDP revealed that each user group had unique concerns about the project. Users with a place attachment, depending on their role and time have different perspectives about the CDP. Students prioritize the aesthetics of the campus and surroundings, while employees focus on the practical challenges of consolidating multiple campuses into a central location. The municipality views the CDP as an opportunity to address sustainability issues in Trondheim city, but neighboring communities are concerned about preserving the existing Høgskoleparken. The study also examined the CDP's impact on green areas, particularly in the study area, which serves as a vital space for social activities, play, and leisure. Participants had varying opinions about the benefits and drawbacks of the CDP's impact on the green area and their attachment to it. Some saw it as a means to address sustainability issues, while others expressed concerns about potential negative impacts on the environment, parking, and public transportation. Despite these differences, stakeholders agreed on the importance of sustainability in the CDP. The analysis of LULCC indicates potential landscape changes in green areas during the implementation phases of the CDP, as depicted in two maps. In summary, users' involvement in the planning process is crucial to ensure inclusive dialogue and alignment with SDGs, ultimately leading to a more sustainable CDP in Trondheim city.

# 5.  Discussion

In this section, the results of the previous chapter are assessed and contextualized with the relevant theory. Subsequently, these findings are applied to address the research questions.

## 5.1.  Perceived CDP Possible Changes and Its Impacts

The perspectives of users regarding the benefits of the green areas are diverse. According to the group interview with students, the green area is a place where they can meet, share, and learn. They believe that any significant changes to the green areas would make a negative impact on socialization. On the other hand, participants from Trondheim Municipality expressed their belief that the CDP change on the green areas would benefit the green area, making it more attractive and comfortable for users. The social and recreational benefits of green areas are consistent with many studies that have found positive associations between exposure to nature and various health outcomes, including physical activity, mental health, and social cohesion (Bratman et al., 2015; Mennis et al., 2018). These studies suggest that green areas can provide valuable opportunities for relaxation and learning. Richardson et al. (2013) also discovered that mental health can be improved by the existence of public green spaces, as they provide opportunities for socialization and physical activity. Similarly, my findings suggest that some users (particularly students), value the green areas as a place for socialization, sharing, and learning. Another study by Maas et al. (2006) found that green spaces can have a positive impact on physical health, as they provide opportunities for exercise and stress reduction. My findings also suggest all the users appreciate the timeless nature of some recreational pursuits and the ability of campus green areas activities to bring joy to people of all ages. Overall, these studies and the findings in this thesis coincide with and show the importance of green areas in promoting mental and physical health, as well as the need to consider the diverse needs and priorities of different users and stakeholders when implementing the CDP in the study area.

## 5.2.  Users and Place Attachment

Place attachment and identity are important factors to consider when discussing the potential development of green areas such as Høgskoleparken. As Anderson (2016) points out, people attach meanings to particular places based on their memories, emotions, and experiences. According to the study findings strong sense of attachment to Høgskoleparken was observed

among participants, to varying degrees, and value its history and cultural significance. This is consistent with previous research that has shown that green areas can serve as important places of socialization, recreation, and strengthening of community ties (Ghose & Pettygrove, 2014; Hou, 2017).

This study examines how the neighbourhood uses the area for many activities differently than other users, and they specifically express concern that the proposed CDP may threaten their attachment to the park, which they have developed through frequent use and shared experiences with others. They worry that any significant changes could erode the emotional and cultural significance of the area, affecting their sense of belonging and well-being. This is consistent with research that has shown that the loss of green areas can have negative effects on its user's social cohesion (Aram et al., 2019; Jeong et al., 2021). Furthermore, the CDP and the potential changes to the green area have implications for the identity and culture of the workplace, as individuals bring their attitudes, values, and emotions to their new environment. This has shown that the construction of a new development, people may engage in place-protective actions to defend their community and maintain their attachment to it (Devine-Wright, 2009). In addition the implementation of a CDP can lead to changes in both the users and green areas of a campus. These significant changes may impact users' place identity and place dependence. As a result of the development project involves reducing the number of green areas (see Figure 4:4 and Figure 4:5) or altering their appearance, users who had a strong emotional connection to these areas may experience a sense of loss or disconnection (Barton et al., 2009). On the other hand, the Trondheim Municipality supports and appreciates the introduction of new paths and constructions in the area instead of the green areas. In terms of place dependence, changes to green areas may impact the practical use of the space for users. When the green area is modified users may need to find new areas for socializing or studying. Similarly, if the development project involves the construction of new buildings or infrastructure, users may need to adjust their routines or behaviours to accommodate these changes (Kaltenborn, 1997).

## 5.3. Time and Landscape Dynamics

Time and Landscape emphasizes the importance of understanding the historical and cultural context of a particular landscape, including how it has changed over time due to various human activities (Balée & Erickson, 2006; Jones, 2003). In the case of the CDP, the project involves the consolidation of multiple campuses into one central location, which would significantly alter the existing landscape and potentially disrupt the historical and cultural significance of

the green areas surrounding the campuses. Different stakeholders may have different temporal orientations and priorities, and it is essential to take these into account to ensure the project's sustainability in the long run. This is in line with research that emphasizes the importance of taking a long-term perspective in development projects to ensure their success and longevity (Bal et al., 2013).

The findings of this study shows that students have a shorter horizon when it comes to the green areas, while employees tend to have a longer-term perspective. Trondheim Municipality and neighbouring communities have the longest view, emphasizing the importance of sustainable, long-lasting solutions that will benefit future generations. Specifically, students were more interested in short-term use and prioritized addressing immediate challenges such as concerns with noise during their stay. In contrast, employees were more interested in the ongoing upkeep and maintenance of these areas. Finally, Trondheim Municipality and neighbouring communities were more focused on the long-lasting impacts of these initiatives.

The study also indicates that the CDP dynamic and temporal nature of landscapes will be changed over time due to the CDP and its various factors, such as new building of constructions, removal of parking ground and green areas modifications this represents a significant change in the landscape. This change could potentially alter the social and cultural practices of the people who use the green areas over time. This also shows how the dynamic and temporal nature of landscapes, will be change over time due to different factors. Similarly Stephenson (2007, 2008) suggests that cultural values are not fixed and unchanging but instead are flexible and can evolve with time, emphasizing the significance of understanding the shifting cultural values linked with landscapes. This also underscores the necessity for a comprehensive strategy to landscape planning and management that accounts for the complex and dynamic nature of landscapes.

## 5.4. Sustainability in CDP

NTNU's definition of sustainability in relation to the CDP states that it is a fundamental aspect which adds value to the community and is incorporated in the university's policy to steer its strategic direction. Sustainable development aims to create eco-friendly campus communities, where the university assumes responsibility in practicing sustainable development and instilling values of sustainable development in students and employees through research, experiments, and practices that involve campus users and their surroundings (Heistad, n.d).

NTNU (n.df) reports that sustainability is a core value in the CDP plan, which outlines a variety of relevant initiatives. The CDP's focus is on establishing long-term sustainability directions for land, infrastructure, buildings, and landscape, and the plan ensures the integration of environmental, economic, and social considerations into its implementation processes to benefit university communities. Building on the University's substantial achievements in sustainability, the development plan will deliver continuous improvements in sustainable land use, buildings, infrastructure, and landscape over time, and encourage the integration of these elements as part of using the campus as a sustainable living space for innovative solutions, according to NTNU (n.da).

According to Figure 4:5 (Map of illustration plan), the CDP blueprint highlights numerous upgrades to roads, pathways, and intersections. Increased and improved facilities for pedestrians, bicyclists, and transit users will make those modes of transportation more user-friendly, further reducing the number of single-occupancy vehicles on campus (Heistad, n.d). However, these initiatives are marketed as sustainable. Yet, upon examining the sustainability claims of NTNU in relation to my research findings, it becomes clear that these efforts were significantly compromised by the decision to cut funding for the CDP. This budget cut resulted in the elimination of many of the project's initial goals, which were often mere fantasies.

A development project and the sustainable vision of a city require inclusive dialogue among the stakeholders, including the population group sampled for the current study. Development projects usually carry elements of changes not only to the physical environment but also people's experiences of its use. This is particularly true among development projects that involve (re)construction activities. Consequently, macro level planning for development projects may not fully fit with all the interests and demands of the local communities, service providers and their customers. Thus, development projects require participatory planning and execution with these and other stakeholders for their effectiveness and sustainability. In other words, the primacy of any development project is engaging the views and perspectives of the end users' need and their suggestions to sustain the project. Any development which excludes the views of the users, and the local people would not be politically and socially viable. Thus, minimizing its chance for success and longevity.

## 5.5. CDP as Interrelate Entity

In this study, the systems theory of landscape design was employed to investigate the potential impact of a CDP on the users and the landscape of the campus. The study area was considered

as a complex and dynamic system, with interdependent components and relationships between them. The approach provided a framework for identifying the entities, relationships, and functions within the landscape system, and for understanding the potential changes that may occur as a result of the CDP. The findings of the study supported the use of the systems theory approach in landscape design, demonstrating its ability to enhance the overall quality of the landscape and meet the needs of different users (Moughtin et al., 2003), one of the key strengths of the systems theory approach is its ability to consider the landscape as a whole, rather than as a series of isolated components. This integrated approach allows designers to consider the interdependent relationships between the different components of the landscape, such as green spaces, buildings, and human activities. By considering the landscape as a system of interconnected parts, designers can identify potential conflicts or synergies between different components and plan accordingly (Batty & Marshall, 2012).

The study findings also highlight the importance of considering the needs of different user groups in landscape design. By engaging with the users of the campus and understanding their needs, designers can ensure that the landscape is designed to meet the diverse needs of the users from the CDP. The study area served multiple functions, including recreation for students, parking for employees, and housing for neighbouring communities, and will also be used as a testbed for technology and innovation. The CDP initiative aims to enhance the overall quality of the landscape and establish a more sustainable and integrated system (Forman & Godron, 1986). Thus, as this study evidence, the perspectives of the users show more about the negative impact of the CDP.

While the findings of the study support the use of the systems theory approach in landscape design, it is important to note that conflicting priorities and values among stakeholders can pose challenges to the successful implementation of this approach. For example, the study revealed that different user groups have varying priorities for the landscape in the study area., the Trondheim Municipality prioritizes building developments and community access over parking facilities, while employees consider having a parking ground as important. On the other hand, the neighbourhoods prioritize maintaining the green areas without any significant change in the study area. These priorities could potentially conflict with a systems theory approach, which aims to consider all entities and relationships within a landscape system and prioritize their interdependence and sustainability. This shows that stakeholders may prioritize certain aspects of the landscape, such as development or accessibility, over others. However, by using

a systems theory approach, designers can identify potential conflicts and work to reconcile them in a holistic and integrated manner (Laszlo & Krippner, 1998).

This study highlights the importance of considering the needs and perspectives of different user groups when designing and managing landscapes. The campus landscape is a complex and dynamic system, composed of interdependent components such as buildings, bridges, and human activities. Therefore, a systems perspective is necessary to improve the overall quality of the landscape.

The findings of this study strongly support the use of a systems theory approach in designing and managing landscapes. By understanding the interrelationships among the different entities, relationships, and functions that make up the landscape system, designers and managers can identify opportunities to improve the sustainability and effectiveness of the landscape. The application of this approach can result in improved integration, sustainability, and quality of the landscape. The use of a systems theory approach is widely recognized as a valuable tool for landscape design and management. It enables designers to take a holistic and integrated approach to design, ensuring that the landscape system functions effectively and sustainably over time. In conclusion, incorporating a systems theory approach can enhance the design and management of landscapes, creating sustainable and high-quality outdoor spaces for all users.

With the above final discussion of the research finding, in what follows I examined the research findings along with the research questions.

**Research question 1: Why is the green areas important for the study participants?**

The findings of this study suggest that participants value green areas for their aesthetic appeal, opportunities for social activities, leisure and play, and environmental benefits. Study participants expressed concern about potential negative impacts of the CDP on green areas, particularly in the study area, and their emotional attachment to them.

The participants in this study believe that green areas are important for a variety of reasons. They provide a sense of calm and relaxation, promote physical and mental well-being, and improve the overall aesthetic appeal of the campus. Green areas also offer a place to socialize, study, and engage in recreational activities, which makes them an essential aspect of campus life.

**Research question 2: What are the expected landscape changes in green areas and parks during the implementation phase of NTNU's CDP?**

The LULCC indicate potential landscape changes on green areas during the implementation phases of the CDP. Figure 4:4 and Figure 4:5 depict the LULCC that will occur on green areas, The proposed development project involves the removal and plantation of some green areas within the study area, while most of the existing green areas will remain unchanged. The construction of new buildings and a bridge within the study area may potentially interfere with the remaining green areas. The results on this suggest that the modifications to natural settings during the implementation phase of the CDP, which could potentially impact the well-being and daily routines of users who utilize these areas. The study recommends that any modifications should consider the potential impact on the users and cultural context of the landscape. Expected landscape changes in green areas and parks during the implementation phase of CDP include the introduction of new structures such as buildings and roads, as well as the alteration of green areas. These findings suggest that the project must be planned and designed carefully, considering the perspectives and experiences of end-users, to ensure that the changes made to the landscape are acceptable and sustainable.

**Research question 3: What are the perceptions of participants regarding the benefits and challenges of CDP?**

The findings reveal that different stakeholders have different perspectives, varying opinions and concerns about the benefits and challenges of the CDP. For instance, students prioritize the aesthetics of the campus and surroundings, while employees focus on practical challenges of consolidating multiple campuses into a central location. The municipality views the CDP as an opportunity to address sustainability matters in Trondheim city, but neighbouring communities are concerned about preserving the existing Høgskoleparken.

Compared to overall trends, study participants perceived the CDP as positive, as it would improve the quality of campus life and create a more sustainable environment. However, they also have concerns about the potential negative impacts of the project on their personal interests and social activities, particularly regarding the removal of green areas and the introduction of new structures in parts of Høgskoleparken.

This suggests that it is important to balance the various stakeholder interests and concerns to ensure that the CDP achieves its intended goals while minimizing any negative impacts on the campus community and the surrounding environment.

**Research question 4: How can users' involvement ensure sustainablity in the NTNU CDP?**

The findings suggest that the principles of participatory planning and community engagement are essential to ensure that a wide range of individuals' needs and values are considered in the account. This can result in more equitable and sustainable plans. Stakeholders agreed on the importance of sustainability in the CDP, and user involvement in the planning process was seen as crucial to ensuring inclusive dialogue and alignment with SDGs, ultimately leading to a more sustainable CDP in Trondheim city.

The CDP at NTNU is addressing sustainability issues by incorporating sustainable principles in its design and implementation. The project aims to create a more sustainable environment by focusing on creating a more walkable and bikeable campus and reducing carbon emissions. However, the project is currently criticized by users due to factors such as its unrealistic goals towards sustainability, and budget cuts. Nevertheless, the study emphasizes the importance of engaging stakeholders, including end-users, in the planning and design process to ensure that the project is sustainable and acceptable to all users.

# 6. Conclusion and Recommendations

## 6.1. Conclusion

In conclusion, this study aimed to explore the perspectives of participants on the importance of green areas and the perceived benefits and challenges of the CDP at NTNU. Changes in the campus landscape, such as the addition or removal of green areas, parks, or other land use structures, can have an impact on the users of the campus. It is important to consider the potential impact of any modifications to natural settings, such as the introduction of new structures, on the well-being and daily routines of the users who utilize these areas. The implementation of the CDP has a significant impact on the users, affecting their sense of place. The LULCC also depicts significant changes that would occur due to the implementation of the CDP and shows the landscape change in the Høgskoleparken area. Although the CDP aims to achieve sustainability goals, the findings show that it falls short of meeting the expectations and original objectives.

Iverson Nassauer (1995) emphasizes the importance of considering the perspectives and experiences of those who use the landscape since their perceptions and practices shape the meaning and value of the landscape. The concerns expressed by the participants about the potential negative impacts of the project on their personal interests and social activities highlight the necessity of taking their perspectives and experiences into account in the design and implementation of the CDP. Additionally, the participants' concerns suggest the need to consider the historical and cultural context of the landscape, which can foster greater support and a sense of ownership over time. This study underscores the significance of incorporating sustainability principles and considering the perspectives of different users and stakeholders in the planning and design process. The subjective and temporal nature of landscapes, as well as the changing perspectives and preferences of different users over time, should be considered in effective management. Ultimately, this research highlights the importance of inclusive and sustainable stakeholder engagement to achieve equitable, sustainable, and successful plans in the CDP.

The importance of considering the perspectives of different users and stakeholders echoes the principles of participatory planning and community engagement, which have become increasingly influential in project planning and design (Gordon et al., 2011; Reed et al., 2018). These emphasize that any development project should engage users. The drawbacks identified by the users signal the need to reassess the plan to include their concerns. Therefore, it is the

responsibility of the planners to consider this as it has an implication on the project's acceptance by the users and its sustainability in meeting their needs.

The findings of this study highlight the importance of considering the perspectives of different users and stakeholders in the planning and design process. Interviews with various users involved in the CDP revealed unique concerns about the project, with stakeholders expressing differing opinions about its impact on green areas and attachment to them. Despite these differences, all stakeholders agreed on the importance of sustainability in the CDP. Engaging stakeholders, including end-users, can cultivate responsibility and ownership and ensure that their needs and perspectives are considered in the planning process. Effective communication can encourage stakeholders to support the CDP, leading to sustainability. This could be realized through inclusive and sustainable planning processes that consider diverse perspectives and promote sustainable outcomes, as any project implemented with bottom up would be succeed.

## 6.2. Recommendations

Although it is not an exhaustive list of points the following are among important recommendations drawn from the study findings. Accordingly, it is important to consult with stakeholders to include their views and ensure their understanding of the development plan, which can reduce negative perceptions of the CDP. In practical terms, it is essential to keep conducting surveys and consult with student, staff, neighbourhoods, and Trondheim Municipality committees to identify any gaps between their concerns and the project plans before proceeding with consultations.

Similarly effective planning and design of development projects require considering the perspectives and experiences of users. This ensures that the project meets their needs and interests while achieving broader sustainability goals. It is crucial to center any development project around the needs and interests of people and engage stakeholders, including end-users and local communities, in the planning process. The subjective and temporal nature of landscapes, as well as the changing perspectives and preferences of different users, should be considered in effective management.

Incorporating sustainability principles and considering the perspectives of different users and stakeholders is crucial for achieving equitable, sustainable, and successful projects. Regular public hearings with users should be held to keep stakeholders informed of project developments. However, despite the importance of these objectives, a large portion of them were among the first things to be removed in the CDP. This removal included their associated budgetary allocation, which can undermine the trust of stakeholders. Therefore, it is essential that these principles and perspectives are prioritized and maintained throughout the project's lifecycle to ensure equitable, sustainable, and successful outcomes for all involved parties. This suggests that the CDP needs to consider users' concerns during the design and implementation process. Failure to do so may lead to a lack of acceptance by end-users. The research participants recommend further consultations and improvements with the input of stakeholders to ensure a sustainable and successful CDP.

# References

Alrobaee, T., & Al-Kinani, A. (2019). Place dependence as the physical environment role function in the place attachment. *IOP Conference Series: Materials Science and Engineering*,

Anderson, B. (2016). *Taking-place: Non-representational theories and geography*. Routledge.

Anderson, J. R. (1976). *A land use and land cover classification system for use with remote sensor data* (Vol. 964). US Government Printing Office.

Antrop, M. (2005). Why landscapes of the past are important for the future. *Landscape and urban planning*, *70*(1-2), 21-34.

Aram, F., Solgi, E., & Holden, G. (2019). The role of green spaces in increasing social interactions in neighborhoods with periodic markets. *Habitat International*, *84*, 24-32. https://doi.org/https://doi.org/10.1016/j.habitatint.2018.12.004

Asplan Viak, S. (2021). *Campus Development*.

Attride-Stirling, J. (2001). Thematic networks: an analytic tool for qualitative research. *Qualitative research*, *1*(3), 385-405.

Bal, M., Bryde, D., Fearon, D., & Ochieng, E. (2013). Stakeholder engagement: Achieving sustainability in the construction sector. *Sustainability*, *5*(2), 695-710.

Balée, W., & Erickson, C. L. (2006). Time, complexity, and historical ecology. In *Time and complexity in historical ecology* (pp. 1-18). Columbia University Press.

Bardalen, A., Skjerve, T. A., & Olsen, H. F. (2020). *Bærekraft i det norske matsystemet Kriterier for bærekraftig produksjon*.

Barton, J., Hine, R., & Pretty, J. (2009). The health benefits of walking in greenspaces of high natural and heritage value. *Journal of integrative environmental sciences*, *6*(4), 261-278.

Batty, M., & Marshall, S. (2012). The origins of complexity theory in cities and planning. *Complexity theories of cities have come of age: An overview with implications to urban planning and design*, 21-45.

Bender, B. (2002). Time and landscape. *Current anthropology*, *43*(S4), S103-S112.

Bender, B. (2006). Place and landscape. *Handbook of material culture*, 303-314.

Bender, B., & Winer, M. (2020). *Contested landscapes: movement, exile and place*. Routledge.

Bratman, G. N., Daily, G. C., Levy, B. J., & Gross, J. J. (2015). The benefits of nature experience: Improved affect and cognition. *Landscape and Urban Planning*, *138*, 41-50.

Bryman, A. (2012). Social Research Methods(4th edn) Oxford University Press. In: Oxford.

Bryman, A. (2016). *Social research methods*. Oxford university press.

Buchanan, C. (2009). Sense of place in the daily newspaper. *Aether: The journal of media geography*, *4*, 62-84.

Bürgi, M., Hersperger, A. M., Hall, M., Southgate, E. W., & Schneeberger, N. (2007). Using the past to understand the present land use and land cover. *A changing world: Challenges for landscape research*, 133-144.

Carter, N. (1969). The use of triangulation in qualitative research. *Number 5/September 2014*, *41*(5), 545-547.

Cheong, S.-M., Brown, D. G., Kok, K., & Lopez-Carr, D. (2012). Mixed methods in land change research: towards integration. *Transactions of the Institute of British Geographers*, *37*(1), 8-12.

Chiesura, A. (2004a). The role of urban parks for the sustainable city. *68*, 129-138. https://doi.org/10.1016/j.landurbplan.2003.08.003

Chiesura, A. (2004b). The role of urban parks for the sustainable city. *Landscape and urban planning*, *68*(1), 129-138.

Chung, C.-J. F., & Fabbri, A. G. (2003). Validation of spatial prediction models for landslide hazard mapping. *Natural Hazards*, *30*, 451-472.

Cohen, L., Manion, L., & Morrison, K. (2017). *Research methods in education*. routledge.

Cope, M., & Elwood, S. (2009). *Qualitative GIS: A mixed methods approach*. Sage.

Cope, M., & Kurtz, H. (2016). 36 Organizing, Coding, and Analyzing Qualitative Data. *y IP address 192.168. 10.17 on 2023/01/21*, 647.

Cosgrove, D. E. (1998). *Social formation and symbolic landscape*. Univ of Wisconsin Press.

Creswell, J. W., & Creswell, J. D. (2017). *Research design: Qualitative, quantitative, and mixed methods approaches*. Sage publications.

Davison, C. W., Rahbek, C., & Morueta-Holme, N. (2021). Land-use change and biodiversity: Challenges for assembling evidence on the greatest threat to nature. *Global Change Biology*, *27*(21), 5414-5429.

De Chazal, J., & Rounsevell, M. D. (2009). Land-use and climate change within assessments of biodiversity change: a review. *Global Environmental Change*, *19*(2), 306-315.

*Delområde 2 - Hesthagen/del av Høgskoleparken*. (2022, November 14, 2022). Retrieved February 16, 2023 from https://storymaps.arcgis.com/stories/9d114371dd53430fbe5fbbd98ffa6a46?play=true&speed=medium

Devine-Wright, P. (2009). Rethinking NIMBYism: The role of place attachment and place identity in explaining place-protective action. *Journal of community & applied social psychology*, *19*(6), 426-441.

Dober, R. P., & Dober, R. P. (1992). *Campus design*. John Wiley & Sons Incorporated.

Dover, J. W. (2015). *Green infrastructure: incorporating plants and enhancing biodiversity in buildings and urban environments*. Routledge.

Dowling, R. (2005). Power, subjectivity and ethics in qualitative research. In *Qualitative research methods in human geography* (pp. 19-29). Oxford University Press.

Dowling, R. (2016). Power, subjectivity, and ethics in qualitative research. I I. Hay (Red.). *Qualitative research methods in human geography*, *4*, 29-44.

Dunn, K. (2021). *Research Methods in Human Geography*.

Farnum, J. (2005). Sense of place in natural resource recreation and tourism: An evaluation and assessment of research findings.

Fawehinmi, O., Yusliza, M. Y., Mohamad, Z., Noor Faezah, J., & Muhammad, Z. (2020). Assessing the green behaviour of academics: The role of green human resource management and environmental knowledge. *International Journal of Manpower*, *41*(7), 879-900.

Foellmer, J., Kistemann, T., & Anthonj, C. (2021). Academic greenspace and well-being—can campus landscape be therapeutic? evidence from a german university. *Wellbeing, Space and Society*, *2*, 100003.

Fongar, C., Randrup, T. B., Wiström, B., & Solfjeld, I. (2019). Urban Forestry & Urban Greening Public urban green space management in Norwegian municipalities : A managers ' perspective on place-keeping. *Urban Forestry & Urban Greening*, *44*(September 2018), 126438-126438. https://doi.org/10.1016/j.ufug.2019.126438

Fonji, S. F., & Taff, G. N. (2014). Using satellite data to monitor land-use land-cover change in North-eastern Latvia. *SpringerPlus*, *3*, 1-15.

Forman, J., & Damschroder, L. (2007). Qualitative content analysis. In *Empirical methods for bioethics: A primer* (Vol. 11, pp. 39-62). Emerald Group Publishing Limited.

Forman, R., & Godron, M. (1986). Heterogeneity and typology. *Landscape Ecology; Forman, RTT, Godron, M., Eds.; Wiley: New York, NY, USA*, 463-493.

Fusch, P., Fusch, G. E., & Ness, L. R. (2018). Denzin's paradigm shift: Revisiting triangulation in qualitative research. *Journal of Sustainable Social Change*, *10*(1), 2.

Gaskell, G. (2000). Individual and group interviewing. *Qualitative researching with text, image and sound*, 38-56.

Germundsson, T., Jönsson, E., & Setten, G. (2022). In search of Nordic landscape geography: Tensions, combinations and relations. In *Socio-Spatial Theory in Nordic Geography: Intellectual Histories and Critical Interventions* (pp. 105-125). Springer International Publishing Cham.

Ghose, R., & Pettygrove, M. (2014). Urban community gardens as spaces of citizenship. *Antipode*, *46*(4), 1092-1112.

Goodman, L. A. (1961). Snowball sampling. *The annals of mathematical statistics*, 148-170.

Granö, O., & Paasi, A. (1997). Preamble: the intellectual and social contexts of JG Granö's Pure Geography. *Granö JG, Pure Geography*, 12-37.

Haggis, T. (2008). 'Knowledge must be contextual': Some possible implications of complexity and dynamic systems theories for educational research. *Educational philosophy and theory*, *40*(1), 158-176.

Hami, A., & Abdi, B. (2021). Students' landscaping preferences for open spaces for their campus environment. *Indoor and Built Environment*, *30*(1), 87-98.

Hashemnezhad, H., Heidari, A. A., & Mohammad Hoseini, P. (2013). Sense of place" and "place attachment. *International Journal of Architecture and Urban Development*, *3*(1), 5-12.

Hassan, Z., Shabbir, R., Ahmad, S. S., Malik, A. H., Aziz, N., Butt, A., & Erum, S. (2016). Dynamics of land use and land cover change (LULCC) using geospatial techniques: a case study of Islamabad Pakistan. *SpringerPlus*, *5*, 1-11.

Hay, I. (2016). On being ethical in geographical research. *Key methods in geography*, *3*, 30-43.

Heistad, A. C. (n.d). *Sustainability at NTNU*. Norwegian University of Science and Technology. https://www.ntnu.edu/documents/139799/1273574286/TPD4505.Anna.Heistad.pdf/39daf1f7-1894-423e-ab27-467a5e7d2b14

Hohmann, H. (2006). Theodora Kimball Hubbard and the "Intellectualization" of Landscape Architecture, 1911-1935. *Landscape Journal*, *25*(2), 169-186. http://www.jstor.org/stable/43332471

Hou, J. (2017). Urban community gardens as multimodal social spaces. *Greening cities: Forms and functions*, 113-130.

Høyskoleparken, F. B. (2018). *180513 Planprogram Innspill-2 Folkeaksjonen* [Report ].

Ingold, T. (1993). The temporality of the landscape. *World archaeology*, *25*(2), 152-174.

Iverson Nassauer, J. (1995). Culture and changing landscape structure. *Landscape Ecology*, *10*, 229-237.

Jansson, M. (2014). Green space in compact cities: the benefits and values of urban ecosystem services in planning. *NA*, *26*(2).

Jeong, W., Stewart, W. P., Gobster, P. H., & van Riper, C. J. (2021). Green leisure: resistance and revitalization of urban neighborhoods. *Leisure Sciences*, 1-21.

Jessel, B., & Tobias, K. (2002). Ökologisch orientierte Planung: eine Einführung in Theorien, Daten und Methoden. In *UTB Uni-Taschenbücher*. Ulmer.

Jones, M. (2003). The concept of cultural landscape: discourse and narratives. *Landscape interfaces: cultural heritage in changing landscapes*, 21-51.

Jones, P. (2020). Systemic design: Design for complex, social, and sociotechnical systems. *Handbook of systems sciences*, 1-25.

Kaltenborn, B. P. (1997). Nature of place attachment: A study among recreation homeowners in Southern Norway. *Leisure Sciences*, *19*(3), 175-189.

Kelle, U. (2007). " Emergence" vs." forcing" of empirical data? A crucial problem of" grounded theory" reconsidered. *Historical Social Research/Historische Sozialforschung. Supplement*, 133-156.

Kommune, T. (2022). *Detaljregulering av Hesthagen og del av Høgskoleparken, planbeskrivelse. Til offentlig ettersyn*.

Kühne, O. (2019). *Landscape theories: A brief introduction*. Springer.

Lambin, E. F., Geist, H. J., & Lepers, E. (2003). Dynamics of land-use and land-cover change in tropical regions. *Annual review of environment and resources*, *28*(1), 205-241.

Laszlo, A., & Krippner, S. (1998). Systems theories: Their origins, foundations, and development. *Advances in Psychology-Amsterdam-*, *126*, 47-76.

Leung, L. (2015). Validity, reliability, and generalizability in qualitative research. *Journal of family medicine and primary care*, *4*(3), 324.

Lewicka, M. (2011). Place attachment: How far have we come in the last 40 years? *Journal of environmental psychology*, *31*(3), 207-230.

Liang, S., Li, X., & Wang, J. (Eds.). (2012). *Chapter 24 - Land Cover and Land use Changes*. Academic Press. https://doi.org/https://doi.org/10.1016/B978-0-12-385954-9.00024-1.

Linneberg, M. S., & Korsgaard, S. (2019). Coding qualitative data: A synthesis guiding the novice. *Qualitative research journal*, *19*(3), 259-270.

Maas, J., Verheij, R. A., Groenewegen, P. P., De Vries, S., & Spreeuwenberg, P. (2006). Green space, urbanity, and health: how strong is the relation? *Journal of epidemiology & community health*, *60*(7), 587-592.

Mennis, J., Mason, M., & Ambrus, A. (2018). Urban greenspace is associated with reduced psychological stress among adolescents: A Geographic Ecological Momentary Assessment (GEMA) analysis of activity space. *Landscape and Urban Planning*, *174*, 1-9.

Michalak, W. Z. (1993). GIS in land use change analysis: integration of remotely sensed data into GIS. *Applied geography*, *13*(1), 28-44.

Motloch, J. L. (2001). Introduction to Landscape Design. New York et al., John Willey & Sons. In: Inc.

Moughtin, C., Cuesta, R., Sarris, C., & Signoretta, P. (2003). *Urban design: Method and techniques*. Routledge.

Murphy, M. (2016). *Landscape architecture theory*. Springer.

*Natur og naturforvaltning*. (n.d). https://www.trondheim.kommune.no/tema/klima-miljo-og-naring/natur/natur/

Naveh, Z. (2001). Ten major premises for a holistic conception of multifunctional landscapes. *Landscape and Urban Planning*, *57*(3-4), 269-284.

Nedd, R., Light, K., Owens, M., James, N., Johnson, E., & Anandhi, A. (2021). A synthesis of land use/land cover studies: Definitions, classification systems, meta-studies, challenges and knowledge gaps on a global landscape. *Land*, *10*(9), 994.

NTNU. (n.da). *About development of the campus*. NTNU. Retrieved 24/2 from https://www.ntnu.edu/campusdevelopment/about-campus-development

NTNU. (n.db). *Zoning plan for NTNUs unified campus*. Retrieved March 29 2023 from https://www.ntnu.edu/campusdevelopment/zoning-plan-for-ntnus-unified-campus

NTNU. (n.dc). *Decisions and Documents*. Retrieved 24 Feb 2023 from https://www.ntnu.edu/campusdevelopment/decisions-and-documents

NTNU. (n.dd). *Phases of campus development*. Retrieved March 08 from https://www.ntnu.edu/campusdevelopment/phases-of-campus-development

NTNU. (n.de). *NTNUs historie*. https://www.ntnu.no/ntnus-historie

NTNU. (n.df ). *NTNU sustainability*. https://www.ntnu.edu/sustainability/about

Nuissl, H., & Siedentop, S. (2021). Urbanisation and land use change. *Sustainable land management in a European context: a co-design approach*, 75-99.

Olwig, K. R. (1996). Recovering the substantive nature of landscape. *Annals of the association of American geographers*, *86*(4), 630-653.

Parker, C., Scott, S., & Geddes, A. (2019). Snowball sampling. *SAGE research methods foundations*.

Plieninger, T., Draux, H., Fagerholm, N., Bieling, C., Bürgi, M., Kizos, T., Kuemmerle, T., Primdahl, J., & Verburg, P. H. (2016). The driving forces of landscape change in Europe: A systematic review of the evidence. *Land use policy*, *57*, 204-214.

Proshansky, H. H., Fabian, A. K., & Kaminoff, R. (2014). Place-identity: Physical world socialization of the self (1983). In *The people, place, and space reader* (pp. 111-115). Routledge.

Rajala, K., Sorice, M. G., & Thomas, V. A. (2020). The meaning(s) of place: Identifying the structure of sense of place across a social–ecological landscape. *People and Nature*, *2*(3), 718-733. https://doi.org/https://doi.org/10.1002/pan3.10112

Raymond, C. M., Brown, G., & Weber, D. (2010). The measurement of place attachment: Personal, community, and environmental connections. *Journal of environmental psychology*, *30*(4), 422-434.

Richardson, E. A., Pearce, J., Mitchell, R., & Kingham, S. (2013). Role of physical activity in the relationship between urban green space and health. *Public health*, *127*(4), 318-324.

Rishbeth, C., & Powell, M. (2013). Place attachment and memory: Landscapes of belonging as experienced post-migration. *Landscape research*, *38*(2), 160-178.

Roy, P. S., Ramachandran, R. M., Paul, O., Thakur, P. K., Ravan, S., Behera, M. D., Sarangi, C., & Kanawade, V. P. (2022). Anthropogenic land use and land cover changes—A review on its environmental consequences and climate change. *Journal of the Indian Society of Remote Sensing*, *50*(8), 1615-1640.

Sanders, E. B.-N., & Stappers, P. J. (2008). Co-creation and the new landscapes of design. *Co-design*, *4*(1), 5-18.

Scannell, L., & Gifford, R. (2010). Defining place attachment: A tripartite organizing framework. *Journal of environmental psychology*, *30*(1), 1-10.

Seitz, C. M., Reese, R. F., Strack, R. W., Frantz, S., & West, B. (2014). Identifying and Improving Green Spaces on a College Campus: A Photovoice Study. *Ecopsychology*, *6*(2), 98-108. https://doi.org/10.1089/eco.2013.0103

Shi, W., & Woolley, H. (2014). Managing for multifunctionality in urban open spaces: Approaches for sustainable development. *Journal of Urban Management*, *3*(1-2), 3-21.

Stephenson, J. (2007). Many perceptions, one landscape. *Landscape Review*, 9-30.

Stephenson, J. (2008). The Cultural Values Model: An integrated approach to values in landscapes. *Landscape and Urban Planning*, *84*(2), 127-139.

Thiel, G. R., & Hartley, N. T. (1997). Cooperative education: A natural synergy between business and academia. *SAM Advanced Management Journal*, *62*(3), 19.

Tilley, C. (2006). Introduction: Identity, place, landscape and heritage. In (Vol. 11, pp. 7-32): Sage Publications London, Thousand Oaks, CA and New Delhi.

Tjora, A. (2018). *Qualitative research as stepwise-deductive induction*. Routledge.

Treitz, P., & Rogan, J. (2004). Remote sensing for mapping and monitoring land-cover and land-use change-an introduction. *Progress in planning*, *61*(4), 269-279.

Tress, B., & Tress, G. (2001). Capitalising on multiplicity: a transdisciplinary systems approach to landscape research. *Landscape and Urban Planning*, *57*(3-4), 143-157.

Tuan, Y.-F. (1977). *Space and place: The perspective of experience*. U of Minnesota Press.

Turk, Y. A., Sen, B., & Ozyavuz, A. (2015). Students exploration on campus legibility. *Procedia-Social and Behavioral Sciences*, *197*, 339-347.

Turner, B. L., Lambin, E. F., & Reenberg, A. (2007). The emergence of land change science for global environmental change and sustainability. *Proceedings of the National Academy of Sciences*, *104*(52), 20666-20671.

Ujang, N., & Zakariya, K. (2015). The Notion of Place, Place Meaning and Identity in Urban Regeneration. *Procedia - Social and Behavioral Sciences*, *170*, 709-717. https://doi.org/https://doi.org/10.1016/j.sbspro.2015.01.073

UN. (2015). *Goal 11-Cities Will Play an Important Role in Achieving the SDGs*. Retrieved April 8,2023 from https://www.un.org/en/chronicle/article/goal-11-cities-will-play-important-role-achieving-sdgs

*UNECE and City of Trondheim, Norway, join forces for smart and sustainable urban development with new Geneva UN Charter Centre of Excellence*. (2019). Retrieved February 26 from https://unece.org/housing-and-land-management/press/unece-and-city-trondheim-norway-join-forces-smart-and-sustainable

Vabø, A., & Langfeldt, L. (2020). The Position of technical universities within changing frameworks of institutional organisation and steering: the case of the norwegian university of science and technology. *Technical Universities: Past, present and future*, 45-59.

Von Bertalanffy, L. (1972). The history and status of general systems theory. *Academy of management journal*, *15*(4), 407-426.

Williams, R. (1983). Capitalism. *Keywords: A vocabulary of culture and society, revised edition*, 51.

**Appendix I: Interview Guide for Students**

**<u>Working title:</u>**

Norwegian University of Science and Technology Campus Development and Impact of Landscape Changes on Users: A Case Study of Høgskoleparken area in the NTNU Campus Development Project

Expected submission date: 15 May 2023

*This interview guide is prepared to explore the landscape changes, perceived feelings of users of Høgskoleparken area, and the impacts of landscape changes by the campus collection project on the users as part of the research process for a master's thesis at Norwegian University of Science and Technology (NTNU). The responses of the study participants will be recorded in person and stored in accordance with the guidelines of the Norwegian Centre for Research Data (NSD) Guidelines. The interview will be semi-structured, with interviewees asked to provide background information, which will be kept confidential, as an initial for follow-up questions about their perspective on the campus project.*

*Interview ID……………………..*

*Country of origin……………………….*

**<u>Sample Questions</u>**

1.  Hello and welcome to the interview. Thank you so much for agreeing to participate in this master thesis. First, I would like to remind you that you can leave the study at any time before publication, including during the interview, and the data you provide here will be removed from consideration.
2.  Briefly, can you tell me about yourself? Which department are you studying?
3.  Are you from Trondheim? How long have you lived in Trondheim?
4.  Which green areas do you like most around the campus? Why?
5.  When do you use Høgskoleparken green area most? (Probe: seasons, days, hours, evening, morning... they prefer to come and why?)
6.  For what purpose do you use this area and why? (Probe: for study, for recreation, for parking….)?

7. How often do you use this area? (Probe: daily, during weekends, always, usually, sometimes, rarely…. And why?).
8. Do you come alone or with other people?
9. Could you think of any benefits/services the area provides? A moment/event/story you associate with this park?
10. How can you describe your overall attachment to this area?
11. Do you know about the new campus collection project to be implemented here? If yes, what have you heard about it and how do you know about it?
12. Do you think that the planned change affects you and how? What do you think are its positive and negative impacts it may bring)? If No, *(some photo illustration from the project plan that shows changes in the landscape will be used to know their perspectives).*
13. How can negative impacts of campus project could be addressed or reduced?
14. Do you have any more comments?

**Appendix II: Interview Guide for Employees**

**Working title:**

Norwegian University of Science and Technology Campus Development and Impact of Landscape Changes on Users: A Case Study of Høgskoleparken area in the NTNU Campus Development Project

Expected submission date: 15 May 2023

**Interview Guide**

*This interview guide is prepared to explore the landscape changes, perceived feelings of users of Høgskoleparken area, and the impacts of landscape changes by the campus collection project on the users as part of the research process for a master's thesis at Norwegian University of Science and Technology (NTNU). The responses of the study participants will be recorded in person and stored in accordance with the guidelines of the Norwegian Centre for Research Data (NSD) Guidelines. The interview will be semi-structured, with interviewees asked to provide background information, which will be kept confidential, as an initial for follow-up questions about their perspective on the campus project.*

*Interview ID……………………..*

*Country of origin…………………..*

## Sample Questions

1. Hello and welcome to the interview. Thank you so much for agreeing to participate in this master thesis. First, I would like to remind you that you can leave the study at any time before publication, including during the interview, and the data you provide here will be removed from consideration.
2. Briefly, can you tell me about yourself and position? What is your daily work like?
3. Are you from Trondheim? How long have you lived in Trondheim?
4. Which green areas do you like most around the campus? Why?
5. When do you use Høgskoleparken green area most? (Probe: seasons, days, hours, evening, morning... they prefer to come and why?)
6. For what purpose have you been using this area? (Probe: for study, for recreation, for parking (Probe: How often do you use this parking slot? Should you drive every day to your workplace? Do you have alternative ways? Walk or Bike? How the planned change in this area could affect you….).
7. How often do you use this area? (Probe: daily, during weekends, always, usually, sometimes, rarely…. And why?).
8. What kind of activities are you doing in this area and why? What is important for you in this area and why especially this?
9. Do you come alone or with other people?
10. Could you think of any benefits/services the area provides? A moment/event/story you associate with this park?
11. How can you describe your overall attachment to this area?
12. Do you know about the new campus collection project to be implemented here? If yes, what have you heard about it and how do you know about it?
13. Do you think that the planned change affects you and how? What do you think are its positive and negative impacts it may bring)? If No, *(some photo illustration from the project plan that shows changes in the landscape and parking slot will be used to know their perspectives).*
14. How can negative impacts of campus project could be addressed or reduced?
15. Is there anything you would like to say/comment?

**Appendix III: Interview Guide for Trondheim Municipality**


**Working title:**


Norwegian University of Science and Technology Campus Development and Impact of Landscape Changes on Users: A Case Study of Høgskoleparken area in the NTNU Campus Development Project

Expected submission date: 15 May 2023


**Interview Guide**


*This interview guide is prepared to explore the landscape changes, perceived feelings of users of Høgskoleparken area, and the impacts of landscape changes by the campus collection project on the users as part of the research process for a master's thesis at Norwegian University of Science and Technology (NTNU). The responses of the study participants will be recorded in person and stored in accordance with the guidelines of the Norwegian Centre for Research Data (NSD) Guidelines. The interview will be semi-structured, with interviewees asked to provide background information, which will be kept confidential, as an initial for follow-up questions about their perspective on the campus project.*

*Interview ID……………………..*

*Country of origin…….….…..*

**Sample Questions**

1. Hello and welcome to the interview. Thank you so much for agreeing to participate in this master thesis. First, I would like to remind you that you can leave the study at any time before publication, including during the interview, and the data you provide here will be removed from consideration.
2. Briefly, can you describe your position?
3. What is your occupation type? What is your background?
4. What is the role of Trondheim Municipality in NTNU's campus development project? What things are considered on the Campus project?
5. Which departments have been engaging in this project? To what extent are they participating? (Probe: Vision, Define, Design, Construction and Use)
6. What is the focus of the Trondheim Municipality in the Campus development project?
7. How does the campus development project interact with the city's sustainability goals (Smart City)?
   - ✓ Are there efforts to take the SDG targets of the city into consideration? Which ones?
8. How does this address SGD 11?
   - ✓ What challenges does the campus development project bring in relation to the achievements of the SDG 11?
9. What things are considered from the campus project to achieve the sustainability goals and communities of Trondheim city? (Probe: community participation)
10. How does it contribute to the achievement of Trondheim's aim to be a sustainable and smart city?
11. Do you have any other comments or suggestions?

**Appendix IV: NSD Form**


**Are you interested in taking part in the research project?**

**"Norwegian University of Science and Technology Campus Development and Impact of Landscape Changes on Users: A Case Study of Høgskoleparken area in the NTNU Campus Development Project?"**

This is an inquiry about participation in a research project where the main purpose is to understand the local users' perspectives on the impact of the future planned new NTNU campus that will incorporates different desires into the land use plan of the future campus and its sustainability.

In this letter, we will give you information about the purpose of the project and what your participation will involve.

**Purpose of the project**
This is a master thesis project which focuses on NTNU campus collections, and its impacts related to the landscape changes on the users in the case of Høgskoleparken area. It investigates the involvement of users in the campus project incorporates different desires into the land use plan of the future campus that will reinforces its sustainability.

**Who is responsible for the research project?**
Norwegian University of Science and Technology (NTNU) is the institution responsible for the project.

**Why are you being asked to participate?**
The research focuses on four main users namely Students who use the Høgskoleparken area, Employees who use the Høgskoleparken area, Neighbourhoods near by the Høgskoleparken area and Trondheim Municipality. You have been chosen because you fall under one of the categories mentioned above.

**What does participation involve for you?**
The methods for this study are semi-structured interviews and focus group discussions. The questions are about your thoughts and perceptions on the possible impacts of the planned new NTNU campus project. For the interviews, you will be asked on your thoughts on the benefits and challenges of green spaces and parks, stories related to the area, and the possible impacts of the future planned NTNU campus project on the study area and achievements of the sustainability goals and communities of Trondheim city regarding the campus development. These questions will also be applied for the focus group discussion,


If you choose to participate in the focus group discussion you will be interviewed or subjected to a group discussion which will take approximately 1;30 hours. I will take notes during these sessions and your answers will be recorded electronically.

**Participation is voluntary**

Participation in the project is voluntary. If you chose to participate, you can withdraw your consent at any time without giving a reason. All information about you will then be made anonymous. There will be no negative consequences for you if you chose not to participate or later decide to withdraw.

**Your personal privacy – how we will store and use your personal data.**

We will only use your personal data for the purpose(s) specified in this information letter. We will process your personal data confidentially and in accordance with data protection legislation (the General Data Protection Regulation and Personal Data Act).

- This data will be available to me and my supervisor only.

I will replace your name and contact details with a code. Participants will not be recognized as they will be anonymized.

**What will happen to your personal data at the end of the research project?**

The project is scheduled to end in November 2022. The data will be deleted after the project is completed and will not be stored for any purpose.

**Your rights**

So long as you can be identified in the collected data, you have the right to:
- access the personal data that is being processed about you.
- request that your personal data is deleted.
- request that incorrect personal data about you is corrected/rectified.
- receive a copy of your personal data (data portability), and
- send a complaint to the Data Protection Officer or The Norwegian Data Protection Authority regarding the processing of your personal data

**What gives us the right to process your personal data?**

We will process your personal data based on your consent.

Based on an agreement with Norwegian University of Science and Technology, NSD – The Norwegian Centre for Research Data AS has assessed that the processing of personal data in this project is in accordance with data protection legislation.

**Where can I find out more?**

If you have questions about the project, or want to exercise your rights, contact:
- Norwegian University of Science and technology (NTNU) via Berit Therese Nilsen (Associate Professor), by email berit.t.nilsen@ntnu.no or by telephone +47 99534676
- NSD – The Norwegian Centre for Research Data AS, by email: (personverntjenester@nsd.no) or by telephone: +47 55 58 21 17.

Yours sincerely,

Project Leader                        Student (if applicable)

(Researcher/supervisor)

---------------------------------------------------------------------------------------------------------
---------

# Consent form

*Consent can be given in writing (including electronically) or orally. NB! You must be able to document/demonstrate that you have given information and gained consent from project participants i.e., from the people whose personal data you will be processing (data subjects). As a rule, we recommend written information and written consent.*

- *For written consent on paper, you can use this template.*
- *For written consent, which is collected electronically, you must choose a procedure that will allow you to demonstrate that you have gained explicit consent (read more on our website)*
- *If the context dictates that you should give oral information and gain oral consent (e.g., for research in oral cultures or with people who are illiterate) we recommend that you make a sound recording of the information and consent.*

*If a parent/guardian will give consent on behalf of their child or someone without the capacity to consent, you must adjust this information accordingly. Remember that the name of the participant must be included.*

*Adjust the checkboxes in accordance with participation in your project. It is possible to use bullet points instead of checkboxes. However, if you intend to process special categories of personal data (sensitive personal data) and/or one of the last four points in the list below is applicable to your project, we recommend that you use checkboxes. This because of the requirement of explicit consent.*
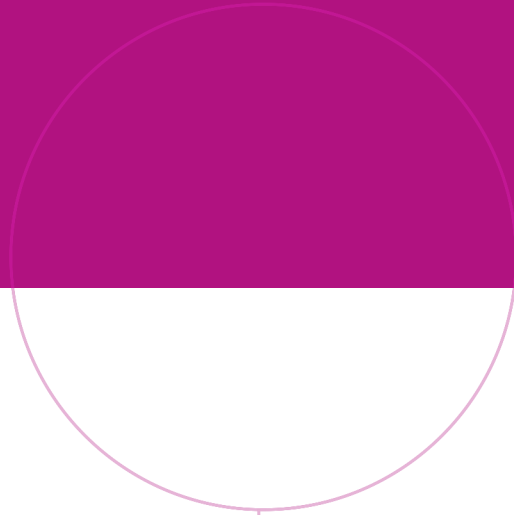
I have received and understood information about the project *[Norwegian University of Science and Technology campus collection and impacts of landscape changes on the users]* and have been given the opportunity to ask questions. I give consent:

- ☐ to participate in *the interview*
- ☐ to participate in *the focus group discussion*

I give consent for my personal data to be processed until the end date of the project, approx.

---------------------------------------------------------------------------------------------------------
(Signed by participant, date)

PS Please do not write your Names, Signature and Date only!