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Blue-Green Infrastructure: The experience of aesthetics. A qualitative study of perceptual and aesthetic landscape at NMBU, Ås.

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Landscape Architecture for Global Sustainability

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Master's thesis in Landscape Architecture for Global Sustainability
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Abstract

As a result of climate change, the world is currently facing global challenges. The Intergovernmental panel on climate change mentioned that extreme weather events such as flooding, will become more frequent under climate change. Due to the nature of these global challenges, Blue-Green Infrastructure is becoming an increasingly crucial element of urban water systems. Blue-Green Infrastructure is a growing research topic for academia as well for landscape architects worldwide due to the recognition of the valuable contribution to mitigate and adapt to climate change.

The implementation of Blue-Green Infrastructure at NMBU campus provides an opportunity to create knowledge about the performance of the infrastructure. The main objective of this thesis is to investigate how the experience of aesthetics work through and on users who frequently visit areas with Blue-Green Infrastructures. A qualitative study was conducted, fieldwork and semi-structured interviews were carried out during the months of October 2022 through February 2023 on NMBU campus park, Ås Norway. To conduct this research, this study answers the following questions research questions:

Research Question: How does the experience of aesthetics of blue green infrastructure on campus alter, work through and on users who frequently visit the area?

Subresearch questions: What is the aesthetic appreciation and perception of Blue-Green Infrastructure in users who frequently visit the campus?
How does the specific climate conditions, seasons affect the perception and aesthetic appreciation of users who frequently visit campus?

The different experiences of aesthetics are presented in the findings, which are discussed through the work of Nohl (2001) and his theory of aesthetic perception; Meyer (2008) The performance of appearance, and Tudor (2014) and the wheel of perceptual and aesthetic landscape.

This research identifies the aesthetic appreciation and perception of Blue-Green Infrastructure as a multi-layered experience that can contribute to the discourse of sustainable design.

Key words: Blue-Green Infrastructure, perception, aesthetic landscape, experience of aesthetic.

Preface

This master thesis is submitted for the Department of Landscape Architecture, Institute of Landscape Architecture at the Norwegian University of Life Sciences (NMBU), as part of the course M30-GLA, master's thesis. This research is weighted 30 ECTS credits and marks the completion of my master's degree of Landscape Architecture for Global Sustainability. The research project has been performed under the supervision of Associate Professor Jorg Sieweke during the Spring semester 2023.

15 May 2023.

Acknowledgments

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Statement of originality

I certify and that this is my own work and that the materials have not been published before, or presented at any other university or award of any type of academic degree. The materials contained in this thesis are my own work, not a "duplicate" from others. Where the knowledge, ideas and words of others have been drawn upon, whether published or unpublished, due acknowledgements have been given in the reference list.

Diana Hernández-Aguilar
May 15th 2023

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BGI= Blue-Green Infrastructure

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Chapter 1: Introduction

This chapter will introduce the reader to the topic. It is divided in 7 subsections. Background information of the research topic of Blue-Green-Infrastructure is briefly discussed in section 1.1, followed by the problem statement in subsection 1.2. In subsection 1.3 and 1.4, the research objectives and research questions are presented respectively. Subsection 1.5 exposes the significance of the study. Subsection 1.6 describes the scope and limitations and finally, the introduction ends in subsection 1.7 with an outline of this thesis research.

1.1 Background

Currently we live in a time of global challenges as a result of as climate change (Babani Anahid, 2020), environmental deterioration and natural hazards. The Intergovernmental panel on climate change mentioned that extreme weather events such as flooding, will become more frequent under climate change (IPCC, 2014) Well highlights that heavy rainfall and long drought will in any case be aggravated by climate change. (Well & Ludwig, 2020). The hazards of flooding in urban areas are enhanced by extreme precipitation events brought on by climate change, along with an increase in impervious surfaces as a result of urbanization (Mossink, 2020).

Due to the nature of the these global challenge, Blue Green Infrastructure (BGI) is becoming an increasingly crucial element of urban water systems (Choe et al., 2020). Sustainable water management is a major challenge of the urban development agenda worldwide. (Kopp et al., 2021). Sustainable approaches such as BGI can increase resilience in a variety of potential future climate scenarios while helping to improve human health, social and economic well-being, environmental quality and livelihoods (IPCC 2014)

Almaaitah et al. (2021) believes that BGI will play a significant role in urban life as cities implement methods for adapting to climate change. In the same line, as urban areas become more vulnerable to risks like flooding, heat stress, and water shortages as a result of climate change, BGI is increasingly recognized as a strategy to mitigate these effects while also providing a number of additional environmental and societal benefits (O'Donnell et al., 2021).

BGI is an umbrella term, the definition is innovative solutions that use and deploy the properties of natural ecosystems and the services that they provide are based on nature for economic growth, creating jobs, and enhancing human well-being (Afata et al., 2022). As described by Choe, BGI has aesthetic and sensory qualities to senses such as sight, smell, hearing, and touch which bring potential therapeutic benefits (Choe et al., 2020). BGI carefully designed can have positive benefits which are reflected in health and wellbeing.

1.2 Problem statement

What is already known?

It is already known that BGI plays an important role in reducing vulnerability to climate change risks such as flooding, heat stress, and water shortages, while enhancing urban environments and quality of life for citizens.(O'Donnell et al., 2021). The BGI has been studied by a diverse number of scholars from different research perspectives.

What is missing?

Most scholars have researched BGI from a technical point of view. Few studies have attempted to generate knowledge about the performance of BGI from a social point of view. In 2021, O'donnell published a study that compared the implicit and explicit perceptions of blue-green and grey infrastructure, the instruments for measurement were an implicit association test, "a computer-based methodology in which participants sort stimuli into pairings of contrasting target-concepts and evaluative attributes; the response time of different pairings was compared to determine implicit preference" (O'Donnell et al., 2021). Another instrument used was a feeling thermometer to investigate user explicit perceptions of safety, attractiveness, tidiness/maintenance, useful, value and need of BGI (O'Donnell et al., 2021)

Why is that a problem?

There is a need for ongoing management beyond the life of the BGI project implementation phase (Ghofrani et al., 2017). The implementation of BGI at NMBU campus provides an opportunity to create knowledge about the performance of the infrastructure. This thesis is an attempt to bring light on the performance from an aesthetic point of view, exploring local user perception and appreciation.

Why Landscape perception and aesthetic experience matters?

Our landscapes have evolved and developed over time, and they will continue to change. The management of change is essential to ensure that we achieve sustainable outcomes: social, environmental and economic (Tudor, 2014).

1.3 Research aim and objectives

BGI has become a significant field of study in landscape architecture for both practitioners and scholars. This type of infrastructure has the potential to improve the aesthetic and social attractiveness of the environment, and increasing property values. (Ghofrani et al., 2017). The perception of aesthetic and perceptual landscape within BGI has not been addressed exhaustively in past research. Hence, the research aims is to describe and explore the local

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appreciation of perceptual and aesthetic landscape in an evaluation of social performance of BGI in the university campus at NMBU, Ås.

The research objective is to understand the experience of aesthetics and perception of the BGI implemented at NMBU on an individual level by people who frequently use the space.

1.4 Research questions

The research question is as follows:

Research Question: How does the experience of aesthetics of BGI on campus alter, work through and on users who frequently visit the area?

Subresearch question:

Subresearch question 1: What is the aesthetic appreciation and perception of BGI in users who frequently visit the campus?

Subresearch question 2: How does the specific climate conditions, seasons affect the perception and aesthetic appreciation of users who frequently visit campus?

1.5 Research significance

As the world is facing global challenges such as climate change, BGI is becoming an increasing approach to manage stormwater (Liao et al., 2017). As BGI is being implemented worldwide, there is an opportunity to explore how the performance of the BGI affects people's life, the public perception and cultural process.

The research agenda priorities for case-studies within the Landscape Architecture Foundation, The American Society of Landscape Architects and the Council of Educators in Landscape Architecture in the social and cultural process area is the research of public perceptions/visual analysis and visual design (Demin, 2011).

The findings of this study will help building theoretical knowledge on how to understand the social performance of BGI, focusing on public perception of aesthetics. It seeks to explore how the perception and experience of aesthetics serve and works through users. It intends to generate knowledge that is built on perception and aesthetic theory, which can serve to practitioners to better design the BGI from an aesthetic point of view. The contribution of this thesis is of significance in the field of cultural processes of landscape architecture projects that attempt to be sustainable.

1.6 Scope and limitations

This subsection is divided in five parts, as follows:

1. General purpose of the study

The purpose of this thesis is to generate a debate within the topic of landscape perception about nature-based solutions in Scandinavia. The blue-green infrastructure implemented at NMBU, Ås is observed, explored, and analysed through the landscape perception perspective. This study is directed to the scholarly practitioners in landscape architecture and environmental design. Bentz and Shapiro define a scholarly practitioner as a person who resolves between the professional practice and the universe of academic research. Practice is part of a bigger activity of knowledge production and reflection. (Deming & Swaffield, 2011) p. 237. The nature of the scholarly practitioner is bidirectional, "it involves using professional practice and knowledge as a tool for evaluating, testing, applying, extending, and modifying knowledge". The blue-green infrastructure is a landscape laboratory used to evaluate, test and modify knowledge based on the literature exposed in the theoretical framework.

2. The population and sample that this research is studying

This research seeks to understand landscape perception and aesthetics experience, the object of study is the blue-green infrastructures built at NMBU campus. These nature-based solutions are the landscape as an object of study. There is no landscape without an observer, hence this research seeks to comprehend the perceptions of individual adults.

3. The duration of the study

This research is conducted during the Autumn parallel 2022 and Spring parallel 2023 at NMBU, which comprise the months of September 2022 through May 2023.

4. The topics or theories that are discussed

The main theories discussed in this study is landscape perception, perception of aesthetics and blue green infrastructure.

5. The geographical location covered in the study

The location used for this research is the park at the Norwegian University of Life Sciences, NMBU, at Ås

1.7 Further outline of thesis

This thesis research is organized in six chapters. This first chapter is an introduction to the research, the problem statement, the research objectives, the research questions and the significance of the study is presented.

The second chapter presents the theoretical framework which explains the definition of BGI used in this thesis, what is landscape and the perceptual and aesthetic components of it. The theory of Sustainable landscape and aesthetics is briefly presented by Nohl's theory of appreciation, Meyer 2018 and Tudor 2014. Chapter three describes the research design and methods used to carry out this thesis. The results of the research are presented in the fourth chapter. The fifth chapter covers the discussion on the research implications, practical implications and limitations of the results. In chapter six there is shown limitations and recommendations of future research Finally, in Chapter seven, the thesis concludes with a summary of the research question's answers.

Chapter 2: Theoretical framework

This chapter illustrate key concepts that are used throughout the thesis. This chapter offers an introduction to these definitions and theories as well as a foundation on which the reader may better understand the results and discussion. The ideas of blue green infrastructure, perceptual and aesthetic landscape and aesthetic perception are all covered in this chapter.

The concepts addressed in this chapter were selected due to their relevance to the research topic. The chapter is divided into three subsections. The first subsection presents the concept of BGI infrastructure. The second subsection presents the idea of perceptual and aesthetic landscape. The third subsection presents the theory of sustainable landscape and aesthetic perception that will help to understand the results.

2.1 Blue Green Infrastructure Definitions

Stormwater is rain, snow and hail that flows from roads, parking lots and roofs. Under natural conditions, most of the water penetrates the ground before it reaches out to watercourses. In densely populated cities with paved and hard surfaces, water flows on the ground via ditches or sewage pipes to the sewage treatment plant or directly to the nearest watercourse (AECOM Canada LTD, 2021).

Nature-based solutions. Solutions that are inspired and supported by nature, which are cost-effective, simultaneously provide environmental, social and economic benefits and help build resilience. (Kopp et al., 2021) Actions to protect, sustainably manage, and restore natural and modified ecosystems that address societal challenges effectively and adaptively, simultaneously benefiting people (human well-being) and nature (biodiversity)(IUCN International Union for Conservation of Nature, 2023).

Blue Green Infrastructure. BGI is an umbrella collective term generally used to refer to the integrated applications of blue and green infrastructures to mitigate and adapt climate change, providing multiple benefits to areas affected by unmanaged stormwater and high heat. (Versini et al. 2018 in (Almaaitah et al., 2021)). BGI can exist at various geographical levels (region, city-region, urban, river basin/catchment, watershed and site) (Ghofrani et al., 2017). As a result of the various solutions that challenge the view of water engineering and nature-controlling infrastructure. Different terms have been developed (Suleiman, 2021). Different scholars provide a different name to interpretation of BGI. These terms are bound to geography and the core concepts differ slightly (Suleiman, 2021).

This sub-section presents a synopsis of the definition of BGI according to different authors.

Author	Definition	Concept
(Well & Ludwig, 2020)	A multifunctional planning approach addressing a range of issues and objectives depending on whether the focus is on the blue (water) or green (vegetation) elements. It is a network of natural and near-natural areas that has a positive effect on the quality of urban environment. The concept was developed at the level of infrastructure and landscape.	Multifunctional planning approach
(Hamel & Tan, 2022)	A term which highlights the structural elements of nature-based solutions. It has a broad focus on urban water management rather than stormwater specifically.	Term
(Ramboll, 2016)	A paradigm that combines two types of infrastructure: blue and green and its own values in a union that strengthens urban ecosystems by evoking natural processes in man-made environments. Green infrastructure refers to projects that include vegetated design elements: horizontally and vertically. Blue infrastructure refers to the infrastructure related to hydrological functions including rainwater and urban storm water systems as well as surface and groundwater aquifers. The Blue infrastructure may be natural, adapted or man made.	Paradigm
(Balany et al., 2022)	A strategically planned network of natural and semi-natural areas with other environmental features designed and managed to deliver a wide range of ecosystem services, which include microclimate regulation and enhanced human thermal comfort.	Strategically planned network
(Almaaitah et al., 2021)	Blue-Green Infrastructure (BGI) consists of natural and semi-natural systems implemented to mitigate climate change impacts in urban areas, including elevated air temperatures and flooding.	Natural and semi-natural systems
(Afata et al., 2022)	Blue-Green Infrastructures (BGI) integrate solutions implemented to enhance water management and landscape values for more climate resilient and liveable cities. It has created an opportunity to renew the natural structure of water balance in cities and rural through the increase in rainwater retention and enlargement of permeable areas. Innovative solutions that use and deploy the properties of natural ecosystems and the services that they provide are based on nature for economic growth, creating jobs, and enhancing human well-being	Integrated solutions

(Kopp et al., 2021)	In the current environmental and political context of planning urban adaptations to climate change, the umbrella term BGI refers to the urban green infrastructure systems associated with elements of stormwater management. The term is used in various context internationally and it is applied at national levels of sustainable urban development planning.	Umbrella term GI systems associated with elements of stormwater

Table 1. Definition of Blue-Green Infrastructure

The term blue green infrastructure is as wide and vast as the universe of papers published in the international academic world. Integrating concepts of blue-green-infrastructure is beyond the scope of this thesis. In this thesis the term is used as a thematic approach.

In the literature studied, the term BGI is associated with different terms relating to sustainable stormwater management in diverse countries. In the next table, these terms are summarised:

Author (s) and Date	Term	Country where it is used most	Definition
(Almaaitah et al., 2021)	GI Green Infrastructure	USA	Nature-based systems that mimic the natural hydrology and regulate surface energy processes through evaporation, shadowing, and adjusting emissivity, and positively affecting air movement and heat exchange. "Green Infrastructure is an interconnected network of waterways, wetlands, wildlife habitats, and other natural areas; greenways, parks, and other conservation lands; working farms, ranches, and forests; and wilderness and other open spaces that support species, maintain natural ecological processes, sustain air and water resources, and contribute to the health and quality of life for (American) communities and people" (Mell, 2008)
(Woods Ballard B. & Wilson S, 2015)	SuDs Sustainable urban drainage systems	United Kingdom	Sustainable Drainage Systems (SuDS) are methods for managing surface water that take into account water quantity (flooding), water quality (pollution), biodiversity (wildlife and plants), and amenity. SuDS mimic nature and usually manage rainfall close to where it falls. SuDS can be designed to transport (convey) surface water, slow runoff down (attenuate) before it enters watercourses, they provide areas to store water in natural contours and can be used to allow water to soak (infiltrate) into the ground or evaporated from surface water and

			lost or transpired from vegetation (known as evapotranspiration). These drainage systems can contribute to sustainable development.
	Sustainable stormwater management		Aims to reduce runoff by treating the stormwater close to its source. The treatment is done through natural processes and the goal is to return the water to its natural cycle.6,7
(Jacqueline Hoyer et al., 2011)	WSUD Water sensitive urban design	Australia particularly	"The interdisciplinary cooperation of water management, urban design, and landscape planning. It considers all parts of the urban water cycle and combines the functionality of water management with principles of urban design. WSUD develops integrative strategies for ecological, economical, social, and cultural sustainability"(Jacqueline Hoyer et al., 2011)
	IURWM Integrated Urban Resource Water Management	Worlwide	"IUWM calls for the alignment of urban development and basin management to achieve sustainable economic, social, and environmental goals. It brings together water supply, sanitation, storm- and wastewater management and integrates these with land use planning and economic development"

Table 2. Blue-Green Infrastructure associated terms according to different geographical regions.

2.1.1 Blue Green Infrastructure classification

BGI components can be classified according to function, position and scale.(Ghofrani et al., 2017)

<u>FUNCTION</u>

BGI performs a range of ecohydrological functions such as infiltration, sedimentation, biodegradation, rainwater interception, evapotranspiration, adsorption, filtration. (Hamel & Tan, 2022) These functions provide four key ecosystem services: riverine flood risk, stormwater flood risk, stormwater quality and waster.(Hamel & Tan, 2022). Similarly, Ramboll argues that blue infrastructure provides functions of slowing down, decentralization and spreading, soaking into the underground, evaporating and releasing water into the natural water environment. This includes flow control, detention, retention, filtration, infiltration and different forms of water treatment. In general, blue infrastructure provides services for both aspects of quantity and quality control.(Ramboll, 2016).

In the following table the function of blue green infrastructure is summarised:

CLASIFICATION	PURPOSE		
Function	Reduce storm water run off	Detention	Can store water during and after extreme precipitation and gradually discharge it to the sewer system
		Retention	Can store water and gradually infiltrate it to the ground without any connection to the sewer system
		Storage retention	

Table 3. BGI classification of function

<u>SCALE</u>

Scale can vary from site-scale to watershed scale ecosystems.

Scale	Regional/urban scale
	Private scale
	Block scale

Table 4. BGI classification of scale.

<u>POSITION</u>

Position	Infiltration retention
	Above the ground
	On the ground

	Subsurface components

Table 5. BGI classification of position

2.1.2 Blue Green Infrastructure components

There are different BGI components. For the purpose of this research I only focus on rain gardens.

Rain gardens. "A depressed area in a landscape with planted grass and flowering perennials that collect rainwater from roofs, driveways, or streets, allowing it to soak into the ground"(Bąk & Barjenbruch, 2022). The depression of the area is usually shallow. Other functions of the rain gardens are temporary capture/retention of runoff. Rain gardens are simple and low-cost solutions within BGI, they are effective in rainwater management. The area of the plot determines the efficiency of the garden, but it is not a restraint. Rain gardens are dry most of the time, due to the fact that they drain water within 12-48 hours (NGWA, 2022). According to Shafique Rain gardens are also referred to as LID facilities or LID practices. Rain gardens can aesthetically improve the area by the supply of trees and plants (Shafique & Kim, 2017).
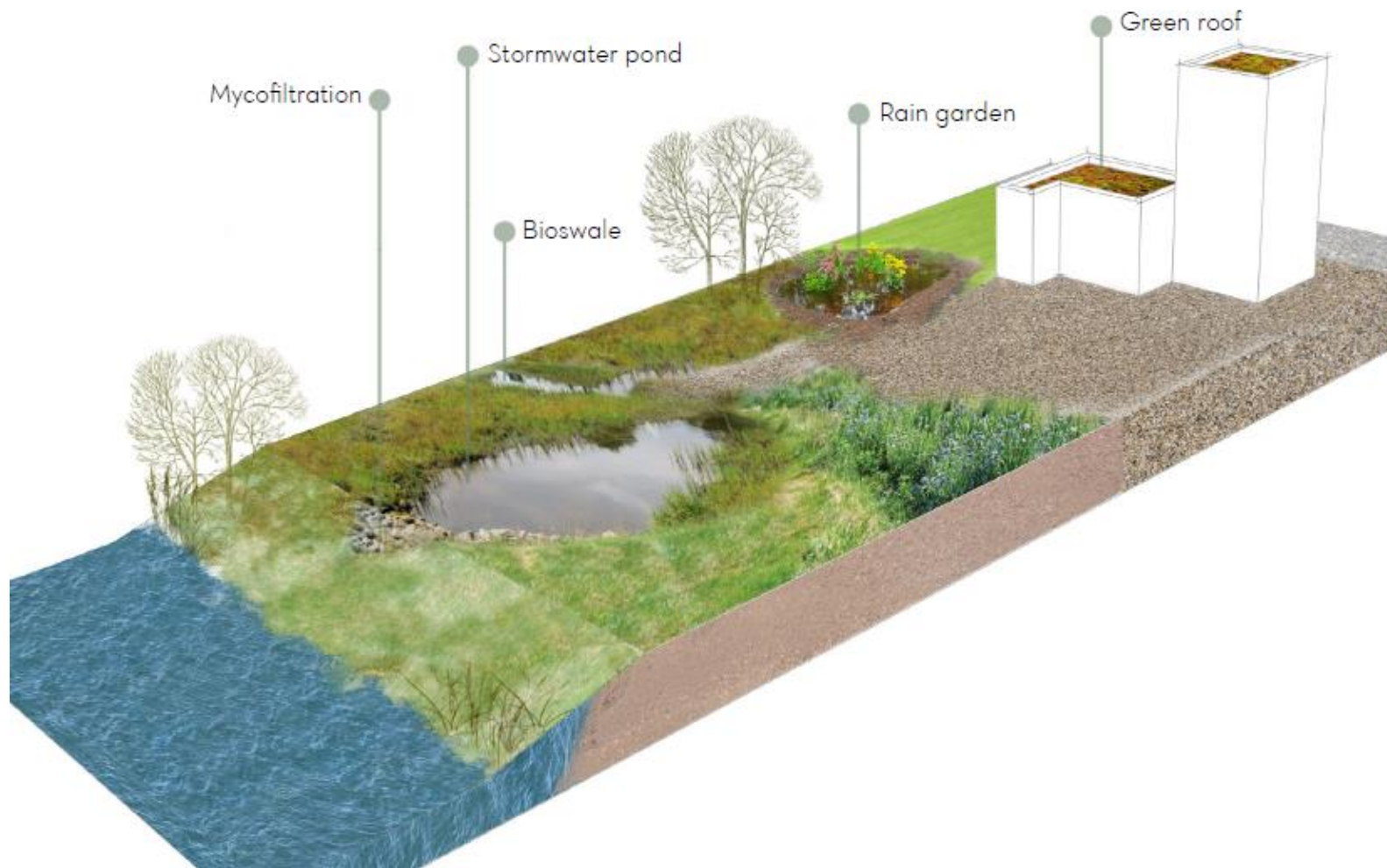
Figure 1 BGI components from "Droppeparken where the city rythm meets nature cycle" Image source: (Babadi, 2020)

2.2 What is Landscape?

In order to understand what landscape is and how it is understood, I take the European Landscape Convention definition of "Landscape" :

> " ….. an area, as perceived by people, whose character is the result of the action and interaction of natural and / or human factors." (Europe, 2000).

In the definition of landscape, people and its perception, the perceptual dimension, is fundamental to the construction of the term landscape (Kaymaz, 2012). Hence, I opt to investigate BGI as a landscape entity, where people's perception is critical to understand its performance. Among the multiple definitions of landscape which exists in academia, I take the European Landscape Convention term because it promotes sustainable planning, protection and management of European landscapes (Kaymaz, 2012).

2.3 Perceptual and Aesthetic Landscape.

The Landscape wheel illustrates the many components that interact to produce a landscape. We observe, in the outer ring the two main actors interacting: the place and the people. Then, going towards the centre, there are three rings which symbolize the three different types of landscape: natural landscape, cultural and social landscape, and perceptual and aesthetic landscape.
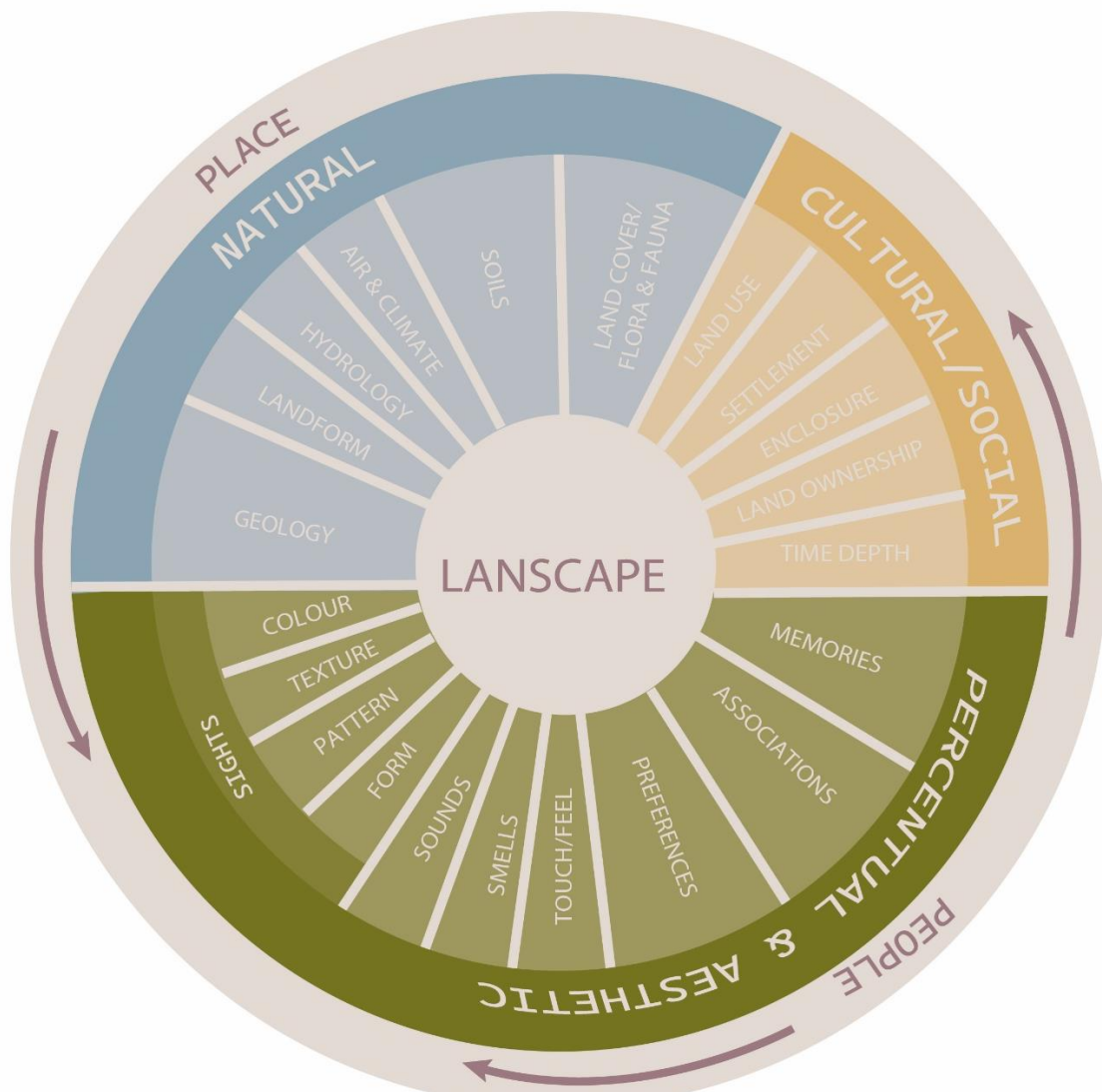
Figure 2 Perceptual and aesthetic landscape. Text from Tudor. Image source:(Tudor, 2014)

The perceptual and aesthetic landscape is conformed by memories, associations, preferences, and features that can be touched felt, smelled, heard, and seen. In the landscape, people can observe colour, texture, pattern, forms (Tudor, 2014). Memories and associations can be obtained via stakeholder engagement. Preferences might be identified as part of a desk study. And touch, feel, smells, sounds, sight information can be obtained through a descriptive study done in the field with general population of a community. Associations made with a landscape can relate to an individual's own experiences, memories and history, whilst some cultural associations may operate at a community or national level (Tudor, 2014).

According to Choe, well-designed BGI can also be used to generate or add natural sounds to the landscape, examples of these sounds are bird songs, sounds from water features, the wind passing through leaves, insects sounds These sounds can mask or distract attention away from unwanted sounds such as road traffic noise. (Choe et al., 2020)

2.4 Landscape perception/appreciation.

Within the landscape architecture discipline there has been different theories aiming to understand perception. Wilson developed the biophilia hypothesis (1984) where he argues that people have a natural need for affiliation with natural environments and other forms of life, human beings have established an emotional bond with nature and other livings.

The way that different people view and interact with the landscape varies. A person is in the landscape, in the natural environment, as the mobile centre of a three-dimensional, multisensorial experiential continuum. The appreciation of a landscape natural beauty can involve the ears (the sound of rain, insects, birds, or silence), touch (the warmth of the sun, the chill of the wind, the texture of the grass, rock, sand), smell (fragrance of flowers, odour of decay), taste (the taste of saps and waters) as well as the eyes (Callicott, 1983).

According to Tudor, people's reactions to landscapes are not limited to its visual aspects; they can also be influenced by their senses of hearing, smell, touch, and taste (Tudor, 2014). Additionally, associations and memory are crucial.

2.5 Aesthetic Perception.

"…unstructured information means reality, the world out there in all its glorious complexity. Every phenomenon that can be perceived or measured can be described as information" (Cairo, 2012) p.16

To talk about aesthetic perception, I followed the work of landscape architect Werner Nohl. In a paper called "Sustainable landscape use and aesthetic perception", he presents a conceptual framework for better understanding of landscapes as aesthetical objects. In his research Dr. Nohl focuses on four aspects of landscape aesthetics. The first one is the poor aesthetic reality of landscapes of 2000's. The second aspect is a more sustainable use of landscape. Then, he talks about the cognitive process of perception and aesthetics. Finally, the four aspect of his research is the aesthetic categories he proposes: the beautiful, the (new) sublime, the interesting and the plain. For the purpose of this research, I focused on the basic cognition process of perception developed by Nohl.

According to Nohl Aesthetic perception can be seen as a way of gaining information through sensory experience (Nohl, 2001). "Perception is considered as a special cognitive instrument and landscape as a special cognitive object. Aesthetic perception involves extracting information, knowledge and stories from the landscape as much as possible." (Nohl, 2001).

The appreciation of an environment's natural beauty involve the different senses and the mind, the faculty of cognition (Callicott, 1983). Nohl emphasizes the faculty of cognition when interacting with a landscape, he mentions for example that sustainable landscapes will present areas where nature can grow spontaneously and freely. Hence, those areas can be informative through the process of cognition. And he proposes four different levels where people can gain information as a prerequisite of aesthetic joy, as follows:

1. Perceptual (sensory) level. It refers to the sensory experience. The information comes from what people see, hear, smell, feel or taste from the landscape. The more people perceive elements, structures, and processes, the greater aesthetic joy.

2. Expressive (emotional) level. It refers to the emotional experience of the beholder. The landscape: elements and structures are associated with feelings and emotions. The more positive, people, may interpret the perceived landscape elements, the higher the aesthetic delight. For example a mountain may feel magnificent to us, and a motorway may be threatening.

3. Symptomatic (understanding) level. The landscape and its physical things are understood as signs or symptoms indicating something else. For example, a seabird in the sky may indicate an ocean. "The aesthetic joy as a

whole is greater, the more and the more often the beholder meets objects characterized with such signs, and the more he is able or thinks is able to interpret them" (Nohl, 2001).

4. Symbolic (imaginary) level. The viewer's observations of visible things in the landscape lead to diverse thoughts and ideas according to the contents. These ideas can be personal or impersonal. Nohl exemplifies this point with a perceived overgrown natural pond may stir up the picture of a free and easy life.

Summarizing Nohl, he points out that the aesthetic joy is greater the more a person is able to extract aesthetic knowledge from the landscape in all the four levels of cognition. Finally, Nohl categorize the landscape according to two functions: narrative and poetic. While, the perceptual level and symptomatic level together explains to the narrative function, the expressive and symbolic levels contribute to the poetic function.
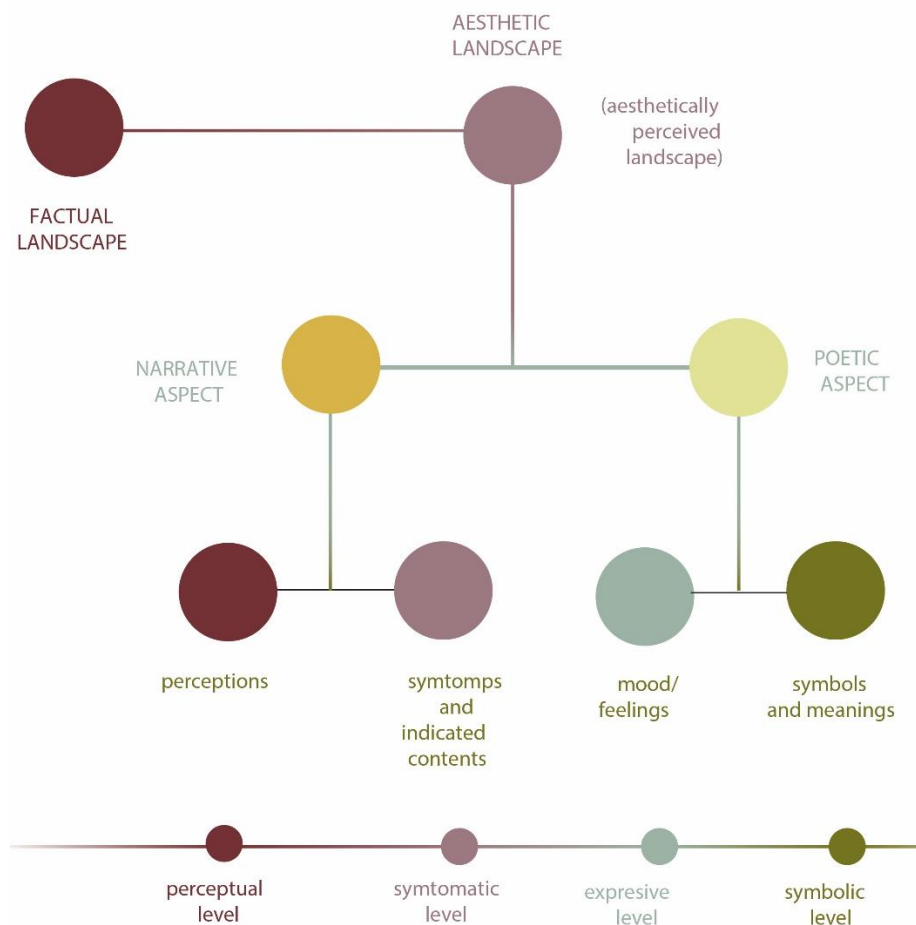
Figure 3 Aesthetic Perception. Text from Nohl. Image Source:(Nohl, 2001)

2.6 The performance of appearance

This section describes the work of scholar and professor of Landscape Architecture Elizabeth Meyer. She claims that sustainable landscape design, is generally understood in three principles: ecological, social and economic, but rarely the factor of aesthetic has a place in the sustainability discourse. And whenever aesthetics is in the discourse this term is associated with "the visible" and it is judged as superfluous. Hence, her work discusses the role of beauty and aesthetics in the sustainability agenda. She claims that ecologically regenerative designs are not enough for culture to be sustainable. Meyer states that what is needed for culture to be sustainable are designed landscapes "that provoke those who experience them to become more aware of how their actions affect the environment, and to care enough to make changes" (Meyer, 2008).Hence, she proposes to use the role of aesthetics environmental experiences such as beauty in changing human behaviour from an egocentric to a bio-centric perspective.

Meyer organizes her work in a manifesto divided in three parts. The first part is the introduction where she talks about the limited discussion of sustainability in landscape architecture. Meyer insists that inserting aesthetic into discussion of sustainability can lead to recognition, empathy, love, respect and care for the environment. She states the appearance of a designed landscape is more than the visual part. The visual can be connected to the body to have what she describes as a poly-sensual experience. The crucial aspect of beauty and aesthetic to sustainability is an ecological design agenda. "The act of experiencing designed landscapes poly-sensually, over time, through the body, is not simply an act of pleasure, but possible, one of transformation". Hence, the public's and designers conceptions of sustainability will expand beyond the ecological health realm, into social practice (Meyer, 2008).

The part two of her manifesto talks about sustainability in North American landscape architecture. She categorizes the attitudes of American landscape architects towards the term sustainability and proposes five approaches. The fifth approach is of great interest to this thesis. Meyer call it "Sustaining Beauty". The aesthetic experience of landscape is proposed as a tool in the sustainable design toolbox of landscape architects. Somatic, sensory experiences, unexpected forms, spaces and sequences of landscape follows new awareness of the aspects necessary to sustain and regenerate life. In the same line as Nohl. Meyer claims that between those two ways of experiencing and processing, cognition occurs. She finalizes her second part of the manifesto stating that beauty has not been recognized for its potential agency to contribute to a sustainable city.

Finally in the third part of the manifesto, there are 11 principles regarding sustaining beauty. Those are as follows:

1. Sustaining culture through landscapes. "Sustainable landscape design is not the same as sustainable development or ecological design or restoration ecology or conservation biology."

2. Cultivating hybrids: language of landscape. "Conceptualizing sustainable landscapes requires new words as well as new technologies, new languages as well as new technique."

3. Beyond ecological performance. "Sustainable landscape design must do more than function or perform ecologically it must perform socially and culturally".

4. Natural process over natural form "Ecological mimicry is a component of sustainable landscape design, but the mimicry of natural processes is more important than the mimicry of natural forms".

5. Hypernature: the recognition of art "The recognition of art is fundamental to, and a precondition of landscape design".

6. The performance of beauty. "Exaggeration of experience, and that artistically exploit the medium of nature – is restorative."

7. Sustainable design = constructing experiences. "Beautiful sustainable landscape design involves the design of experiences as much as the design of form and the design of ecosystems. These experiences are vehicles for connecting with, and caring for, the world around us."

8. Sustainable beauty is particular, not generic. "There will be as many forms of sustainability as there are places/cities/regions".

9. Sustainable beauty is dynamic, not static. "The intrinsic beauty of landscape resides in its change over time."

10. Enduring beauty is resilient and regenerative. "Antiquated conceptions of landscape beauty as generic, balanced, smooth, bounded, charming, pleasing and harmonious persist and must be reexamined.

11. Landscape agency: from experiences to sustainable praxis. "The experience of designed landscape can be a spatial practice of noticing, wandering and wondering in, and caring about the environment. The experience of landscape can be a mode of learning and inculcating values

Meyer concludes explaining that design and beauty matters, because the experience of it moves something in our psyche. She claims that designed landscapes need to be constructed human experiences as much as ecosystems. The reasoning behind this is that a designed landscape can influence on a greater extent to the environment than a landscape that only incorporates environmental practices without being designed to create experiences. The experience of beauty can move citizens to action, transforming them into a "new generation of environmentalist-citizens" (Meyer, 2008).

Therefore, the performance of a landscape's appearance and the experience of beauty should have as much weight in public discourse about sustainable landscapes than the performance of its ecological systems .

Chapter 3: Research design and methods

This chapter presents a detailed description of the research design and methods used to conduct this research and to show how I engaged with the knowledge creation. It shows the research design is relevant and justified to the subject of matter.

The chapter is structured in 3 sections. First in 3.1 it is explained the methodology approach conducted for this thesis, the methodology approach is based on the conceptual mode of concentric frames of Wang and Groat (2013) and complemented with ideas and concepts of Demin. Since the purpose of this research is to examine the local perception and appreciation of BGI, the research was conducted using fieldwork and interviews as methods for data generation, which is described in 3.2. This chapter finalizes in 3.3 with the methods for analysis of the collected information.

3.1 Methodology approach

The discipline of landscape architecture interfaces with and draws upon interpretive models of social sciences and humanities.(Deming & Swaffield, 2011) Thus, the methodology approach selected is based on the social science and interpretive research.

Following the conceptual mode of concentric frames of Wang, I have developed a visual methodology approach diagram explaining the research design. At the broadest level, the systems of inquiry or strategy, which refers to the overall research plan or structure of the research study. The system of inquiry is Empirical description. The tactics refer to a more detailed deployment of specific techniques, such as data collection devices, response formats, archival treatment, analytical procedures, and so on.

3.1.1 Systems of Inquiry

According to Groat and Wang, systems of inquiry, paradigms or worldview are the researcher's own broad assumptions about the nature of reality, knowledge, and how one can understand it (Groat & Wang, 2013). Groat argues that people conducting research makes assumptions about the nature of the world and how knowledge is generated. The systems of inquiry are those sets of assumptions. Demin has called them strategies of inquiry. The system of inquiry used in this research is empirical description.

Empirical Description

Landscape relates "primarily to the human scale and is expressed in everyday actions such as drawing, mapping, constructing, and planting. This makes landscape architecture accessible to empirical description"(Deming & Swaffield, 2011). Landscape also relates to what can be seen,

touched, and smelled, moved through, and experienced (Deming & Swaffield, 2011)This research design used empirical description. As McIntyre mentioned The philosophical school of empiricism, emphasizes information derived from experience and first-hand observation of the physical senses (2005 cited in (Deming & Swaffield, 2011)). Denim claims that empirical description is the most basic research strategy. I used this inquiry because "descriptive research strategies are easily adaptable to the level of skill and scale of action that is feasible in graduate research".

As mentioned by Demin, descriptive strategies are adequate for research that are exploratory into phenomena about which little is researched. Descriptive strategies builds understanding about landscape characteristics and community values and activities to provide evidence in support of proposed designed principles and project-based research.

I used what Denim has labelled as a social descriptive survey. "An investigator designs the research to systematically ask other people to provide information on the topic of interest" (Deming & Swaffield, 2011). I used a semi-structured interview to ask individuals who use the BGI at NMBU campus about their aesthetic perceptions. The BGI landscape is described through the eyes of the different beholders currently using NMBU campus. This type of strategy of inquiry is usually used in landscape perception studies. (Deming & Swaffield, 2011).

3.1.2 Type of research: qualitative.

This research is qualitative. As mentioned by Groat and Wang qualitative research depends on non-numerical evidence, "whether verbal (oral or written), experiential (film or notes about people in action) or artifactual (objects, buildings, or urban areas). Bryman claims that to view events and the social world through the perspective of the informants, researchers use a qualitative approach. (Bryman, 2016):399. This research studies the local appreciation and perception of BGI, the reflections of the people who uses the spaces are considered. Hence, qualitative research was selected for this study. This research is dependent on verbal information obtained by participants and the landscape serves as an artifact of knowledge creation. Reality is seen as subjective and multifaceted as perceived by the participants in this study.

3.1.3 Type of reasoning. Abductive

From data generation to a theoretical notion there is a type of reasoning. Inductive and deducting reasoning techniques are most used within social science. However, this research is situated within the abductive reasoning.

Deming has classified the agenda of knowledge formation or type of reasoning in three dimensions:

a. Inductive. "The generation of descriptions and explanations of relationships in the world through strategies of inquiry grounded in the world of experience and empirical evidence" (Deming & Swaffield, 2011)

b. Deductive "The development of explanations from theory and the systematic testing of these explanations through formal processes of experimentation, evaluation, and argumentation"(Deming & Swaffield, 2011).

c. Abductive. Is recognized as a "reflexive approach", researchers take advantage of the dichotomies of deductive and inductive approach "modifying their theoretical propositions in the light of the evidence, revising their understanding of the evidence (its categories, and its meaning and significance) in light of theoretical concepts and exploring new possibilities of understanding and new ways of knowing"(Deming & Swaffield, 2011). Abduction, a explanatory reasoning, is also called inference or best explanation. https://plato.stanford.edu/entries/abduction/#AbdGenIde According to Alvesson and Sköldberg (2009), 'this approach starts in a similar way of induction, from the empirical information, but into which theories and perspectives are drawn in advance of the research process' (Tjora, 2018):15.

In this study the evidence is provided by personal observations, interviewees, the landscape designers and responsible people of the management of the BGI. The theoretical concepts are grounded in the theoretical framework. Both sources of information complement each other. From the partial observations realized, I inferred the best and most reasonable understanding of the local appreciation of the perceptual and aesthetic landscape which occurs in the BGI implemented at NMBU. The discussion and recommendations of design reflects upon the dichotomy of the empirical evidence brought to light by participants and the explanations from evaluating the aesthetic landscape from theory.
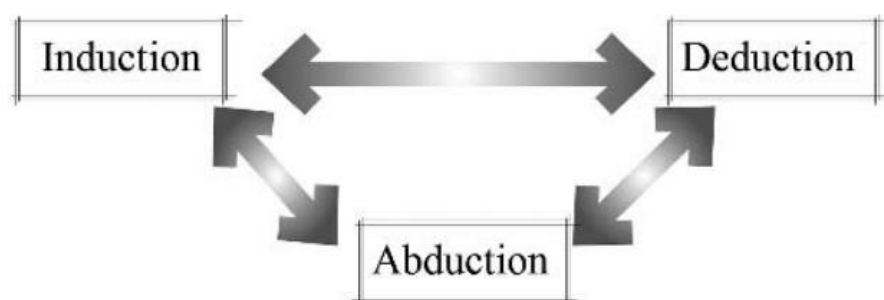
Figure 4 Abduction, Deduction, Induction relationship. Image source:(Deming & Swaffield, 2011)

3.1.4 Epistemology. How will I claim the new knowledge?

In this section, it is explained what the relationship of me, as the researcher, is to that being researched (the BGI landscape at NMBU). This is determined by the context of the study and by my intellectual style. To understand this concept, I asked myself is reality dependent upon, independent of, or interdependent between me, as the researcher and the world?

We find three different approaches:

a. Objectivist approach: "Presumes and seeks to understand a reality or realities in the world existing independently of the investigator" (Deming & Swaffield, 2011)

b. Subjectivist approach: Presume the immersion of the researcher in the system of creating new knowledge and realities. And this is recognized and celebrated. (Deming & Swaffield, 2011)

c. Intersubjectivist approach: "Presumes knowledge of reality is entirely the product of individuals and society". (Deming & Swaffield, 2011)

This research follows the intersubjectivist approach. The new knowledge created by this thesis is based on knowledge of reality as a product of individuals who use the BGI and society or in this case the landscape in which this BGI is situated. The landscape perception of aesthetic are those processes that occur between the observer and the landscape rather than merely within individuals. To exemplify this, an observer encounters the BGI and may see water running down. Then, the landscape is there for the observer. It exists as it is seen. Reality is a process between what is there (the landscape) and the observer.

3.1.5 Nature of theory

There are three summarized roles of theory in landscape architecture that have characterized the discipline: instrumental, critical, and interpretive.

a) Instrumental theory predicts and control.

b) Critical theory challenge assumptions about the nature of practice and stimulates change.

c) Interpretive theory improves the comprehension of meaning and context (Deming & Swaffield, 2011). It extracts relationships and significance systematically and reflexively (Deming & Swaffield, 2011): Corner 1991.
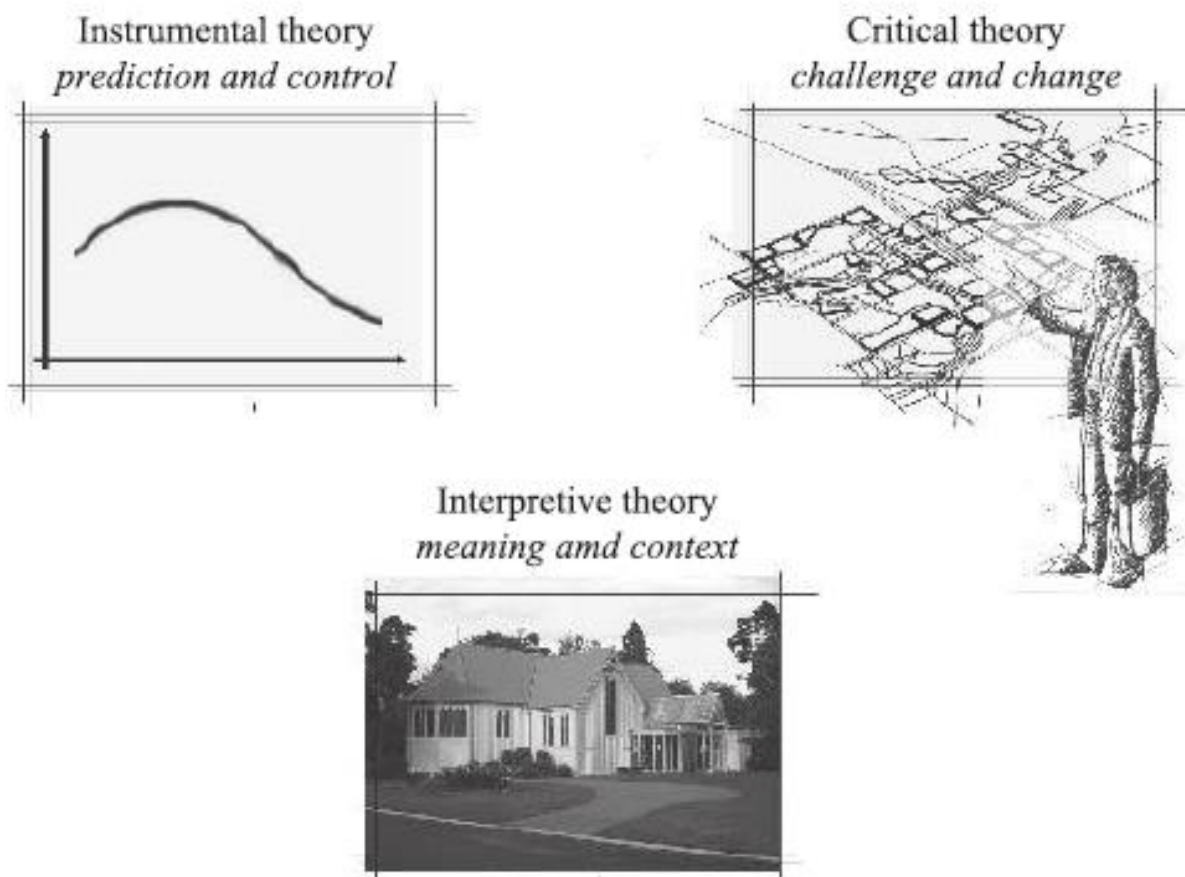
Figure 5 The nature of research in Landscape Architecture. Image source(Deming & Swaffield, 2011)

This research study follows and interpretive nature of theory. According to the interpretive theory, the process of interpreting is a process of conveying sense.(Wang, 2019). "Interpretive research is often not concerned with searching for specific answers, but with understanding or "making sense of " a dynamic social process as it unfolds overtime. Hence, such research requires an immersive involvement of the researcher at the study site for an extended period of time in order to capture the entire evolution of the phenomenon of interest" (Bhattacherjee, 2011) . In this study, I did not intend to search for specific answers rather I sought to understand the aesthetic perception as a dynamic process. I made an understanding of that specific perception of the BGI landscape. The period of time used for this research was from the months of October 2022 through February 2023.

Inquiry or Strategy	Type	Type of reasoning	Epistemological approach	Nature of theory
Empirical Description	Descriptive social survey	Abductive	Intersubjectivist	Interpretive

Table 6 Summary of strategy research in this thesis

3.2 Methods for data generation

The purpose of this section is to illustrate which methods were used to generate data during the fieldwork. Data generation refers to the process of generating the data I am interested in from all relevant sources to find answers to the research problem. The purpose of my thesis is to study the BGI at campus and to understand what the aesthetic appreciation and perception of users who frequently visit the campus is. Hence, I used semi-structured interviews as my data collection method for exploring the experiences, beliefs and views of users visiting/interacting with the BGI. Semi-structured interviews were the most appropriate methods of data generation, based on qualitative research. This provided me a thorough grasp and specific insight from each participant.

The timeframe for producing this master thesis was September 2022 through May 2023 . The fieldwork was carried out during the months of October 2022 through February 2023.

3.2.1. Primary data collection

The primary data collection is the 'original data collected for a specific research goal' (Hox & Boeije, 2005) p. 593

Semi-structured interviews

During the months of of October 2022 through February 2023, data generation was produced. Semi-structured interviews were the main method to generate knowledge of people's perceptions and experiences about the BGI and its components. I conducted semi-structured interviews face to face with different stakeholders, those were selected based on purposive sampling. This kind of sampling, also known as judgement sampling, is frequently employed in qualitative research when the researcher prefers to learn in-depth information on a particular occurrence versus drawing general conclusions from statistics. I was interested in learn in-depth information on the perception. A statistical survey would have limited the information I desire to produce. The researcher uses their knowledge to choose a sample that will be most helpful to their study goals (Scribbr, 2022). I divided the study in 2 samples. And did an iteration of interviews. The first round was in Autumn and the second round in Winter. The iteration of interviews was done to see how seasons may affect the perception and aesthetic appreciation of users who frequently visit campus.

Since I am studying the perception of BGI at campus of users who frequently use the space for Sample 1 I use students, since they spend a great amount of time at the university park. The intention of the inclusion criteria was to have a relative homogenous sample of adults. The conditions to be eligible to participate in the study were:
- Adults from 21-35 years old

- Adults who speak English
- Users who claim to have spent at least 1 year at university.

The exclusion criteria was based on ethical considerations, such as being underage or being unable to give informed consent.

The interviews were carried out on site, asking the interviewees to walk through the area with me, to answer the interview guide in 11 areas.

For sample 2, I interviewed stakeholders who had designed/collaborated/managed the BGI at campus.

The interview guide was created beforehand with the questions and topics that need to be addressed. The interview guide for sample 1 was proved with a participant and questions were modified. Planning and creating the interview instructions benefited from the thorough examination of previous research articles related to the research topic. In appendix I and II, the guidelines used for the interviews are shown.

Participants

In sample 1. A total number of 20 interviews were conducted during Autumn. This number was decided once I started to see theoretical saturation. The duration of the interview varied from 25 minutes to 2:00 hours. The extent to which topics were discussed was dependent on the perspective of the informants. The procedure to perform the interviews was to walk the BGI together with the interviewees and ask about their perception in every of the 11 areas selected.

- Users: key informants from the age of 21 to 35

I did a second round of interviews during winter. The total number of interviews were 7.

In sample 2. A total number of 2 interviews were conducted.

- Architects: One key informant from an architectural studio who has been involved in all the stages of the project.
- Institutions: One key informant who have been working on the project "Landscape laboratory at NMBU"

Observation

The BGI was observed and recorded through photography during the months of October 2022 through February 2023.

As Cooper Marcus and Francis argue, "observation can be a very efficient way to gain insight into the character, use, and performance of places already designed" (Cooper Marcus & Francis, 1998). I use observation to gain insight into the character and performance of the BGI. The tactics used for this inquiry of research was recording the seasonal changes through photography.

Mapping

Mapping landscape areas allows landscape architects to describe, understand, and interpret spatial-visual properties of landscape (Liu & Nijhuis, 2020). I mapped the places with the largest and the smallest aesthetical appreciation according to the participants.

3.2.2. Secondary data collection

Secondary data, 'information collected for a different purpose than the research question' (Hox & Boeije, 2005) p. 593. The information collected was: grey literature, academic articles, and chapters of a book about the aesthetic landscape, aesthetic perception and blue green infrastructure. The secondary data allowed me to the theoretical framework previously explained in chapter two. It also gave a common ground of concepts and theories in which to base my results in the analysis stage.

3.3 Limitations of data generation

Along with the development of this research some limitations arouse. I acknowledge them below, as follows:

a.   Individuality and subjectivity

The interviews were conducted in an individual manner. The aesthetic appreciation and perception of the landscape will vary according to the viewer. The answers reflect the individual perspective of the observer. The discussion section portrays the experiences of individual adults aged 21 to 35 years old. It portrays the narratives of all the interviewees. In their answers their worldviews, narratives, experiences, and understanding are included, this implies an intrinsic bias. This thesis is not determinative.

b.   Observable landscape

The tridimensionality of the landscape can't be explored in a totality with one interview. The perspective will influence in what the observer is seeing, and therefore the same landscape can give different aesthetic appreciation from different angle perspectives. The different perspectives alter the perception and what is observable to the eye of the viewer. The information available is different according to the angle perspective.

c.   Weather

The common conception of good weather and bad weather affects the people perception about the landscape. Most answers implied that sunny bright days were good weather. Some interviewees acknowledge the strong influence the 'bad weather' have on them. Hence, perception is affected by climatic conditions.

D. Difficulty to obtain insight from people

It was challenging to obtain answers from people. Asking the interviewees to walk through the area with me didn't seem appealing during winter. Also asking about landscape to people who are not literate on the field can be quite challenging "I don't usually have strong opinions about the landscape " was the answer of one interviewee.

3.4 Methods for data analysis

The purpose of this section is to describe the procedure for how the information collected was managed to develop the findings.

As Tjora suggest in his book "Qualitative Research as Stepwise-Deductive Induction" (Tjora, 2018), the raw data from interviews was captured with sound recording. This procedure not only allowed me to focus on the non-verbal information by the participant but also gave me confidence that the spoken information was well documented.

20 semi-structure interviews were conducted and recorded in Autumn. 17 interviews were transcribed, and selected for analysis. 3 interviews were discarded due to inconsistency in the tour or bad audio qualiy. The interviews were analysed using a narrative analysis.

7 semi-structure interviews were conducted and recorded in Winter, which only 5 revelead useful information to th purpose of this research.

3.5 Ethical concerns

This section describes the actions that I took ensure my research fulfils international standards regarding ethical requirements. As Bui states 'When conducting research of any kind, there is always the possibility that you will encounter ethical issues'(Bui, 2013) p.75. This research was planned, designed, and implemented with the Belmont report as the ethical ground. 'The Belmont report is a summary of the basic ethical principles and guidelines for conducting research with human subjects'(Bui, 2013) p. 77. In the Belmont report, three main aspects are considered: respect for persons, beneficence, and justice This research design was assessed by the Norwegian Centre for Research Data with reference number 510809.

Respect for persons
The Belmont report emphasizes the significance of seeing people as autonomous agents and the right to protection for those whose agency has been compromised. (Biomedical & Research, 1978) I viewed participants in this study as people with the ability to choose whether or not to take part in the research. An information letter was produced to allow participants to make informed choices and provide their signed agreement to participate. View Appendix III. English information letters were written specifically for each sample. The whole project's goal and the research methodology were covered in the letter. It further highlighted that withdrawal was possible at any moment and that participation was optional.

Beneficence and Justice

According to this concept, one should "do no damage, maximize possible advantages, and avoid possible downsides" (Biomedical & Research, 1978). The research adhered to the principles of confidentiality and anonymity in order to limit any potential damage to the subjects. All the information is treated confidentially, and participants names will not be published. According to NDS, all transcripts will be deleted after the study is completed.

3.6 Transparency and validity of the research

As Creswell (2009) suggests 'validity refers to the accuracy and credibility of the findings' (Creswell & Creswell, 2017). The data collection/generation techniques utilized must be reliable to provide valid results, the research must measure what it intends to measure. This guarantees that the data discussed and the conclusions drawn are valid (Scribbr, 2019).

The three methods selected semi-structured interviews, observation and mapping were thoroughly researched and based on existing knowledge in articles regarding BGI and Landscape perception and aesthetic.

The research sought to find plausible and reliable findings. Bui suggests that in qualitative research, a strategy to increase validity is "providing thick descriptions of the information provided by interviewees" (Bui, 2013) p. 187. In the findings and discussion chapter, informant quotations are used to utilize their actual words, without paraphrasing them, to minimize bias. By doing this, the chance of incorrect information interpretation is reduced.

To produce valid results, the population sample was clearly defined by selecting people from a specific age range 21 to 35 years old. I reached theoretical saturation.

Transparency refers "to the lack of hidden bias of the researcher". This is expressed as objectivity or neutrality. Due to the nature of this research, Interpretive research, the study takes a distinct approach to objectivity based on the claim that it is difficult to take a completely impartial view in social events whenever human researchers are involved. To assure the scientific legitimacy of my study I use transparency as the primary measure.

I disclose freely to the reader that: time, resources, and language were key factors that might influence the research during the data generation, hence these can influence the knowledge claims I present in the findings. A great potential limitation to the study was the language. During data generation, both researcher and informants were using English to communicate with each other. English is neither my mother tongue nor the mother tongue of most informants. Therefore, this aspect opened the possibility for the loss of relevant data due to misinterpretation of the question or lack of technical vocabulary.

As Tjora suggest the inter-subjectivity of in-depth interviews exists in and of itself (Tjora, 2018) p.13. This indicates that the kind of contact between the researcher and the informant affects the ideas the informants communicate.

In social sciences, an inherent limitation is subjectivity in the analysis of findings. Because more theoretically motivated interpretation is included at an earlier stage in the qualitative analysis, there are typically more components of researcher subjectivity present (Tjora, 2018): p. 14.

The research question (What is the aesthetic appreciation and perception of BGI in users who frequently visit the campus?) sought to build a discourse through the stakeholder's viewpoints. These viewpoints have a subjective quality. Each informant perceives reality differently. Hence, rather than generalizing the aesthetic appreciation, the research focuses on documenting the experiences and perceptual appreciations of a clearly define group of adults and discusses recommendations of design acknowledging those situational factors.

3.7 Study area

In this section the extent of the study area is identified. The study area is in Ås municipality in Norway. Ås is a municipality in the Viken county, Norway. The area is 103km^2 and the population is 17, 969 inhabitants (SSB, 2014).

1 Location Map. Norway. Viken County. Ås Image (Hernández D., 2023)

The Norwegian University of Life Sciences, NMBU, at Ås is comprised by a particular composition between historic buildings and an alluring park, which is currently used for recreation and teaching purposes. (NMBU, N. U. o. L. S., 2023).

The park, which most part was landscaped in 1930, is one of the largest and consistent neoclassical parks in Norway, the oldest parts of the park were established in 1860, and in 1870 the Nordskogen Arboretum was landscaped, this consist of various Norwegian and foreign tree species. The park is around 2.2 km^2 and consist of 1100 different species of trees and shrubs. (NMBU, N. U. o. L. S., 2023).

BGI-study area description

The BGI in the university campus in NMBU, Ås which forms part of the landscape laboratory is used as a case study. Norway's landscape laboratory NMBU is an "arena for interdisciplinary research with a focus on sustainable nature-based solutions in the face of societal challenges" (NMBU, N. I., 2023) The entire university park is used as an outdoor laboratory for research including teaching. Important users of this laboratory are several faculties at NMBU, but public actors and private business community can test out nature-based solutions in full-scale.

Figure 6 NMBU park areas. Image source:(NMBU, N. U. o. L. S., 2023)

Areas in the Park

1 Fougnerhaugen
2 Falsenstøtta
3 Det sentrale parkrommet
4 Viftebedene
5 Dahlstøtta
6 Tunet
7 Svanedammen
8 Bioteknologibygningen
9 Smiebakken
10 Den Fredrikshaldske kongevei
11 NIBIO – park
12 Damgården
13 Staudebøgen
14 Idrettsparken/Samfunnet
15 Nordskogen
16 Planteskolen/Treforsøksparken
17 Uraksen
18 Hasselbakken
19 Veterinærbygningen
20 Hestehagen
21 Åkebakke
22 Gårdsrom

Chapter 4: Findings

This chapter is divided into two parts. In the first part it is shown the observations carried out during the fieldwork. The seasonal changes and the landscape change is presented. Through photographs of the area.

As mentioned in section 3, the tactics deployed to generate knowledge about the perception of aesthetics of BGI was semi-structured interviews in two different seasons: Autumn and Winter. In section 4.2, I present visually the results of the Autumn interviews under the light of Nohl's theory of Aesthetic perception and Tudor's wheel of perceptual and aesthetic landscape.
In section 4.3 I present visually the results of the Winter interviews.

Kartutsnitt

Tegnforklaring

Kommunemaske
border

Norge i bilder
Red: Band_1
Green: Band_2
Blue: Band_3

Målestokk 1: 4000
15.03.2023

0   50   100
m

4.1 Fieldwork

Area 1. Grønne vannveier

Picture taken October 09th 2022

Picture area 05. Picture taken 23 February 2023

Picture taken October 09th 2022

Picture area 05. Picture taken 23 February 2023

Picture taken October 09th 2022

Picture area 05. Picture taken 23 February 2023

Picture taken October 09th 2022

Picture area 05. Picture taken 23 February 2023

Picture taken October 09th 2022

Picture area 05. Picture taken 23 February 2023

Picture taken October 09th 2022

Picture area 05. Picture taken 23 February 2023

Picture area 05. Picture taken October 9th, 2022

Picture area 05. Picture taken 23 February 2023

Picture area 05. Picture taken October 9th, 2022

Picture area 05. Picture taken 23 February 2023

Picture area 06. Picture taken in October 9th, 2022.

Picture area 06. Picture taken 26 February 2023

Picture taken 09 October 2022

Picture taken 23 Febrero 2023

Picture taken 08 October 2022.

Picture taken 26 Febrero 2023.

Area 9 Veterinærhøgskolen Dyresykehuset 2

Picture taken 08 October 2022.

Picture taken 26 February 2023.

Picture taken 08 October 2022.

Picture taken 26 February 2023.

Picture taken 09 October 2022.

Picture taken 26 February 2023.

4.2 Perceptual and Aesthetic Landscape: Autumn Interviews

Area Grønne vannveier

Bench

Bridge

Small pond

Different vegetation
Different sizeav

Patches of soil

Bridge

Plants

Perceptual level

Smells Mud

Colors Blue Orange Grey
Red Brown Yellow

Hear Birds chirping
Water running down

Symptomatic level

Symptomatic level text

Expressive level

Expressive level text

Symbolic level

Symbolic level text

Figur 2 Findings Area 1 Grønn vanveien. Autumn. Diagram (Hernández D. 2023)

Area Grønne vannveier

Tall tree
Alone tree

New planted trees

Trees at the beggining
Couple of trees in the corner
Trees at the beggining

Exhibiton art

Different stages
Elevation

Bridge
Shortcut

Perceptual level

Colors
Smells   Cold wet day
         of Autum
Hear   Cars

Symptomatic level

"It is divided in three parts"

Expressive level

I like the bridge
Interesting
Anticipation to see how
it grows with the new plants

Symbolic level

"I have never really
stopped here"

Figur 3 Findings Area 1 Grønn vanveien. Autumn. Diagram (Hernández D. 2023)

Area Grønne vannveier

Exhibiton art

Variety of plants
Pattern of plants

Tall tree
Alone tree

Small hill
Incline

Metal structure with water
Sink looking element

Perceptual level

Colors
Smells   Cold wet day
         of Autum
Hear   Cars

Symptomatic level

"It is divided in three parts"

Expressive level

Inviting

Symbolic level

"I have never really
stopped here"
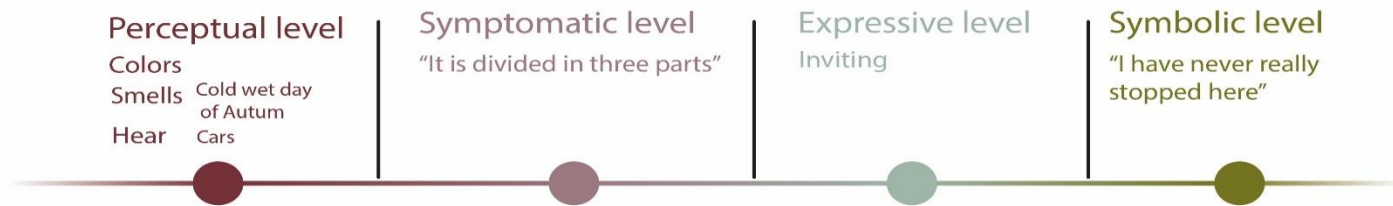
Figur 4 Findings Area 1 Grønn vanveien. Autumn. Diagram (Hernández D. 2023)

Area Andedammen

Birds around

Reflection of the sky

Pond

Duck house
House for the animals
Cute house

Evergreen trees
Tall trees in the middle of the pond
Trees over the water

Consolidated ecosystem
Water lilies

Reflection of the sky
Water

Perceptual level
Colors Blue Yellow
         Red Green
Smells Water
Hear   Birds
         Frogs

Symptomatic
There is a duck house so I assume there are duck here, ha ha ha

Expressive level
Peaceful   Alive
Cozy area   Quiet
Beautiful place   Calm
Supremely beautiful

Symbolic level
"It has been here for a long time, and it has grown as part of the environment"
"I have sat down in the benches around"

"I love this place"
"This my favorite place"

Figur 5 Findings Area 2 Andedamen. Autumn. Diagram (Hernández D. 2023)

Area Niagara 1

Moss on the stone

Different kinds of plants
Variety of plants
Diversity of bushes

Small pond

Small cascade
Break up of water

Patches of soil

Stone structure

Remaining grass
Grasses

Sky color reflected on water
Color of water green-blue ish

Color of water green-blue ish

Plants
Bushes
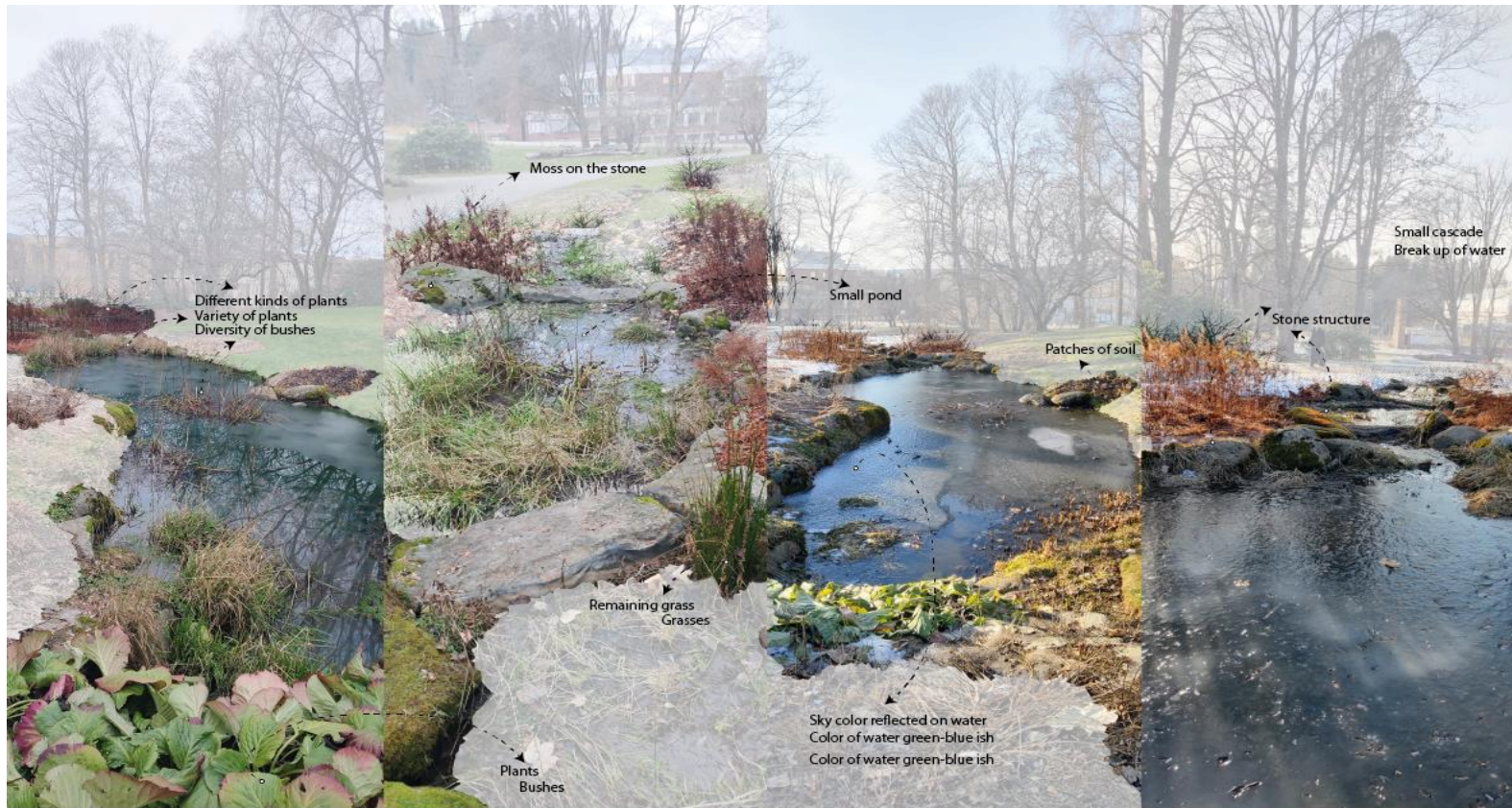
Figur 6 Findings Area 3 Niagara 1. Autumn. Diagram (Hernández D. 2023)

Area Small ponds

Perceptual level

Colors Almost no colors

Smells

Hear Water running
from the hill

Symbolic level

The ducks were walking here
during the summer

I didn't notice the ponds until my shoes
got wet

Expressive level

Flow   Sweet
Natural   Pretty
Melancholy
Good placement of
ponds visually
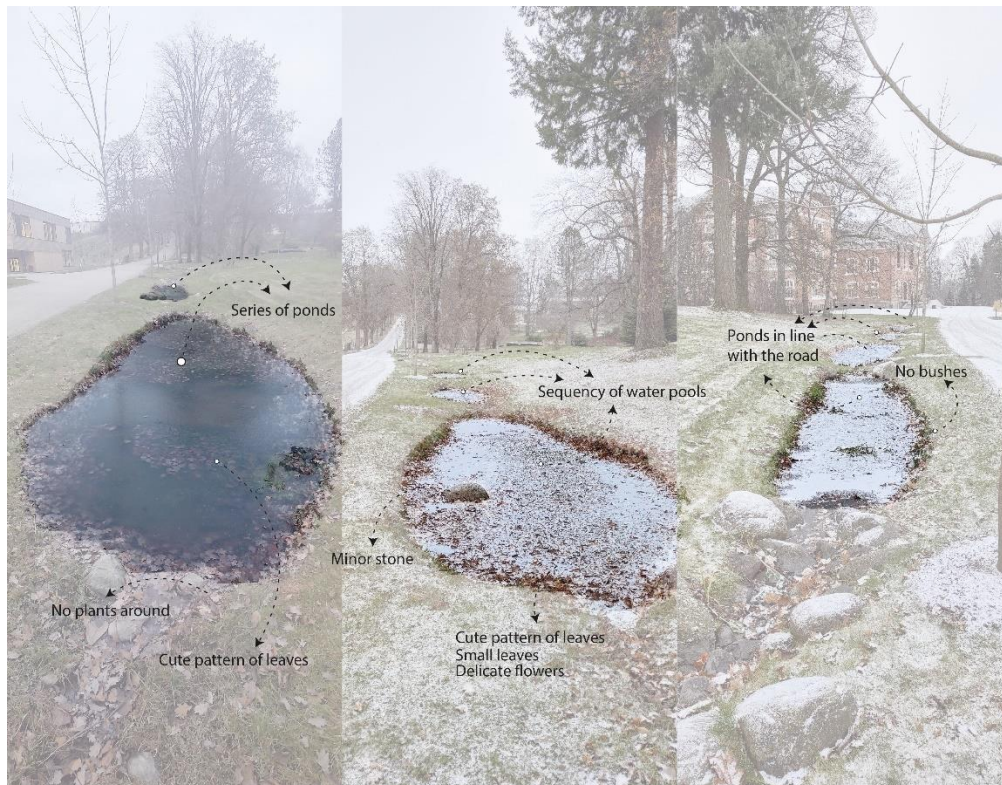
Figur 7 Findings Area 4 Small Ponds. Autumn. Diagram (Hernández D. 2023)

Area Clock axe

Plants sticking out

Sitting areas

Diferent stones surrounding the area

A little swamp
A pond
A bit of water

Overgrown grass

Not cleared up plants

Perceptual level

Colors Brown Grey Green
Smells Smells something weird
but I don't know what
exactly it is
Hear Noise from the university
Noise from the people
passing by

Symptomatic level

I mean my guess is that normally
this area is filled with water
because of the little water
structure that they built and put
it on the top

Expressive level

Sad
Very wild
Curioisty for the plants

Symbolic level

I have never sat there

Figur 8 Findings Area 5 Clock axe. Autumn. Diagram (Hernández D. 2023)

Area Bikuben

Perceptual level
Colors Blue   Orange
        Green   Gray
Smells No smells
Hear   No sounds

Symptomatic level
"The path leads the water
down, is this connected to
 some place?"
The water path direct the
water to the pond

Expressive level
Calm   It looks nice
Relaxing   Kept up place
Flow

Symbolic level
"I have walked this path
 down"

Benches
Wooden seats

Grass around
Plants dying

Patches of small plants

Stones
Big rocks

Pipe
Sticking out tub

Round stones
Small stones

Geometric rocks

Figur 9 Findings Area 6 Bikuben. Autumn. Diagram (Hernández D. 2023)

Area Lille Årungen

Text annotations on image:

View in different angles
Open view to the road
Open sight to the landscape

Place to socialize
Benches to sit
Benches to take the sunligh
Wooden structure

Pond
Waterpool
Small body of water

Perceptual level

Colors Blue   Orange Brown
        Green Gray   Yellow

Smells No smells

Hear   Noise from the road

Symptomatic level

Symptomatic level text

Expressive level

Expressive level   Beautiful
Romantic   Lovely lake
Enjoyable
Pleasant place
The pond is very nice

Symbolic level

Small pier
"I havent sit there"
"I remember sitting
here with friends,
it is really nice"

Figur 10 Findings Area 7 Lille Årungen. Autumn. Diagram (Hernández D. 2023)

Area Veterinærhøgskolen Dyresykehuset 1

Row of trees
Alley of trees

Parking lot

Green grass left

Grasses

Water stream
Flow of water
Meadow with snow

Metalic thing
Vessel
Huge drain stainer
Spiral manhole
Shaft
Concrete hole

Wild nature

Overgrown weeds

Perceptual level

Colors Green White
Orange Blue

Smells Dyrehuset

Hear Noise from the traffic

Symptomatic level

The small meadow remind
me to a river

Is it connected to other
areas?

Expressive level

Artifical-looking shaft   Ugly shaft
I like the look of the wild nature   Weird vessel
Contrasting metalic thing
I dislike the sticking out manhole
Nice water stream

Figur 11 Findings Area 8 Veterinærhøgskolen Dyresykehuset 1 Autumn. Diagram (Hernández D. 2023)

Perceptual level
Colors   Green   Gray
            White
Smells   Horses next to us
Hear   Noise from the road

Symptomatic level
The drainage may lead to
a water river

Expressive level
Interesting

Symbolic level
Doesn't give me much
information
Unless you walk here to
focus you will actually
see the structure

Figur 12 Findings Area 9 Veterinærhøgskolen Dyresykehuset 2 Autumn. Diagram (Hernández D. 2023)

Area Veterinærhøgskolen Dyresykehuset 3

Perceptual level
Colors   Green   Red
         Orange Gray
Smells   Horses
Hear   Traffic Road

Symptomatic level
I assume that water drips down.
The path towards a small pond down there.

Expressive level
Natural

Symbolic level
I think this looks more natural because it is a path that is not so transited.
I used to come here to run. I used to go from here to Årungen.
It is nice to see the sunsets from this area.

Figur 13 Findings Area 10 Veterinærhøgskolen Dyresykehuset 3 Autumn. Diagram (Hernández D. 2023)

Area Disc golf

Frisbee golf
misplaced

Bunch of stones
Stone structure
Stone bridge

Wild grass

Hill

It is obviously man made

Murky water

Pond

Weeds

Perceptual level

Colors Gray Brown
Smells Horses
Hear   Traffic Road
        Water running down to the pond
        Noise from university

Symptomatic level

"I think the water usually flows down
from the top there into the pond, the
stones seems to be created to have a
path for the water "

Expressive level

Sad
A bit dead
Urban
Man-made

Symbolic level

I have played frisbee golf with my friends
People fishing out the frisbees

Figur 14 Findings Area 11 Discgolf Autumn. Diagram (Hernández D. 2023)

4.3 Perceptual and Aesthetic Landscape: Winter Interviews

Area Grønne vannveier

Perceptual level
Smells Traffic
Colors Red Brown
Hear Road Traffic

Symptomatic level
"Due to amount of twigs I think there is a lot of plants and bushes durng summer".

Expressive level
Pristine landscape.

Symbolic level
The twigs are really vertical.

Figur 15 Findings Area 1. Grønne vanveier. Winter. Diagram (Hernández D. 2023)

different rees with snow

pead
vegetation

twigs

Perceptual level	Symptomatic level	Expressive level	Symbolic level
Smells		Pristine landscape.	
Colors White			
Hear Road People walking on snow			

Figur 16 Findings Area 1. Grønne vanveier. Winter. Diagram (Hernández D. 2023)
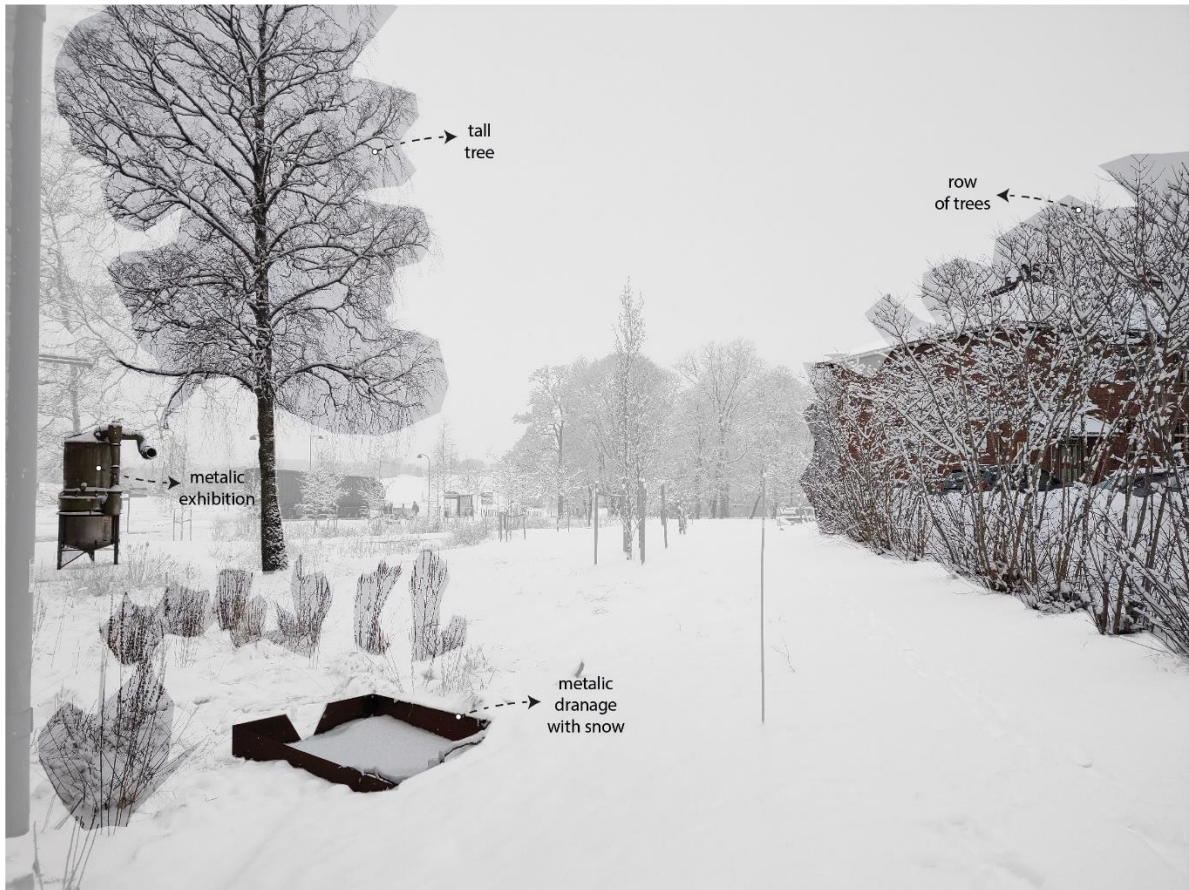
Figur 17 Findings Findings Area 1. Grønne vanveier. Winter. Diagram (Hernández D. 2023)

Area Andedammen

Perceptual level

Smells

Colors   White Gray

Hear   The wind between
the trees with snow

Symptomatic level

"I would assume there is
water around the trees in
the middle because it seem
like an island".

Expressive level

Pretty nice place
Peaceful
Calm
Quiet

Symbolic level

Island with the duck
pond in the middle.

Figur 18 Findings Area 2 Andedammen. Winter. Diagram (Hernández D. 2023)
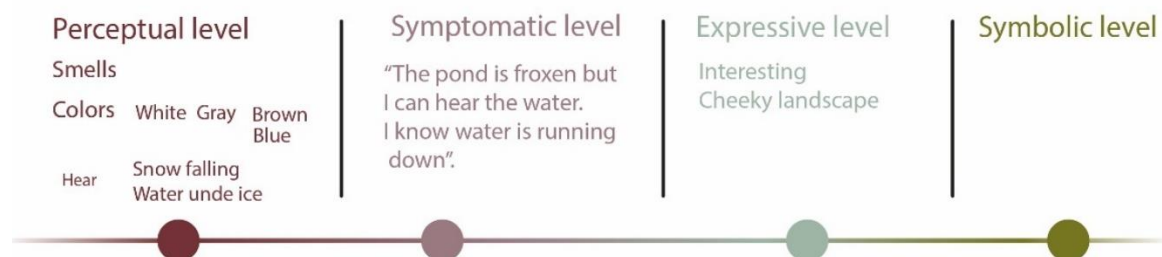
Figur 19 Findings Area 3 Niagara. Winter. Diagram (Hernández D. 2023)
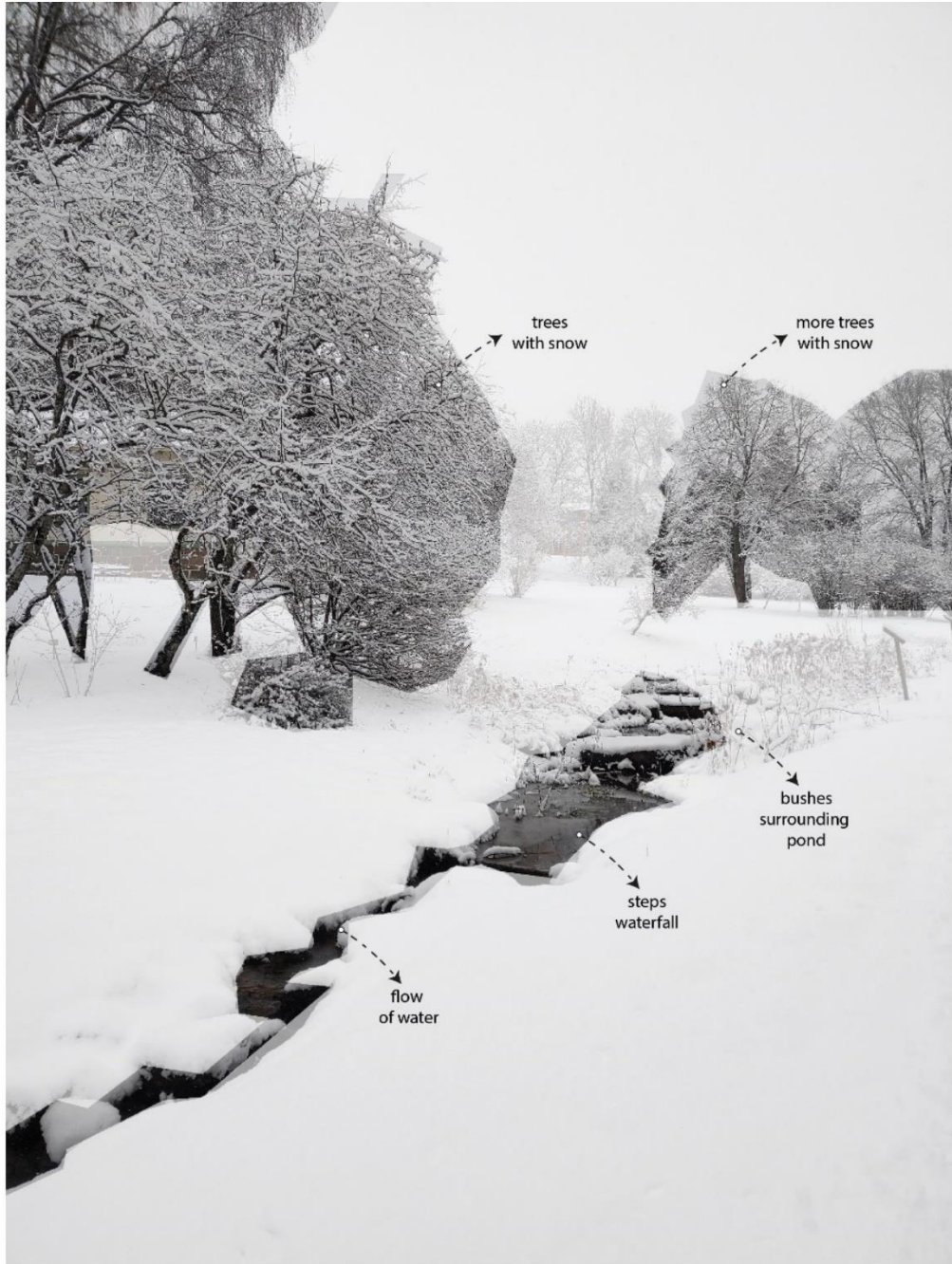
Perceptual level

Smells Cold day

Colors White Ice Blue Blue

Hear Snow falling from trees

Symptomatic level

"I guess the trees are old because they seem to be standing here for long".

Expressive level

Powerful
Inspired lanscape

Symbolic level

"The flow of water reminds me of a waterfall".

Figur 20 Findings Area 3 Niagara 1. Winter. Diagram (Hernández D. 2023)

Area Small ponds

series
of trees

random rocks
lying around

rounded
rocks

Perceptual level	Symptomatic level	Expressive level	Symbolic level
Smells None		Lonely landscape	
Colors White		Indifferet	
Hear Snow falling from trees.		Bored	
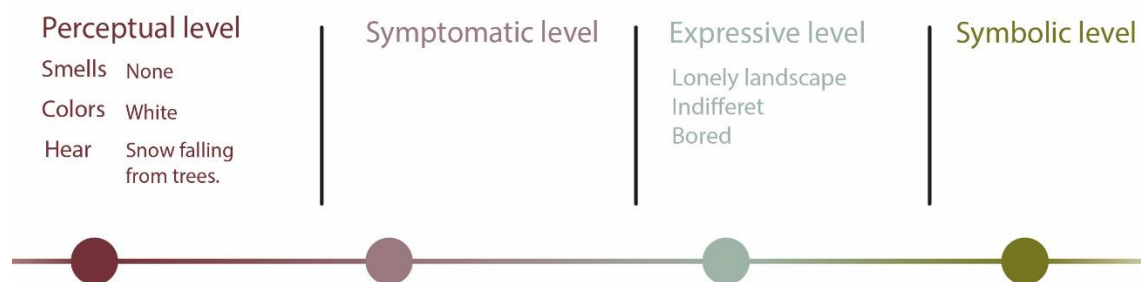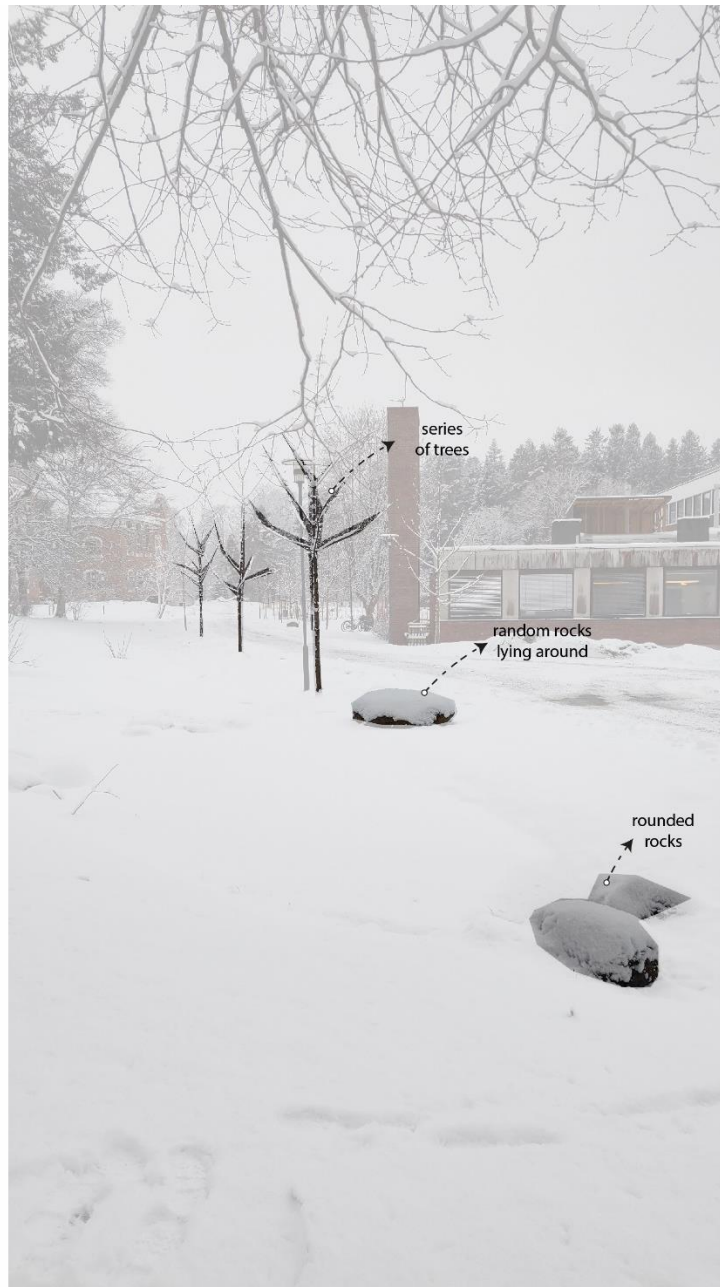
Figur 21 Findings Area 4. Small ponds. Winter. Diagram (Hernández D. 2023)

Area Clock axe

Perceptual level
Smells None
Colors White Gray Black None

Symptomatic level
"The snow covers the steps and it highlights the structure".

Expressive level

Symbolic level
It looks like a mountain.
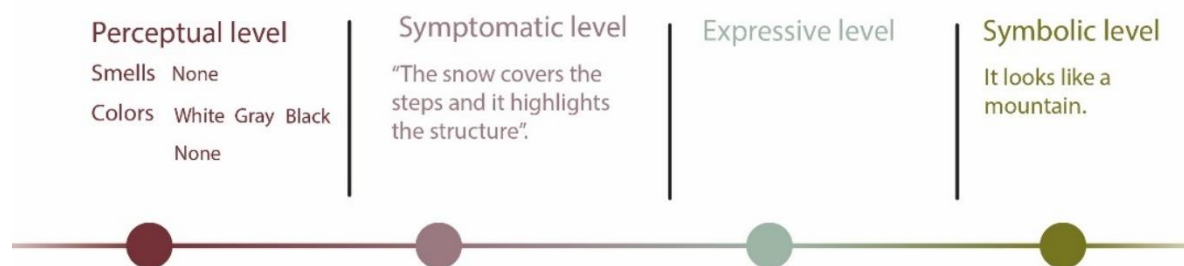
Figur 22 Findings Area 5 Clock axe. Winter. Diagram (Hernández D. 2023)

Area Bikuben

Green sculpture

Sleeping Plants
bushes and branches

Huge stones

Rocks covered with snow

Perceptual level

Smells None

Colors White Green
Brown Gray

Hear People passing by

Symptomatic level

I think there is a river
below because the
stones seem to delineathe
the water flow

Expressive level

Sadness
Solitude

Symbolic level

"I didn`t notice the sculpture
untilnow"

Figur 23 Findings Area 6 Bikuben. Winter. Diagram (Hernández D. 2023)

Massive building
Modern building

Decorating
bushes

Benches

Perceptual level

Smells None

Colors Red White
Brown Black

Hear Traffic road

Symptomatic level

The bushes in the
background I think there
are to decorate the
surroundings

Expressive level

Sadness
Too much contrast
Building too dominant

Symbolic level

"The snow landscape makes
my attention to focus on the
building which has an
interesting architecure "

Figur 24 Findings Area 7 Lille Årungen. Winter. Diagram (Hernández D. 2023)

Area Veterinærhøgskolen Dyresykehuset 1

Perceptual level

Smells None

Colors White

Hear People passing by

Symptomatic level

The color of the plants tell me it`s very cold now

Expressive level

Sad
Plants died

Symbolic level

"The drainage looks like a spiral"
"The drainage looks like a cake of snow"

Figur 25 Findings Area 8 Veterinærhøgskolen Dyresykehuset 1 Winter. Diagram (Hernández D. 2023)

Area Veterinærhøgskolen Dyresykehuset 2

Frozen water

Perceptual level

Smells   None

Colors   Ice blue   Sky blue
          Royal blue

Hear   The road traffic

Symptomatic level

The water is ice blue
which means we are
halfway over winter

Expressive level

Calm

Symbolic level

"I like this area on winter it
looks so calm"
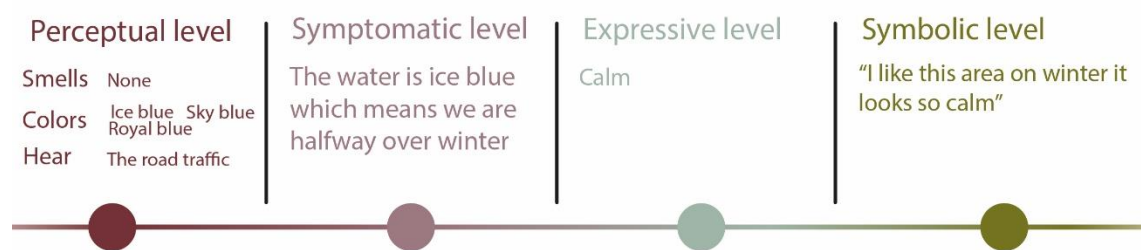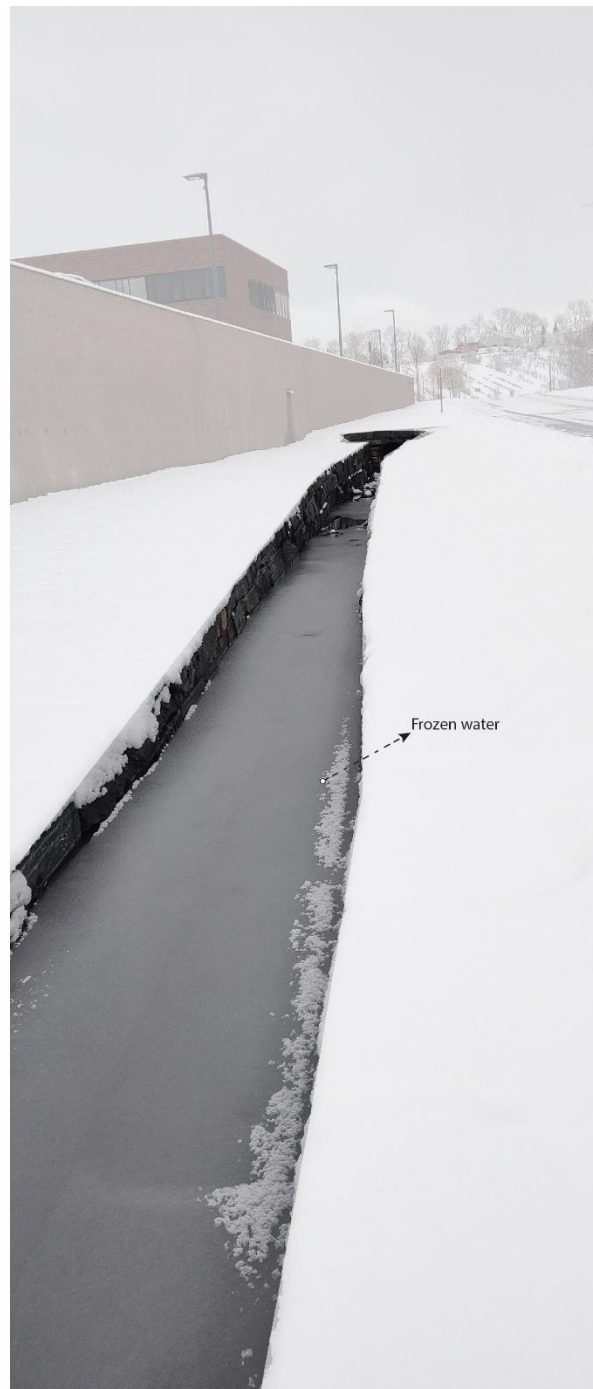
Figur 26 Findings Area 9 Veterinærhøgskolen Dyresykehuset 2 Winter. Diagram (Hernández D. 2023)

Slot opening from
the wall

Drainage

Geometrical stones

Small stones

Perceptual level	Symptomatic level	Expressive level	Symbolic level
Smells Cold	None	"The water is so clean I like it"	"The shallow water reminds me to a mirror" I can see the sky reflecting
Colors White			
Hear The road traffic			

Figur 27 Findings Area 9 Veterinærhøgskolen Dyresykehuset 2 Winter. Diagram (Hernández D. 2023)

Geometric Architecture
Building with sharp edges

Trees aligned to the
flow of water

Canal

Sort of river flow
of water

Treshold

Perceptual level

Smells None

Colors Blue
        White

Hear   Flow of water

Symptomatic level

None

Expressive level

"I like the flow of water"
The flow of water

Symbolic level

"The geometric architecture
seems like triangles with the
landscape I like it"

Figur 28 Findings Area 10 Veterinærhøgskolen Dyresykehuset 3 Winter. Diagram (Hernández D. 2023)

Figur 29 Findings Area 11 Discgolf Winter. Diagram (Hernández D. 2023)

Chapter 5: Discussion and practical implications

5.1 Discussion

In this section I answer the main research question and sub research questions.

Research Question: How does the experience of aesthetics of BGI on campus alter, work through and on users who frequently visit the area?

The experience of aesthetics works through individuals from many scales. At the individual level, a cognitive process is generated that can be explained through different theories of landscape perception. People look at the BGI and get complex information that is individually categorized, filtered, and processed. Therefore, the experience of aesthetics is subjective. As long as there are as many individuals as there are landscapes, the experience can be infinite. However, at the local level, this aesthetic experience can serve a more global purpose of development and can be inserted into the sustainability agenda.

Meyer explains in her first point of the manifesto "Sustaining culture through landscapes "that "Design enables social routines and spatial practices, from daily promenades to commuting to work. It translates cultural values into memorable landscape forms and spaces that often challenge, expand, and alter our conceptions of beauty" (Meyer, 2008)

Through the experience of BGI people can have access not only to infrastructure that provide ecosystem services but also give the opportunity to connect with nature and reproduce at a local scale cultural terms. To exemplify this I can use the term friluftsliv that is deeply embedded in the Norwegian culture and values. Friluftsliv is a Norwegian concept that translates to "open-air living" or "free air life." It refers to the practice of spending time outdoors in nature and engaging in outdoor activities. Friluftsliv is deeply ingrained in Norwegian culture, and it is considered an essential part of the Norwegian identity. Friluftsliv is more than just spending time outdoors; it is a way of life that emphasizes the importance of connecting with nature, regardless of the season or weather conditions. .(visitnorway, 2022).

Through the design of BGI and the aesthetic experience, people can sustain the local culture.

Figur 30. Woman engaging with the pond area at Andedammen. Looking and teaching her kid about the ducks. Photography taken October 09 2022 (Hernández D, 2023)
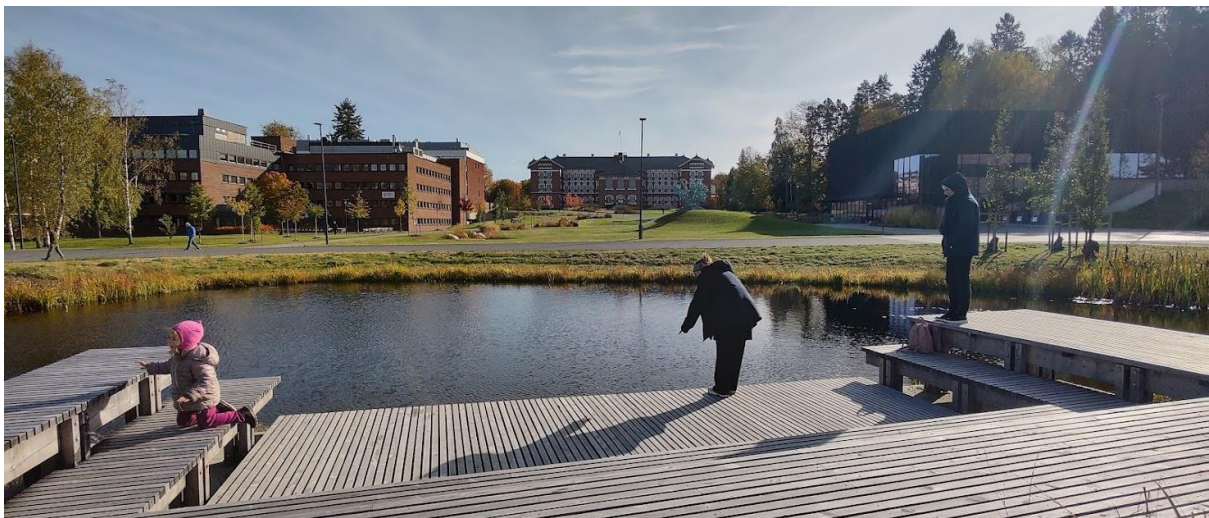
Figur 31 Women looking at the pond "Lille Årungen" to see if there is fish. The woman leaning forwardscalls the kid to grab her attention in an effort to make engage her with the nature" Photography taken October 09 2022. (Hernández D, 2023)

Another valuable point from Meyer's work can be her second point of the manifesto "Beyond ecological performance"

"Sustainable landscape design must do more than function or perform ecologically; it must perform socially and culturally." (Meyer, 2008)

Sustainable landscape design can reveal natural cycles and regenerate natural processes – by cleaning and filtering rainwater or replenishing soils through arrested erosion and deposition – and do so while intersecting with social routines and spatial practices.

Meyer argues that the interconnection between ecological and social temporal cycles, links the daily life and the particular events of a specific site to the experience of the dynamic biophysical aspect of the environment. Hence, Hydrology, ecology and social human life are blended.

Figur 32 Photography taken 22 February 2023. Photo Credits: Liang Shanshan. Frozen Andedammen where students perform "The Kurt Stille Memorial Run" annual event. This celebration interlinks the student and sororities, the landscape, and the BGI.

By 2023 "The kurt stille memorial run" has been celebrated for almost 50 years. It is an exemplification of how the BGI performs socially beyond ecological performances. The celebration takes part of the memories and associations with the pond Andedammen. Memories and associations are part of the perceptual landscape according to Nohl and Tudor.

Answer to the sub research question 1.
Sub research question: What is the aesthetic appreciation and perception of BGI in users who frequently visit NMBU campus?

The aesthetic appreciation and / perception of BGI can be summarized as an aesthetic experience, which is shaped by a multi-layered cognitive process.

Aesthetic experience as a cognitive process: Aesthetic perception involves extracting information, knowledge, and stories from the landscape as much as possible. Nohl points out that the aesthetic joy is greater the more a person can extract aesthetic knowledge from the landscape (Nohl, 2001). Through an analysis of the answers of the interviewers I conclude that a common pattern of appreciation and perception of the BGI elements is people wanting to understand the landscape. I found that the more people could extract information from the four different layers proposed by Nohl the more people reacted with a positive experience of perception from the landscape observed. People want to extract information from a broad range of information categories.

Answer to the sub research question 2.

Sub research question: How does the specific climate conditions, seasons affect the perception and aesthetic appreciation of users who frequently visit campus?

Since aesthetic appreciation and perception is defined as an experience, a cognitive multi-layered process occurs every time a person observes the BGI. The aesthetic appreciation may be different every time, especially when the seasonal changes are visible. The aesthetics and performance of appearance of blue-green infrastructure are influenced by seasonal variations, which result in a variety of aesthetically experiences throughout the year. Blue-green infrastructure's aesthetics alter with the seasons, resulting in a dynamic and changing landscape. The fact that there is a period with snow in Norway and other northern countries, has made Sagrelius to talk about the term Blue-Green-White infrastructure. However, that topic is beyond the scope of this thesis (Öhrn Sagrelius et al., 2022)

5.2 Practical implications

In this section, information extracted from the answers of the interviewees are drawn to create a series of practical implications to build aesthetics experiences of landscapes of BGI. The intention of these experiences is to promote better practices of design that give agency to the role of aesthetic in the sustainability agenda. By creating experiences of aesthetics that create emotional and psychical changes, the landscape and its environmental care can be sustained.

1. ALLOWING UNCONTROLLED NATURE IN SPACES OF CONTROLLED NATURE.

Some people perceive the spontaneous and uncontrolled nature that appears and grows in spaces where nature is controlled as something that is worthy of value or appreciation. This appreciation is in line with the discourse that BGI is within the sustainability agenda. Interviewers believe to some extent that uncontrolled nature, that suddenly appears in controlled areas, and which reflects natural processes of succession is valuable.
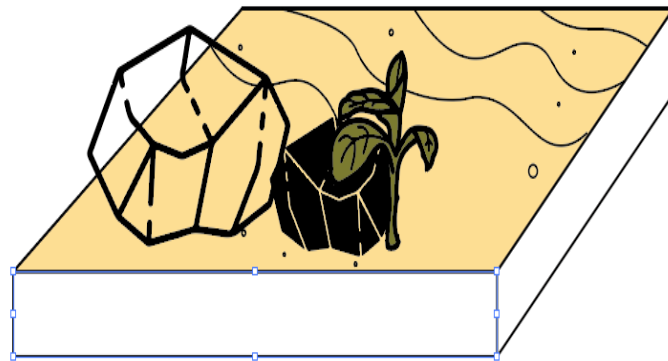
Figur 33 Diagram Allowing uncontrolled nature in spaces of controlled nature (Hernandez D., 2023)

AUTUMN INTERVIEW
Respondent: I like there is some amount of wild nature, even if it is probably controlled.
Researcher: Why do you like that there is wild nature?
Respondent: "It feels like it is not that much human impact. I know there is some human impact. The water ways have been created to control the runoff of rain, so I know that obviously this has been created by the university or whoever is in control of managing that, but it doesn't look like it's been too processed, and I sort of like that. Because our university talks a lot about human contact with nature and sort of nurturing that relationship and when I see something a little bit wilder but not like perfected, it kind of makes me appreciate it a little bit more. I guess I like the look of that but maybe not everyone else does".

2. NATURAL LOOKING AREAS OVER TOO MAN-MADE AREAS.

Some interviewees reported to prefer natural-looking natural areas than man-made natural areas in blue green infrastructures. The reasoning behind this could resonate to the idea that when nature looks too formal it produces a sense of unattractiveness. Nassauer talks about this phenomenon in his work of "Messy ecosystems, orderly frames" (Nassauer, 1995). He found out that when naturalness is too formal, too open, bare, flat, or monotonous, people find it unattractive. In words of the interviews 'nature that doesn't look too natural' doesn't add too much joy to an aesthetic experience.
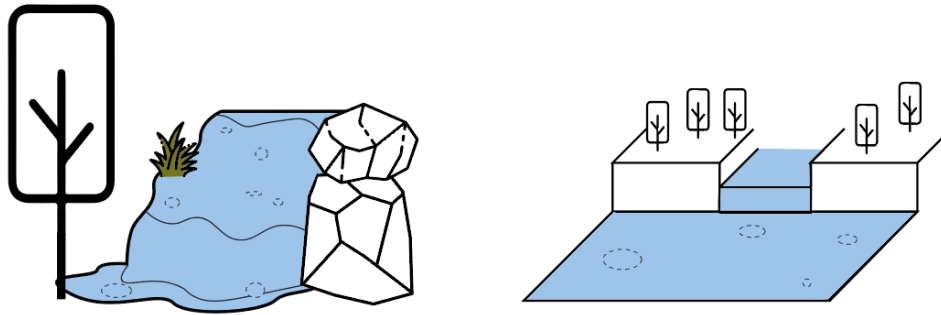
Figur 34 Diagram natural looking areas over too man made areas (Hernandez D., 2023)

AUTUMN INTERVIEW
Respondent: The trees are sad because there's only branches left and brown colour. And the stone structures are piled up on the hill to create a path for the water, because of the grey colour that makes also kind add to the feeling that looks too urban and too man made. Then the nature and the bushes and the grass and the trees sort of help hide that a bit, then it doesn't look that much man made because still looks like nature is overtaking a little bit and I always think I really like the look of trees, I associate that with something a bit nicer and cheerful.

3.   ELEMENTS FROM A WIDER NATURE INTO THE LANDSCAPE PROVIDES MORE JOY.

Allowing nature to grow into designed landscape elements may provide more joy and a pleasant aesthetic experience to the observer. Wild nature allows the observer to extract symptomatic information. As Nohl claims, symptomatic information helps to understand the object observed as a symptom of something else. Observable sand may be a symptom of a nearby beach landscape. To exemplify, in the BGI, when an interviewee observed the moss growing into the stones, the moss reminds her to the moss she has previously observed in the forest. The moss also allows people to understand that there is a natural process growing into the area. Furthermore, it may bring symptomatic information to the observer as in form of memories or anecdotes.
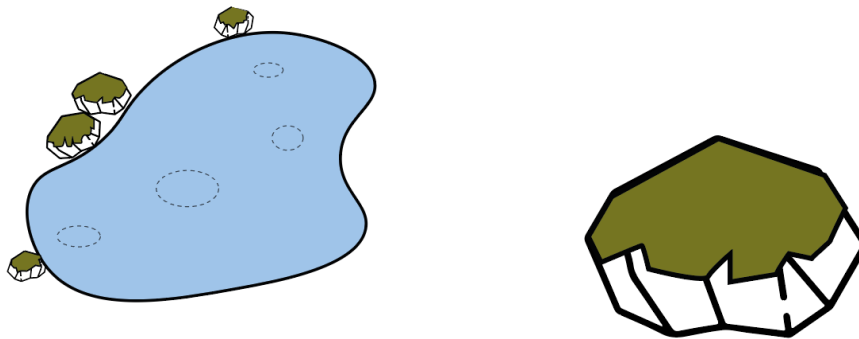
AUTUMN INTERVIEW
Respondent: I see some green moss on the stones.
Researcher: What do you think about that?
Respondent: I love it, I really like moss and just on the weekend I went in a cabin trip with my boyfriend and we walked to the forest and it was covered in moss. It is so beautiful, and bright, and you walk on it, it is so soft it, it is so vibrant it I love it.

Figur 35 Diagrama elements from a wider nature into the landscape provides more joy-

4. VARIETY OF COLOURS GIVE MORE AESTHETIC JOY.

When interviewees were asked about the perception they had towards different BGI areas there were more positive aesthetic appreciation concerning areas that were perceived as more colourful. As Lee-Hsueh claims, diversity of plants is essential to cause variety in the visual landscape and ecological function. This richness is essential to ecological aesthetic. (Lee-Hsueh, 2018). Usually, these areas had a variety of vegetation, plants, trees, and bushes. In comparison with areas where there were more stones and less vegetation material, the answers were less positive. Hence, I interpret this pattern of answer as the more perceptual information can be extracted from the landscape (colour, texture, pattern, form) the greater aesthetic joy.


Figur 36 Diagram variety of colour give more aesthetic joy. (Hernández D., 2023)

5. **BGI** AESTHETICS AND FUNCTIONALITY TOGETHER GIVES GREATER JOY TO THE OBSERVER.

An interesting aesthetical experience is given to users of BGI when there is a function associated with the landscape element. In other words, if designed elements exist only for aesthetic reasons there is less information to extract from the landscape and it becomes less interesting. When design elements, in addition to aesthetic qualities, have functions, there is more cognitive information available to the observer.
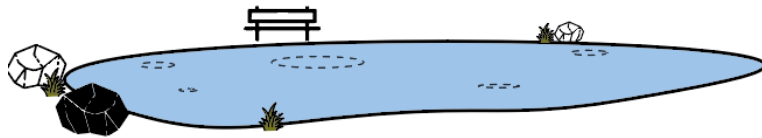
AUTUM INTERVIEW
Respondent: "It is a good question. I think here what I find most interesting is the pond and I do really like the idea of the structures of the water flowing into the pond and that sort of like not only been there for aesthetic reasons but also just having a functionality behind and being integrated with the landscape sort of"

Figur 37 Diagram BGI aesthetics and functionality together give greater joy to the observer. (Hernandez D., 2023)

This common pattern of thought was shown several times by most interviewees in different areas. Some people assumed the purpose or function of the BGI, specially with ponds while others only wondered whether there was a function assigned to it. However, having access to cognitive information may explain why people show a positive attitude.
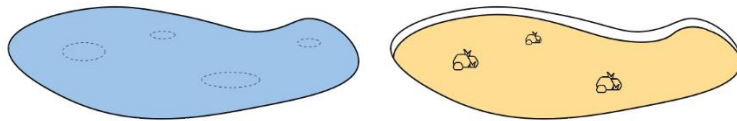
AUTUMN INTERVIEW
Respondent: "I honestly haven't had the chance to understand why we have a pond here or it is just to enhance the aesthetics of the university, or if this pond actually serves a purpose or if it is used to hydrate the land…yeah, but anyways it looks beautiful".

6. CORRECT PERFORMANCE OF DESIGNED LANDSCAPE ELEMENTS.

To obtain the greater joy or aesthetic experience, it is recommended to have a proper maintenance/ construction process to assure the design landscape elements function properly. Some interviewees reported to be confusing to see pond structures without water through different seasons. People are confused when there is a landscape element which has a function, but it does not perform the function. This can be explained in line with Nohl symptomatic level. The observer is dissatisfied when it sees a symptom of a function but does not see a concordance. LINK Arkitektur, the office which produce the design of BGI claims that there is a dispute between them and NMBU park because in the building process there may have occurred a rupture of the membrane. Water leakage to the ground occurs and the ponds have been long time without water.

6. Correct performance of designed landscape elements.

Figur 38 Diagram a pond with water and a dry pond. (Hernandez D., 2023)

AUTUM INTERVIEW
Respondent: I see what it looks like the shape of a pond, or well it seems like a pond, but I am confused right now, I am unsure whether or not it should have water.

a. Dissonance may indicate a lack of care.

In line with the previous point, in what people referred as dissonance, I resonate with Nassauer's work about care. If the landscape is built to have a function but for some reason (negligence of maintenance due to diverse bureaucratic reasons) the function is not fulfilled, the viewer gets a cognitive dissonance. The dissonance creates a negative appreciation of the landscape because people find the designed landscape unattractive. The unattractive attitude comes from the belief that the area is not cared for enough to fix the issue or provide enough maintenance to fulfil the function. Although I understand that in larger projects of landscape architecture there may be several bureaucratic limitations, the cognitive process of public perception does not consider those limitations.

7.   CUES TO CARE.

Through the interviews carried out, a greater appreciation and positive perception of the BGI was observed when there were symbols that people identified as signs of maintenance. This can be explained through the "cues of care" term by Nassauer. "Cues to care make the novel familiar and associate ecosystems that may look messy with unmistakable indications that the landscape is part of a larger intended pattern" (Nassauer, 1995) p. 167. For example, in Andedammen pond there is a well-known duck house, that is painted every year. Unconsciously, this is a cue that this area is taken care of and maintained by students and NMBU. On the other hand, in other BGI areas there was accumulated leaves in one corner, a cue indicating the maintenance people was there earlier. The areas furthest away from the central buildings, towards Årungen, sometimes did not present any of these symbols. Some people commented that it looked as if lacked care. Therefore, people expressed it wasn't nice to walk around there.
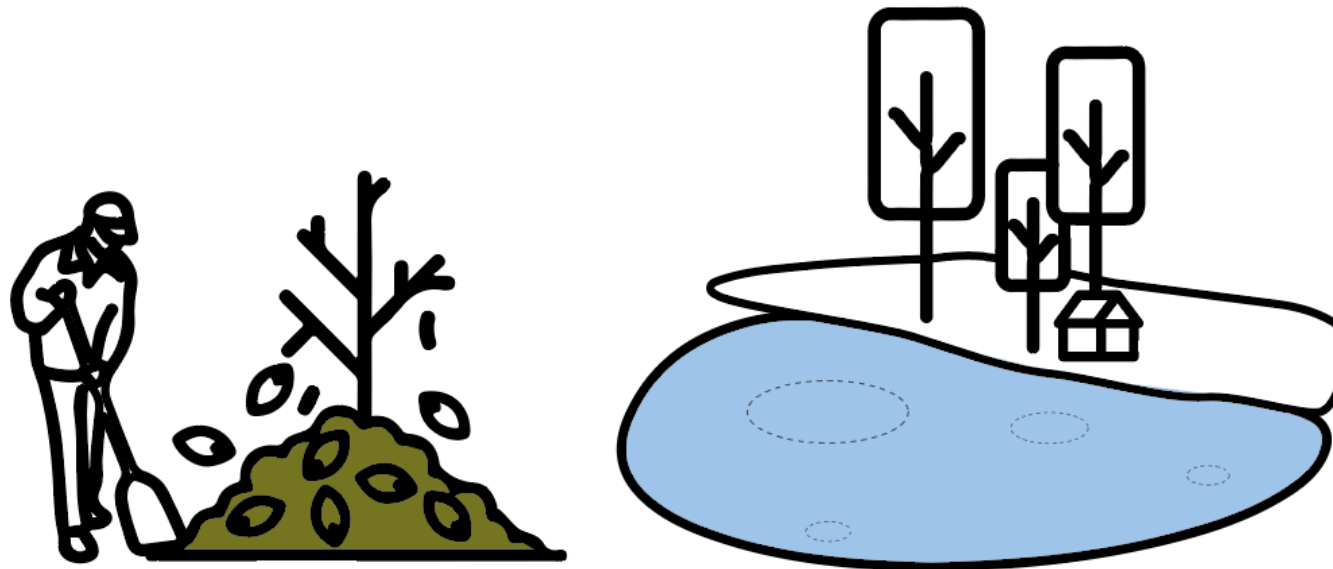
Figur 39 Diagram representing a man taking care of the Autumn leaves, in the right side the duck small house is a sign of care

8. AESTHETICAL DESIGN DECISIONS SHOULD CONSIDER THE ORIGINAL DESIGN AESTHETICS.

This thesis used observation and recording through photography as a method for knowledge creation. In the stage of recording, a designed manhole was recorded during the different seasons. I witness the evolution and change of the aesthetic design. The manhole went from being a designed element to a conventional element that didn't keep the original designed qualities, and it was negatively criticised by observers. I believe the intention of the manhole with a spiral shape was to create a delightful aesthetic experience, however the context in which it was placed was not optimal. Then, aesthetical decisions were taken and the original qualities of the manhole in spiral was visually lost. Having two similar manholes in one area may have created a cognitive confusion in observers. Then, this element received many comments of non-appreciation.

Figur 40 Photo series of evolution of a spiral designed manhole

9. HARMONY: INTEGRATION OF THE DESIGNED ELEMENTS AS WHOLE ENTITY.

When the BGI areas present poetic aspects of landscape: expressive and symbolic effects of landscape as part of the aesthetical understanding, then a sense of harmony or beauty is experienced in observers of the landscape. In other words, when people observe a landscape and this gives a sense of harmony, or being part of a whole, and there are symbols of being integrated into the surrounding then the aesthetic experience is considered as positive. This is what Nohls (2001) refers as his aesthetic perceptual category of "the beautiful".

9. Harmony: integration of the designed elements as whole entity.
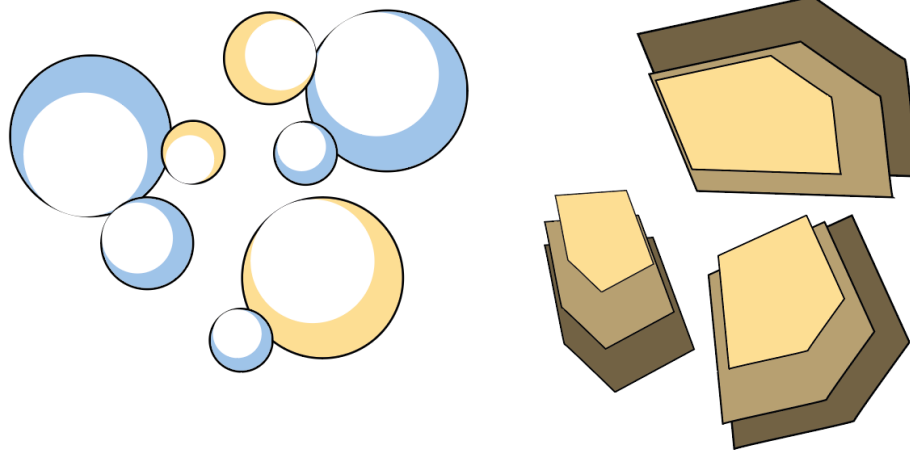
Figur 41 Diagram representing harmony between softscape and hardscape

WINTER INTERVIEW
Respondent: . I think here what I find most interesting is the pond and I do really like the idea of being integrated with the landscape sort of…because when it is lots of plants around it or when there is overgrown, the stones don't take that much. So, it looks like it is part, and it is supposed to be there and belongs, so I feel like that is the most interesting.

10. APPARENT NATURALNESS.

People tend to show a predilection to designed landscape elements that look as if they were natural to the environment, although they were intentionally created or man-made as people called it. This point relates to what Nassauer defines as apparent naturalness. In his research of "Messy ecosystems, orderly frames" he points out that the look of care is highly associated with landscapes that farmers (in his research) found attractive. He states that "naturalness" as a cultural interpretation, involves the global concept of care. In a content analysis of descriptive terms organized under the concepts of landscape care he found that apparent naturalness, and "development blends in habitat" are found to be attractive (Nassauer, 1995). In the information gained from interviews, people expressed to see natural areas. The stones placed in the Niagara area seem to be natural because those blend with the landscape. However, this is an apparent naturalness.

10. Apparent naturalness.
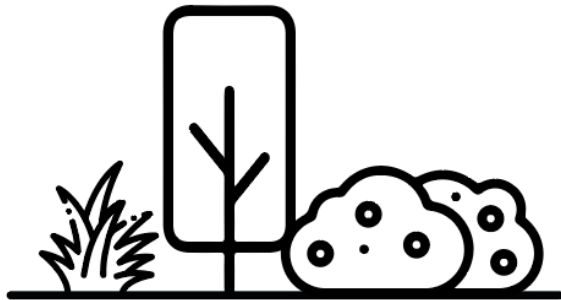
AUTUMN INTERVIEW
Area Niagara. Respondent: "If you pass here a hundred times you don't notice them (the stones), you know, you don't notice them at all, until you stop and you are like oh wow look at that, it was there. It is sort of clever ways of integrating it, even though… Now it much sticks out because it is so grey and out there, but usually when it is surrounded by nature it is not that much"

Figur 42 Diagram showing different plant species that portraits naturalness, but those were intentionally selected

11. COMPLEXITY AND LEGIBILITY.

The BGI landscape can be complex, and when that happens the outcome of appreciation and perception is influence by the legibility.

On the one hand, when the landscape is too complex or has too many elements that are not coherent between them, the viewer may have difficulties to understand it and develop a negative appreciation. I refer to the term coherence explained by Lee-Hsueh. Environmental information is coherent when the setting is orderly and easy to understand for people. (Lee-Hsueh, 2018).

On the second hand, when the contents of the landscape can be easily identified, indicating legibility, the viewer tend to develop a positive appreciation and perception. Complexity and legible landscapes give richness and diversity of aesthetic experiences.

11. Complexity and legibility
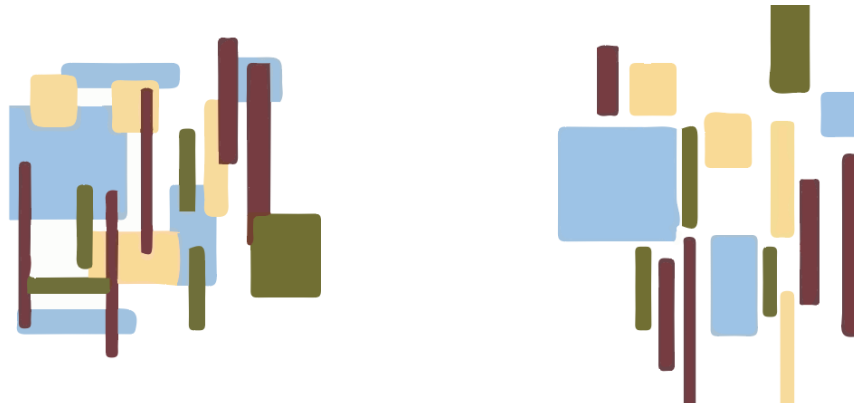
Figur 43 Diagram illustrating concepts of complexity and legibility. (Hernandez D., 2023)

12. Multiple points of view.

There is a positive appreciation of the BGI when the area can be observed through different angles. Having many and different points of view accessible to the observer allow the viewer to extract more information from the same area. When the viewer has the possibility to explore and interact with the blue-green infrastructure from different angles, the aesthetic joy is greater. This point also loosely relates with the prospect-refuge theory of perception proposed by Appleton. The prospect refugee theory is a tendency to prefer environments with unobstructed views (prospects) and areas of concealment and retreat (refuges) (Appleton, 1975).

12. MULTIPLE POINTS OF VIEW
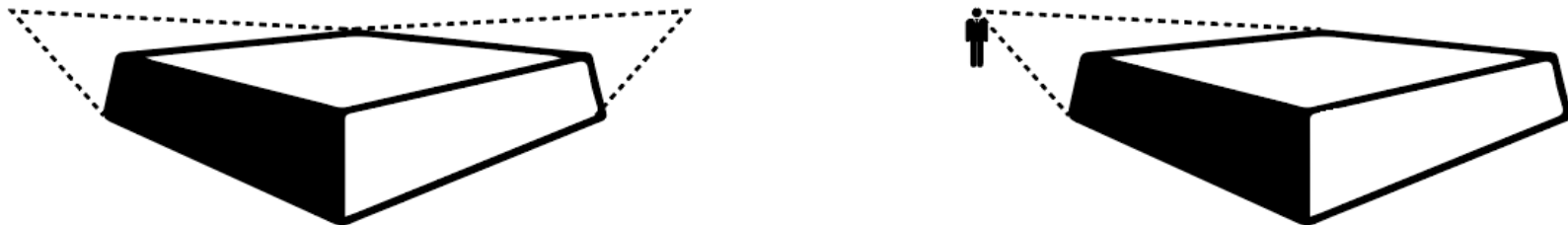
Figur 44 Diagram illustrating that with multiples point of view, the observer have more acces to cognitive information, in the right side of the drawing the observer only can see the landscape from a single angle.

13. HUMAN INTENTION AND DESIGN.

Throughout the study of the perception of BGI in different areas, I found the repeated pattern of people towards wondering if the landscape element observed where something planned or just something that was there. To exemplify this, I will use the stones, steps, seats located in UR access. Those stone steps have a function, and intention and design. These three qualities help the observer to understand that it is a design element and there is human intention behind it. As Nassauer states "we must design to frame ecological function within recognizable systems of form" (Cooper Marcus & Francis, 1998) p. 162

On the contrary, when there is intention but not recognizable systems of form, the observer may not have a rich aesthetic experience.

13. Human intention and design
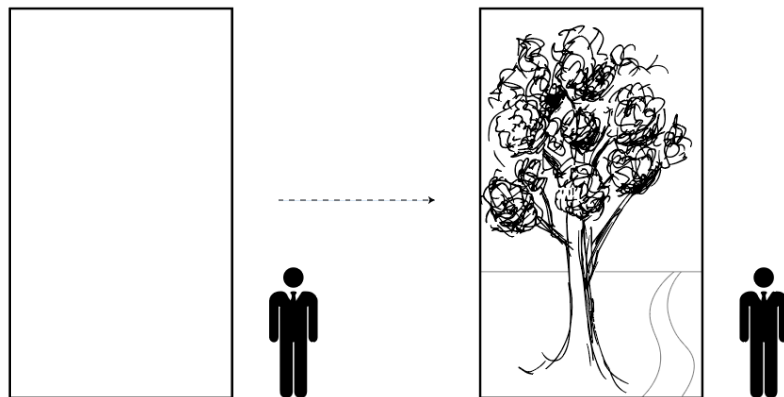
AUTUMN INTERVIEW
Respondent "I don't know if this is water that got collected here, or if it is done on purpose"
Respondent " I didn't know these were ponds, I always though that they were puddles."

Figur 45 Diagram, on the left the observer may not "see the landscape" there is no human intention, on the right the landscape can convey human intention. (Hernández D., 2023)

14. LEGIBILITY.

Through the responses of interviews over the winter, I noticed a pattern of people talking about hardscape landscape elements much more than softscape landscape elements. The softscape, commonly known as plant material, was not visually available to users during the winter. Therefore, the hardscape is important for the legibility of a space. The hardscape was manifested through rocks and stone elements. These indicated to people that there was a landscape, some interviewees assume it was BGI and other only guessed. I conclude that for a BGI design to be appreciated in 2 different seasons of the year where there are visible changes in climate, both the hardscape and softscape must be designed to produce aesthetic experiences.

Autum interview
"The stone structure gives three dimensionality during winter. Otherwise I wouldn't see anything, only white and snow"

Figur 46 Diagram, the stones gives legibility to the landscape during winter

15. FAMILIARITY.

There is greater aesthetic joy when people acknowledge the landscape and when there is a sense of familiarity. This principle is based on the idea that the observable landscape and its appreciation is built from the poetic aspect of it according to Nohl. Or in Tudor's framework (2014) from memories and associations that arise from the landscape elements. In the same line, this percept can be aligned with Meyer term of landscape agency. Landscape agency: from experiences to sustainable praxis. "The experience of designed landscape can be a spatial practice of noticing, wandering and wondering in, and caring about the environment. The experience of landscape can be a mode of learning (Meyer, 2008).

Autumn interview
Respondent "I don't really notice these things, I think it was until a year into me living here that I started to notice these things, because I just walked past by and I was like mmm some water that it is probably just drip down from the hill. It is a whole pond now that I see"

TIME
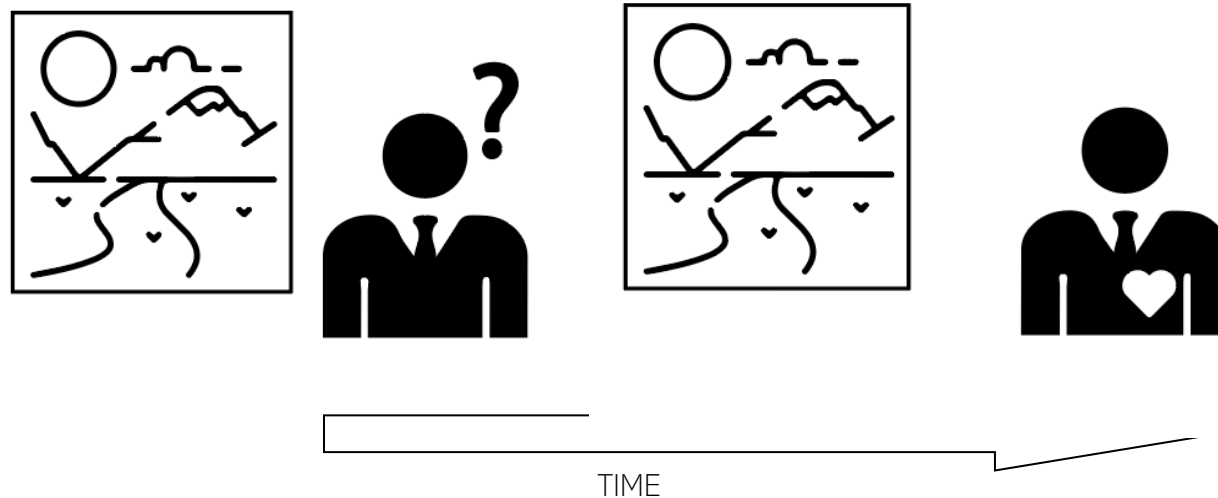
Figur 47 Diagram familiriaty concept. (Hernández D., 2023)

Chapter 6: Limitations and future research

Through a literature review and building a theoretical framework, this study was carried out to understand how the experience of aesthetics work through and on users who frequently visit BGI. The BGI infrastructure at NMBU park was used as a landscape object of research. Even though this study showcases the aesthetic appreciation and perception of BGI, it is constrained by some limitations which could be addressed by future work. First, the research study was limited to students from 21-35 years old. The appreciation presented in this study is limited to their perspective. The study was carried out in two seasons Autumn and Winter.

Hence, a future study could follow the same approach over an extended period of time, covering the four seasons of a year: summer, spring, autumn and winter, to have a complete view of the aesthetic perception of the same area of BGI. The future study could benefit by having an extensive sampling and using the same individuals to ask the same interview guide in all the different seasons.

Chapter 7: Conclusion

The outline of this thesis is to understand the experience of aesthetics of BGI on NMBU campus. The objective of this thesis was to understand how this aesthetic experience alters, works through and on users who frequently visit the area. Through this study, I described what is Blue-Green Infrastructure, its multiple definitions in academia and its classification and components.

BGI contribute to mitigate and adapt to climate change, while enhancing quality of life. BGI develops aesthetically pleasing and socially acceptable solutions. Aesthetics plays a crucial part in the sustainable agenda. A sustainable design needs to be practical, effective, and appealing to the eye. Since aesthetics may enhance user experience and encourage environmental stewardship, it is crucial to sustainable design.

Then, I discussed several concepts and theories which built my theoretical framework. I revised what landscape is, the perceptual and aesthetic landscape, landscape perception, landscape appreciation, aesthetic perception and the performance of appearance.

I carried out fieldwork and semi-structured interviews in two different seasons: Autumn and Winter to understand the appreciation of aesthetic and perceptual landscape. Summarizing my findings and discussion I state that the experience of aesthetics works through individuals from many scales. At the individual level the experience of aesthetics is subjective. The aesthetic appreciation and / perception of BGI can be described as an aesthetic experience, which is shaped by a multi-layered cognitive process.

Finally, aesthetics is crucial to the sustainable agenda because it results, when favourable or positive, in designs that are aesthetically pleasing, widely accepted, and considerate of the environment. Aesthetics-based sustainable design of BGI may enhance user experience, encourage social acceptability, and lessen environmental effect of climate change. Through this research I conclude that we, as landscape architects, can construct a more aesthetically pleasing and environmentally responsible future by combining aesthetics with sustainable BGI.

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Appendices

Appendix I. Semi-structured interviews guide.

Terminology= BGI blue green infrastructure

Introduction

Presentation (A short description of who I am and what the project is about)

I am Diana Hernandez, a master's student of Landscape Architecture for Global Sustainability at NMBU. As part of my master thesis, I am investigating the local appreciation of perceptual and aesthetic landscape in the BGI recently constructed at NMBU in users who frequently visit campus. As part of the study, I am conducting interviews on site. The project aim is to investigate the appreciation of the BGI solutions during Autumn. So I would like to interview you. I would appreciate your collaboration in this research.

Information sheet

Presentation of information sheet .

What the interview will be used for?

-The interviews will be used for collecting, analysing, describing and presenting data for my thesis research.

Rights to the interviewees

The interviewee can at any time choose to cancel the interview

The interview is anonymous

Interviewees may choose to undo participation

The interview will be recorded upon consent

Procedure for the interview

Can I record the conversation for later transcription?

Guide

Area of the BGI:							
Day:							
Time:							
Sex:	Male			Female			
Age :							
Frequency of visit:	Once a week	Once a month	Once a year	Several a week	Several a month	Several a year	1st time visiting
Purpose of visit:							
Activities performed here:							
Company:	Alone.	Group (number of people)					
Duration of the Interview:							
Season							

PERCEPTUAL LEVEL: SENSORY EXPERIENCE.

The next questions are related to the 5 senses.

1. Do you see something?
    1.1.   What elements do you see here?
    1.2.   Which colours do you see here?
    1.3.   Do you recognize any of the plants species?
        1.3.1. Are there any positive elements you perceive here?
        1.3.2. Are there any negative elements you perceive here?
    1.4.   What structures do you see here? →
    1.5.   How would you describe a structure?
    1.6.   Do you see any natural process here?
2. Do you hear something?
    2.1.   What do you hear?
3. Do you smell something?
    3.1.   What do you smell?
4. Do you (physically) feel something?
    4.1.   What do you feel?

EXPRESSIVE LEVEL: EMOTIONAL

The next four questions are related to the emotions and feelings.

1. Does this landscape evoque you any feeling?
2. Which feeling?
3. How would you classify your feeling? (positive or negative)
4. Do you know why?

SYMPTOMATIC LEVEL: UNDERSTANDING

The next three questions are related to the understanding of the landscape.

7. How do you interpret this landscape?
8. Which elements of this landscape provide you information to interpret it in that way?
9. Do you associate this landscape with something?

SYMBOLIC LEVEL: IMAGINARY

10. Does this landscape inspire you ideas of any kind?
11. Does this landscape inspire you thoughts of any kind?
12. Does this landscape bring memories of any kind?
13. Do you have any anecdote here?

OVERALL PERCEPTION

14. Do you like the area?
    a. Why?
15. Do you dislike the area?
    a. Why?
16. What do you find interesting here?
17. What do you find boring here?

18. Location of favourite places within BGI

Appendix II. Interview guide for link.

1. How would you define BGI?
2. Can you tell me a bit about the BGI designed and implemented at NMBU?
3. What is the size of the project?
4. What were the motives to design and construct BGI at campus Ås?
5. What was the target of the BGI? Small, big rain events or both?
6. When you designed the BGI did you consider aesthetic qualities?
    a. Which ones?
7. When you designed the BGI did you contemplated some aesthetic criteria?
    a. Yes →What was it?
8. Do you considered the seasonality in your aesthetic criteria?
    a. How?
9. When did the construction start?
10. What are the constructed structural components of the BGI ?
11. What are the ecological functions of those BGI components?
12. Do you consider maintenance plays a role in the aesthetics of the project?
    a. Can you tell me a bit about how is the maintenance managed and implemented?
13. Do you consider time plays a role in the project's aesthetic?
14. What are the features specifically targeted at aesthetic joy?
15. Are there any features targeted for a sensory experience?
    a. Are there features for sight?
    b. Are there features for smell?
    c. Are there features for touch?
    d. Are there features for hearing?
16. Are there any features targeted for an emotional experience?
    a. Are there any expectations for triggering emotions in the users?
17. . Are there any physical features built to help understand the landscape in a cognitive way?
18. Are there any physical features to activate the imagination of users?

Are you interested in taking part in the research project

"Blue green infrastructure: Local appreciation of perceptual and aesthetic landscape. A qualitative case study at NMBU, Ås."?

This is an inquiry about participation in a research project where the main purpose is to investigate the appreciation of the blue-green infrastructure solutions at NMBU campus in Ås during the autumn season 2022. 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 research project aims to describe and explore the local appreciation of perceptual and aesthetic landscape in a post occupancy evaluation of BGI in the university campus at NMBU, Ås. The study intends to gather the public perception of adults who use the space frequently. The research question is "What is the aesthetic appreciation and perception of BGI in users who frequently visit the campus?" This research project is a master thesis at the faculty of Landscape Architecture for Global Sustainability, at NMBU, Ås. The collected personal data will only be used for the purposes of this research.

Who is responsible for the research project?

NMBU is the institution responsible for the project. This research will be published in the university library systems and it can be published in the website of SPARE-project https://www.spare-project.com/student-projects. **NMBU partnered with SPARE "Space for resilience" and intends to include master theses as part** of the working package number 2: **blue-green infrastructures for integrated stormwater, recreation and biodiversity management,**

Why are you being asked to participate?

You have been asked to participate in the project because you are passing/walking by the blue-green infrastructure at campus. I am interested in knowing your opinion.

What does participation involve for you?

If you chose to take part in the project, this will involve that you will participate in a semi structured interview, which will be based on a defined set of 18 questions regarding aesthetic perception. The information will be collected trough note-taking and voice recording. The information 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).

- *The master student Diana Hernández-Aguilar in connection with NMBU will have access to your personal data.*
- *The interview guide doesn't require your name and contact details. I will store your consent which has your name in a private folder on a personal device and that won't be shared to third parties or stored on the web.*
- *Your individual participation won't be recognizable in the publication. The research focus is on the answers of people not in people itself.*

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

The project is scheduled to end May 15 2023. *The personal data, including recordings will be destroyed at the end of the project. The files will be deleted and erased. There won't be any follow up from this research.*

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 *NMBU* Data Protection Services 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:
- NMBU via Associate professor Jorg Sieweke jorg.sieweke@nmbu.no
- Master student Diana Hernández-Aguilar diana.hernandez.aguilar@nmbu.no
- Our Data Protection Officer: Hanne Pernille Gulbrandsen personvernombud@nmbu.no
- Data Protection Services, by email: (personverntjenester@sikt.no) or by telephone: +47 53 21 15 00.

Yours sincerely,
Jorg Sieweke   Diana Hernández-Aguilar
Associate professor/Student supervisor   Master Student

Consent form

I have received and understood information about the project Blue green infrastructure: Local appreciation of perceptual and aesthetic landscape. A qualitative case study at NMBU, Ås.and have been given the opportunity to ask questions. I give consent:

☐ to participate in *an interview*

I give consent for my personal data to be processed until the end date of the project, approx. *May 15 2023*

(Signed by participant, date)

Are you interested in taking part in the research project

"Blue green infrastructure: Local appreciation of perceptual and aesthetic landscape. A qualitative case study at NMBU, Ås. "?

This is an inquiry about participation in a research project where the main purpose is to investigate the appreciation of the blue-green infrastructure solutions at NMBU campus in Ås during the autumn season 2022. 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 research project aims to describe and explore the local appreciation of perceptual and aesthetic landscape in a post occupancy evaluation of blue-green infrastructure in the university campus at NMBU, Ås. The study intends to gather the public perception of adults who use the space frequently. The research question is "What is the aesthetic appreciation and perception of BGI in users who frequently visit the campus?" This research project is a master thesis at the faculty of Landscape Architecture for Global Sustainability, at NMBU, Ås. The collected personal data will be used only for the purposes of this research.

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Why are you being asked to participate?

You have been asked to participate in the project because you have information regarding the blue-green solutions implemented at NMBU campus in Ås. The criteria decisions regarding aesthetic qualities of the blue-green infrastructure is of vital importance for this research.

What does participation involve for you?

If you chose to take part in the project, this will involve that you will participate in a semi structured interview, which will be based on a defined set of 18 questions regarding aesthetic perception. The information will be collected trough note-taking and voice recording. The information 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

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- *The master student Diana Hernández-Aguilar in connection with NMBU will have access to your personal data.*
- *I will replace your name and contact details with a code. The contact details and respective codes will be stored separately from the rest of the collected data. I will store your consent which has your name in a private folder on a personal device and that won't be shared to third parties or stored on the web.*

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

The project is scheduled to end *15 February 2022. The personal data, including recordings will be destroyed at the end of the project. The files will be deleted and erased. There won't be any follow up from this research.*

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

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- Our Data Protection Officer: Hanne Pernille Gulbrandsen personvernombud@nmbu.no
- Data Protection Services, by email: (personverntjenester@sikt.no) or by telephone: +47 53 21 15 00.

Yours sincerely,

Jorg Sieweke   Diana Hernández-Aguilar
Associate professor   Master Student
Student supervisor

Consent form

I have received and understood information about the project *[insert project title]* and have been given the opportunity to ask questions. I give consent:

☐ to participate in *a conversation/interview*

I give consent for my personal data to be processed until the end date of the project, approx. *February 15 2022*

(Signed by participant, date)