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CARESCAPE OF BLUE-GREEN SOLUTIONS IN EVERYDAY LIFE

Exploring the socio-materiality of a landscape technology

Mottaghi, Misagh

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This research explores how blue-green solutions (BGS) take part in various everyday situations in the Augustenborg neighborhood of Malmö, Sweden, where BGS were introduced over twenty years ago to control urban flooding. The research applies a relational perspective, looking at everyday life as something that is contextually formed and given meaning in relation to the socio-materiality of the environment. The research argues that the concept of resilience is inadequate in responding to the evolving challenges of urban areas, as situations before and after flooding are never the same. Instead, the thesis emphasizes the necessity of these environments to be responsive to the diverse needs of everyday life situations, including flooding. The study avoids looking at BGS as isolated artifacts in the urban landscape and, inspired by both actor-network theory (ANT) and affordance theory, it tries to explain the relationships between people and BGS through the lens of matters of concern and care. In this work, the interaction between blue-green infrastructure and society is understood from an urban design perspective and, as a spatiotemporal study of matters of care, the obtained knowledge also adds to science and technology studies (STS).

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It matters what matters we use to think other matters with.
(Haraway, 2016:12)

For my parents

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Abstract

As urban populations grow, and cities become more compact, sustainable technologies are needed to address issues such as climate change. Yet, embedding them in urban areas is sometimes challenging, e.g., finding space to accommodate urban runoff caused by heavy rainfalls to prevent damage to lives and properties. To mitigate the impact of flooding, open landscape technologies have been developed and given different names, including blue-green solutions (BGS). BGS utilizes open surfaces, allowing for less reliance on pipe facilities while minimizing environmental damage. While urban open space plays an important role in everyday life, its functions need not be limited by the implementation of BGS, means enhancing flood resilience should also address the daily needs of people.

This research explores how BGS take part in various everyday situations in the Augustenborg neighborhood of Malmö, Sweden, where BGS were introduced over twenty years ago. The research applies a relational perspective, looking at everyday life as something that is contextually formed and given meaning in relation to the socio-materiality of the environment. The thesis employs a mixed qualitative and quantitative approach to answer: What aspects seem to matter in an environment with BGS, and how are they spatially situated in everyday life? How can the co-effects of BGS as technical artifacts be studied in relation to their temporality? How can everyday users' expectations and concerns be considered in the design process of BGS? The research argues that the concept of resilience is inadequate in responding to the evolving challenges of urban areas, as situations before and after flooding are never the same. Instead, the thesis emphasizes the necessity of these environments to be responsive to the diverse needs of everyday life situations, including flooding. The study avoids looking at BGS as isolated artifacts in the urban landscape and, inspired by both actor-network theory (ANT) and affordance theory, it tries to explain the relationships between people

and BGS through the lens of matters of concern and care. In this work, the interaction between blue-green infrastructure and society is understood from an urban design perspective and, as a spatiotemporal study of matters of care, the obtained knowledge also adds to science and technology studies (STS).

The study shows a connection between the affordances in the environment and the accumulation of concerns developed over time. The link establishes complex relations in everyday life and influences various aspects of the socio-materiality of the environment. The study benefits from using mixed methods as well as combining multiple qualitative methods, as each method can only reveal specific aspects. The results show that the performances and possibilities of the environment are different and do not necessarily convert to one other. However, they are interrelated, and their interaction is temporal and contextual, and this affects the use of the BGS. The employment of BGS in urban space entails a kind of time-space extension of the space and hence puts the area in the state of a new becoming, in the sense that the relationships between human-nonhuman actors constantly change and shape new relationships. Also, the results indicate that affordances affect human expectations and concerns while these concerns in turn have a bearing on the affordances and what the area means. This shifts socio-material concerns and expectations and forms a landscape of care that is formed and transformed via BGS.

Carescape of BGS argues that utilizing the perspective of care can help to acknowledge overlooked entities in the development of blue-green infrastructure. The thesis confirms that despite generating potential conflicts of interest, BGS can largely facilitate cohabitation between human and nonhuman creatures. This requires extra care and consideration in design to enhance the co-benefits. In addition, the thesis highlights the importance of evaluating and refining typologies and conventional design methods for environments with BGS, and the need for continuous evaluation and adaptation of the space to maximize its response to the users. The thesis proposes 'Care with Urban Design- Urban Design with Care' as a critical approach that allows the integration of BGS into the urban landscape by incorporating natural systems, enhancing landscape technologies, and making the environment responsive to the environmental, ecological and social aspects of urban open space.

CHAPTER 1

Introduction

1. INTRODUCTION

For a few weeks in the summer of 2014 I stayed in a friend's apartment in Lund. My friend was traveling and I was actively looking for an apartment to rent, and all of my belongings were temporarily in the basement storage space of another apartment in Malmö. On August 31 I received a phone call: because of rainfall, all of my belongings were submerged in water, and if I didn't come to move them, the damage would only get worse, as the waterways in the basement appeared to have gotten blocked. I immediately got on a bus for what is usually only a 35-minute-journey, but flooding on the roads meant that the trip went very slowly, with traffic coming to a halt. The bus had to reroute constantly as some streets were even impassable. Some cars got stuck when their engines couldn't manage, and their owners left them there and went to wait for help on higher ground rather than risk ending up under water. The delay was frustrating, as I imagined the damage increasing in scope. But what could I do except look out the windows and listen to the emergency and rescue services' alarms? I was intrigued to see that while the run-off was disturbing the road traffic, there were few puddles to be seen in the surrounding open spaces.

It took me more than two hours to get to my things. On the way to the basement, I was offered a pair of Wellington boots and informed that the water had probably mixed with some discharge from the sewage system and was thus contaminated (Figure 1). I heard someone joke "We didn't know there was a pool in the price when we bought the apartment!" I put the boots on and with some help managed to save some boxes, but at the thought of drying books and papers contaminated with urine and feces, I had to bring many things straight to the bin. As I left the building, I took a short stroll through its beautiful garden and noticed the same thing that I had already seen on the bus: no puddles. The building is part of a large urban block development project that includes several residential buildings that are

quite densely built compared with other buildings in Malmö. The area is very green, and the inhabitants share a large, diverse, and beautiful space with subtle terrain changes included in the design. The topography, however, is applied in such a way that the run-off is led into the building's entrance hall and not to the surrounding green space (see Figure 1). Traffic was lighter on the way home, and some parts of the city were getting somewhat back to normal. As I watched the world go by outside, I couldn't stop thinking about the full potential of space, relating it to my own discipline as an architect and reflecting on how easy it is to forget and waste opportunities when designing in such a complex world.

Figure 1: Residential building in Malmö. Photos by the author on 31 August 2014.

The temporary home of my belongings was not the only place to be affected by that 2014 rain event. Central Malmö experienced 110 mm of rainfall within a six-hour period that day – in an average summer, it does not usually rain more than 60-65 mm per month. The amount of rainfall in August 2014 is estimated to occur once every 200 years (VA SYD, 2017). All of Malmö was affected in some way (Figure 2), and flooding was reported in around 3000 properties, including the hospital and some routes leading to it (Sörensen and Emilsson, 2019).
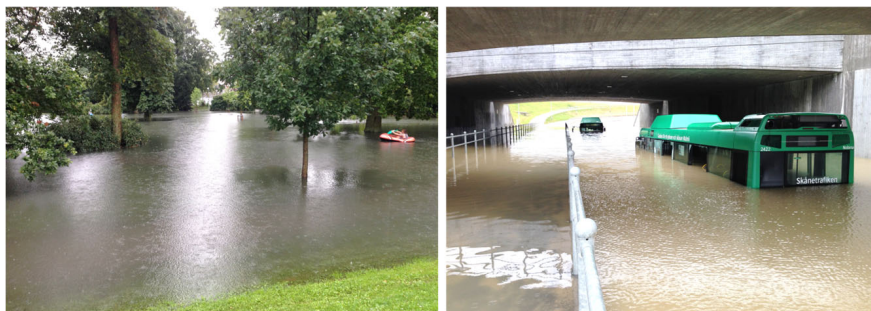
Figure 2: Malmö after the flood. Photos by Henrik Thoren on 1 September 2014.

After the flood, Malmö's water utility (VA SYD) continually received damage reports from property owners and insurance companies. VA SYD is only responsible for handling stormwater for up to ten-year rain events however, and mainly through an underground pipe system with a limited capacity. The city of Malmö was in a state of shock for some time following the rain event, which became a driving force for continual discussions and decisions aimed at avoiding similar consequences from future heavy rainfall. At that time, between 2013-2015, I was working as a project assistant at Lund University's Center of Water and Environmental Engineering. My role involved researching how to tackle climate change-related water and environmental issues in urban planning and design. Specifically, I focused on ways to achieve more comprehensive urban water management in Swedish cities. I collaborated with researchers, most of whom had engineering backgrounds, who shared my interest in finding mutually beneficial solutions for urban design and water resilience management. The collaboration started with a solid problem-solving intention, and the task and the nature of the work allowed me to actively participate in discussions in academia and practice and observe the city's efforts in improving Malmö's flood resilience. To provide a more detailed account of my entrance to this field of research I should say my passion for thinking with/for water in design stems from my background as an inhabitant and an architect in Isfahan, which is one of Iran's most historic cities and a city that suffers from severe water scarcity. In 2012, I completed my master's thesis in Sustainable Urban Design at Lund University. In my thesis, I explored the regeneration of an ancient water system using a decentralized water treatment system as an urban design tool to promote an ecological lifestyle. This water-focused topic brought me in contact with some of the teachers and researchers in this academic center and ultimately led to my two-year employment and a very interdisciplinary work experience, that proved an invaluable opportunity for my professional development on many levels. While there I mainly conducted two research projects. The first was *Adaptive Urban Landscape and Solutions for Water Challenges in Europe: Towards developing the blue-green layer of Swedish cities' master plans*, financed by the J. Gust. Richert Foundation. The second project, called *Water Resilient*

Cities: Swedish cities and the need for integrated urban water management with a focus on flood resilience, was funded by Region Skåne.

After the flooding incident, countless internal and external meetings, workshops, seminars, conferences, collaborations, and site visits were held to increase knowledge and transfer it into practice at different local, regional, and national levels (e.g., Mottaghi et al., 2015; Mottaghi, 2015a; 2015b; 2015c; Sustainable Business Hub, 2015). At the same time, there was a range of arguments on different related topics ranging from the debates about what to do technically and spatially, to who was in charge and who should pay, to criticizing the current legislation and involving politicians. A focal point for almost all arguments was that there were few possibilities to control urban flooding by developing or redeveloping the underground (pipe) facilities, which are limited, inflexible, and expensive. Instead, stormwater management needs to move in the direction of utilizing open surfaces in the city to reduce the extent of urban flooding. This is a very challenging process, however. As the likelihood of cloudbursts is increasing in the region due to climate change (Ohlsson et al., 2015), the city is also becoming more populated and denser, meaning that more people and properties will be affected. As the city grows more compact, less open space will be available for use in flood prevention. However, to reduce future impact, many uncertainties need to be recognized and planned for. Thus, the city of Malmö, like many other European cities facing similar issues, such as Copenhagen, Rotterdam, and Bergen, began almost immediately to start providing municipal stormwater management plans. The plans emphasize the need to prioritize open- and landscape solutions over conventional stormwater controller facilities, and they suggest strategies and visions for improving flood resilience by integrating urban runoff management into different land use plans. At the same time, the Swedish Housing Agency (*Boverket*) advocates densification in cities as a sustainable urban development strategy (Boverket, 2016). This means accommodating more people in less space and incorporating mixed-use functionality (Boverket, 2010). However, this approach requires complex problem-solving skills, which in turn call for a complex understanding of the problem. Comprehensive knowledge of how to support both the city and its citizens in a flood resilience program is essential. Together, all actors involved in the program must

identify and understand the concerns that must be addressed, prioritize the necessary aspects, implement appropriate measures, apply practical approaches, promote beneficial features, reinforce vulnerable areas, care for those affected, etc.

Resilience vs. Responsivity

The cloudburst plan for Malmö was published several years later, in 2017, and the year after it was followed by an action plan as a decision-making document explaining how the city should work to achieve the goals of the cloudburst plan that outlined specific measures to be implemented (Malmö stad, 2017; 2018a). The plans were introduced as an important step toward a more resilient Malmö (*ett motståndskraftigt Malmö*). The cloudburst plan deals with the runoff that cannot be handled by the pipe system, which runs through the city and causes damage to lives, property, and the environment and occasionally disturbs vital functions in the city. The plan emphasizes increasing the flood resilience of urban areas by utilizing open space. But what is resilience, and what will a more resilient Malmö look like? There is already a serious lack of free space in our urban areas. While handling urban runoff is just one of the tasks supposed to be given to open urban space; it is also expected to fulfill many other functions related to the lives of urban dwellers.

The Oxford English Dictionary defines resilience as (i) the action or an act of rebounding or springing back; rebound, recoil, and (ii) elasticity; the power of resuming an original shape or position after compression, bending, etc. (Oxford English Dictionary, n.d.-a). Since 1973 (Holling), the resilience concept has been applied in several strands of research and used broadly as a quality of ecological and social systems. Walker et al. (2004: 2) define it as "the capacity of a system to absorb disturbance and reorganize while undergoing change so as to still retain essentially the same function, structure, identity, and feedbacks." Klein et al. (2003: 43) conclude that the term is best used to define certain system characteristics, as "the amount of disturbance a system can absorb and still remain within the same state or domain of attraction; the degree to which the system is capable of self-organization." Nevertheless, the concept was later criticized for

different aspects such as focusing only on restoring previous situations despite their failures and weaknesses (Pelling, 2010), or failing to recognize the important role of urban design and planning in achieving sustainability and reducing climate change risks (e.g., Ahern, 2011; 2013; Sharifi, 2019). However, in both research and practice, the flood resilience approach is mostly applied in relation to risk mitigation rather than using a chance to transform open urban space to enhance, for example, urban liveability (van Veelen, 2016). The risk of urban flooding is increasing at the same time as open urban space is growing more complex. The open urban spaces that would contribute to flooding resilience are per se complex systems, and these complex systems are supposed to be adaptive. Adaptation is also a complex and multi-issue phenomenon. Simply adapting urban environments to such uncertainties cannot ensure success by itself, as every change obviously comes with long-term and unknown effects. In his PhD thesis *Adaptive Planning for Resilient Coastal Waterfronts*, van Veelen (2016) writes that the key to success is to use moments of transformation efficiently and not to see adaptation only as a strategy to minimize the risks, but as a chance to also improve urban environments socially.

Urban environments should continuously swing between coping with extreme situations, recovering from them, coping with small events, and gradually transforming to the normal. However, the 'normal' is never static and never remains the same after going through many happenings. This thesis elaborates on how engineered and environmental resilience of urban areas should and can be understood socially and not just in terms of bouncing back to the previous condition, i.e., to the state that was before the urban flooding event. Improving the flood resilience of urban areas should not only target excess water but also people in that the utilized open urban space can be used and appreciated by them on a daily basis and not only in relation to extreme water situations. The research departs from the resilience concept and argues that situations before and after extreme events are never the same, indicating that the idea of resilience is inadequate in responding to the evolving challenges of urban areas. Cities and urban areas face climatic risks, but must nonetheless also address the everyday needs of their citizens. Therefore, the thesis adopts a more inclusive approach and instead

focuses on responsivity, emphasizing how urban areas can be more responsive to the diverse needs and demands of their communities. It argues that to achieve socio-technicality, open stormwater facilities (as technological artifacts) need to have a high level of responsivity, i.e., they should be able to 'answer back' (and not only bounce back) in a meaningful way and to different occurrences, including heavy rainfalls. The Oxford English Dictionary defines responsivity as the degree to which something is responsive; the state or property of being responsive; responsiveness (Oxford English Dictionary, n.d.-b). The term 'social responsivity' was introduced by the Swedish sociologist Johan Asplund (1987) to discuss how things and people respond in a particular encounter and has since then also entered the realm of architectural research. Through the notion of 'material responsivity' (Kärrholm 2012: 130), this thesis addresses the ability of the built environment to offer some kind of response to certain uses and submit itself 'for the inscription and practice of different users', or for different events, such as rain and flooding. The term thus explores the abilities of space to respond to different material situations (including urban flooding situations) as well as different corporeal actions and demands of everyday life. The thesis also argues that the material responsivity of the built environment is vital in promoting the integration of social and environmental sustainability for the city of Malmö. Although the entire concept of sustainability is still vague and debatable in Malmö, it has already been applied as a central theme in the city's spatial planning to balance environmental, economic, and social aspects. The definition is largely being shaped through projects that have become reference points for sustainability, often focused on eye-catching constructions that attract public attention. These projects are usually based on technological solutions targeting environmental improvements in residents' everyday lives (Jönsson and Holgersen, 2017). This might have partially led Malmö towards 'building more of the same' (Holgersen, 2015: 242). Although Malmö has tried to promote social sustainability through local planning and documents (Malmö stad, 2018b), there is still a long way to go in addressing essential social aspects, which are crucial for achieving a just city where individual and collective needs are considered and inhabitants feel equally cared for (Holgersen and

Baeten, 2017). In short, social aspects need to be better integrated into urban planning and design processes in Malmö.

BGS in/as Urban Space

An open space can sustainably contribute to urban stormwater management in different forms (such as wetlands and canals), at different levels (e.g., regional, neighborhood, and individual), on different scales (such as buildings and city or macro and micro), and in different contexts (such as rural and urban). This research focuses on existing and relatively dense urban areas in which the value of open urban space is quite high not only economically but also in relation to use and response to a variety of needs in urban life. More specifically, this research only discusses open urban spaces that are located on the ground (and not, for example, on rooftops) and are publicly accessible or considered potential public spaces. In this study, the implemented landscape stormwater facilities are referred to as *blue-green solutions* (BGS). BGS are components of the eco-technical blue-green infrastructure being assigned to tackle climatic challenges through natural and ecological processes.

BGS are landscape technologies responding to extreme water-related climatic occurrences (e.g., Jarvie et al., 2017; Stovin and Ashley, 2019). Depending on the local interpretation, BGS may also be termed differently, for instance as WSUD (water-sensitive urban design), NBS (nature-based solutions), or SUDS (sustainable drainage system). Regardless of the term used, the term refers to innovative solutions in response to water and environmental challenges. They all include facilities like green roofs, ponds, swales, and wetlands that are designated to lead, treat, and store water. By lowering hydraulic pressure from the current drainage pipe system during periods of heavy rainfall, the facilities are intended to manage urban runoff and reduce the risk of urban flooding. By using the term BGS, I would like to connect my study to the development of blue-green infrastructure, which emerged as a trend at the end of the last decade and as a more environmental means of managing urban flooding (mainly pluvial flooding) (Lamond and Everett, 2019). Development of this infrastructure requires multi-level planning and design

strategies and a cross-scale understanding of BGS, as well as its components in real-life situations. Compared to other terms such as NBS, BGS refers to a more specific category of open facilities that are often implemented in a dense urban area and – usually due to a lack of space – do not contain very large-scale solutions. In addition, NBS usually relate to a wider range of challenges such as human health, well-being, soil pollution, air quality, and water and flooding issues, while BGS are more focused on the lattermost (Hanson et al., 2022). In addition, the term has recently attracted more attention in research, for example, compared with other terms such as SUDS and WSUD (Stovin and Ashley, 2019).

Using urban space as part of blue-green infrastructure means that BGS become part of urban space, and depending on their type, size, and design some may sometimes work as an urban place themselves (such as a large sunken lawn). Sometimes BGS have an even more important role in urban life when they are implemented in important public spaces, such as in an active city park; for more examples refer to Bell et al. (2022). This is where social life and the way in which people engage with BGS becomes important. A significant dimension of urban life is formed in relation to urban/public space and in connection with how the inhabitants interact with space and its permanent or temporal elements. However, the main concern is how the materiality and spatiality of BGS enhances urban life and makes it more inclusive and diverse.

The Quest for Co-beneficiality

Blue-green infrastructure has been introduced as an approach to the sustainable development of urban flood resilience. In 1987, the concept of sustainable development emerged in the report *Our Common Future* as an approach focused on social equity that "meets the needs of the present without compromising the ability of future generations to meet their own needs" (Brundtland, 1987: 16). However, some criticize the vagueness of the concept and argue that it must first be understood locally in order to be useful and further contribute globally (e.g., Ngai, 2020; Folke, 2016). If BGS are supposed to contribute to the sustainable development of our cities,

local needs and demands should be explicitly understood and realized in time for BGS to serve both present and future generations.

Professionals and experts often endorse BGS as solutions that bring something extra to people. In the cloudburst coordination (*Skyfallssamordning*) section of its cloudburst plan, the city of Malmö includes inhabitants as an important target group, stating that communicating with them is essential for the future implementation of the proposed strategies. Communication measures such as "various dialogue projects, to gather experiences and opinions from citizens and businesses regarding how Malmö should be made more resilient" have been highlighted in the plan (Malmö stad, 2017: 22). In addition, 'more multifunctional surfaces' is stated as one of the main three methods of dealing with cloudbursts, (as well as planned or deliberate flooding and avoidance of hard surfaces). A project in the cloudburst action plan called *Tillsammans gör vi plats för vattnet* ("Together we'll make room for the water") was proposed to support private property owners – who own the majority of the land in Malmö – in their voluntary contributions to flood resilience of the city. The project was based on the investment of water utility and financed by the water tax, to ensure that all private and public stakeholders collaborate to make extra room for water (VA SYD, 2022). Communication and active dialogues between the involved actors were stated as essential for the work, although the aspects that should be communicated and how were not mentioned (Malmö stad, 2017; 2018a). However, the provided plans show clearly that consideration for the inhabitants is the core of municipal and political discussions between water utility and planning offices. In almost all stormwater management plans in European cities, the resilient transformation of urban areas by leveraging BGS is generally assumed to 'do good' for urban citizens in many aspects. BGS are frequently referred to as tried-and-true techniques that support human needs. They are often presented as pieces of a necessary urban infrastructure that improves the quality of life, enhances urban living, encourages a healthier lifestyle, adds value to people's lives, benefits many aspects of life, etc.

To understand whether BGS 'do good' for people, multiple questions need to be answered, such as: What do BGS really mean to humans? Would an environment with them be considered more prestigious and thus more desirable to live in than in other areas?

What is considered good enough to be implemented in the urban landscape? Can urban landscapes without BGS be less supportive of urban life? Of course, we cannot answer these or many similar questions because we lack sufficient knowledge about the many aspects of living with BGS. Indeed, we should not discuss the likelihood of the impact of BGS, such as 'doing enough good' as if we knew all about them. We should avoid accepting what we think we know as facts that are always stable and will not change. In addition, how would something fixed in an urban context that is supposed to coexist with ongoing life support the uncertain and changing nature of life? Can an urban environment with BGS support humans when the human condition is constantly changing? This research does not try to answer all of the above questions. Nonetheless, the study started with wondering what BGS can do for people in their everyday lives, not only during extreme stormwater situations.

The Temporality of Social and Spatial

BGS are technologies that arise from the temporal modification of open urban spaces, where time and space interact strongly. For instance, elements of green space such as lawns or dry ponds transform into part of the waterscape during and after rainfall, and with any changes in e.g. water level or properties, the entire landscape changes (Figure 3). On the other hand, the environment is supposed to support people and fulfill their needs, both as a whole and in its components. However, how should we realize what to support when dealing with such a complex network of user individualities and needs? People's issues and interests vary and shape differently around things. They change with human conditions and eventually stabilize in time. BGS are time-related artifacts, they take on different tasks and play roles as different territories with respect to time. These constant temporal and material shifts make the use of the environment strongly time-related. This means that the planning and design processes need to reflect on what, who, and which situation we need to design BGS for. In order for humans to appreciate a given space, it is essential to be spatially supported. For a technical facility implemented on shared land to be socially appreciated, it should fulfill many human desires.

Figure 3: Dry pond (only contains water following rainfall) in Augustenborg. Photo by the author.

In *Reassembling the Social*, Bruno Latour (2005) tries to characterize the social, and criticizes it as something taken for granted that does not lend itself easily to study. He redefines the term social, tracing its connections to its original meanings of being a connector and an association and highlights different ways of deploying controversies of the social world through five different kinds of uncertainties. The first uncertainty is about the status of groups. Groups do not exist as something fixed but are constantly formed and transformed. The second is about the heterogeneity and plurality of the elements that constitute the social: the social is translated or overtaken through a series of different actors. The third uncertainty is connected to the second and deals with the different types of actors that have agency – these are not only humans but also nonhumans. The fourth is about facts. Here, Latour distinguishes between a 'matter of fact' and a 'matter of concern' and points out that there are differences between facts and concerns, and the difference is in their production. Going beyond the idea that things matter the way they are, Latour (1996) refers to matters of concern as a way of highlighting the liveliness of things through their embodiment and connections to other human

and nonhuman actors. For him, matters of fact affirm a stable form of power and control, whereas matters of concern draw attention to agencies as things that cannot be easily explained as facts. Finally, for the fifth source of uncertainty, he refers to the approach of studying sociality. He believes that there is never a fully reliable recipe for studying social aspects, and he calls for more flexibility and creativity in research.

This research explores the temporality of the socio-materiality BGS bring to urban environments through human concerns and expectations. It has been inspired by Latour's view on the multiplicity and heterogeneity of agencies and his notion that sociality is perpetually in formation, as well as by the conception that BGS entail a temporal manipulation of the urban environment.

Aims and Objectives

In this section, I outline the research objectives and position the research in order to clarify its purpose, as well as its relevance to the broader field. I started my research with the overall question of how we can possibly assure the co-beneficiality and multifunctionality of BGS in an urban context while preserving their maximum technicality (flood protection function). At the same time, I realized BGS cannot be understood simply as pieces of technology being implemented in an urban environment; indeed, they shape technology together with the environment. Thereafter, the research progressed with a broader target than simply understanding the benefits of BGS.

Although BGS are spatially designed for extreme climatic occasions, they have a bearing on everyday life. The research endeavor in hand seeks to understand BGS as more than a hydrological artifact and investigates the socio-material effects of BGS in relation to spatial design. It studies BGS as more than mere objects, that is, as something socially and materially constructed. The main research objective is to describe and specify the different ways in which BGS address (and take part in) different everyday life situations, for better and for worse. The study explores the interactions between humans and environments with BGS in day-to-day socio-spatial situations. Here, the interactions are studied at the neighborhood scale and in relation

to different socio-temporal aspects of everyday life. The thesis deals with three detailed questions:

- What aspects seem to matter in an environment with BGS, and how are they spatially situated in everyday life?
- How can the co-effects of BGS as technical artifacts be studied in relation to their temporality?
- How can everyday users' expectations and concerns be considered in the design process of BGS?

In this thesis, I take a relational perspective, looking at everyday life as something that is contextually formed and given meaning in relation to the socio-material environment. The thesis intends to contribute knowledge to the practice of sustainable urban flood management to support everyday life in shared urban space through BGS.

This research examines the flood-resilient urban neighborhood of Augustenborg in Malmö, Sweden, where BGS were introduced and implemented as landscape technologies over two decades ago. The area is often used as a reference as a good example of how existing built environments can be modified socially and environmentally at the same time (Månsson and Persson, 2021). By shifting my view from the flood resilience perspective to the perspective of flood responsivity, or from bouncing back to the situation before a climatic event to responding to flooding as a more complex socio-material situation, the thesis aims at increasing knowledge on the effects – other than mitigating urban flooding – that blue-green infrastructure as an ecological technical setup has on everyday life. The aim is for the produced knowledge to be useful in BGS design in the future (to optimize their co-effects with meeting a certain level of responsivity), this study, through relational human-nonhuman perspectives, investigates if and by what means BGS influence urban dwellers' everyday lives in an outdoor urban environment.

How people relate to the city and its infrastructures has always been an essential question in urban studies. As socio-technical artifacts, cities are forever subject to change, dealing with different types of uncertainties (e.g., Hommels et al., 2008). Science and Technology Studies (STS) is an interdisciplinary field of study developed during the 1960s and '70s that emerged from the convergence of science, technology, and society (Bijker et al., 2012). STS views science and

technology as socially embedded fields and provides relational discourses that transcend the dualist perceptions of technology and society, arguing that science and technology should be understood in a social context (e.g., Yaneva, 2022). Earlier science and technology studies highlighted the link between technology and society, with scholars emphasizing different aspects of the relationship. Some studies have been labeled differently to highlight a particular focus of the STS. For instance, in social ecology studies, founded by Murray Bookchin (1982), the relationships between society and environments are mostly studied in relation to natural ecosystems. Social ecology aims at a society in harmony with nature and concerns energy efficiency, social justice, and appropriate technology, highlighting that technology should be well-suited to its local context (Roseland, 1997; Darrow and Saxenian, 1986).

In STS discourses, the approaches taken to explore the relationality between science, technology, and society have always been of critical importance and greatly influenced the outcome. Of these, Actor-Network Theory (ANT) – which was to some extent born out of STS discourses – is a theoretical and methodological approach to social theories that aims to explain relationships in the form of forever-changing networks (Callon, 1984; Latour, 2005; Mol, 2010). In ANT, humans and nonhumans can both play their parts as active components of any environment. Thus, ANT proposes a 'flat ontology' and, refusing to assume pre-conceived vertical or horizontal hierarchies, it traces power relations, empirically following the human and nonhuman actors relevant for a certain effect or event to take place (Latour, 2005). Although ANT was initially rooted in STS, looking into how science interacts with technology (e.g., Latour and Woolgar, 1986; Latour, 1987), it soon turned into a broader theoretical and methodological perspective and has since been employed in many other discourses, including in urban studies (i.e., Farias and Bender, 2012). ANT has been valuable in urban planning research (i.e., Hommels, 2008; Boonstra and Boelens, 2011; Rydin and Tate, 2016; Farhangi et al., 2020) and urban life studies (i.e., Kärrholm, 2008; Magnusson, 2016; Sandström, 2019) and has been used in different manners and to different extents.

BGS have been mostly discussed in terms of their hydraulic and hydrological efficiency. Although some studies have investigated

some of their related social aspects (e.g., Lamond and Everett, 2023; Mobini 2021), their socio-material experimental dimensions have not been sufficiently examined. Inspired by ANT, this research keeps a distance from the dualistic distinction between technology and society (objects and subject; life and environment; etc.) and through a relational perspective opens a discussion on the conceptualization of how social life shapes in an environment with BGS. This research borrows the STS-ANT notion of flat ontology to study everyday life around BGS in shared urban space as a point of departure. Although this thesis alludes to several academic discourses, such as urban planning, human geography, and anthropology, its primary intent is to contribute to the research fields of architecture and urban design and help the understanding of urban landscape design in its specific urban context. Urban design studies can be very helpful for increasing our knowledge of what BGS bring to inhabitants' urban life.

The urban design discipline has undergone a series of changes that have been influenced by dominant trends and professionals' perspectives on societal values, technological progress, and environmental paradigms. At the end of the 19th century, the field began to gain recognition as a distinct discipline with a focus on spatial structures, aesthetics, and functional aspects and typologies through the works of professional experts like Ebenezer Howard. These elements were still central in the 20th century and emphasized by architects such as Le Corbusier and Gordon Cullen (Larice and Macdonald, 2013). In her book *The Death and Life of Great American Cities*, Jane Jacobs (1961) criticized the established urban planning paradigm, which viewed cities as mere structural entities. Instead, she presented cities as networks of social interactions in which urban spaces are places of communities. The social turn in planning and the human-scale development of urban spaces were later supported and expanded by Christopher Alexander et al. (1977), William H. Whyte (1980), Jan Gehl (2006; 2010) and others, all highlighting the importance of social values and of creating human-centric environments. In the late 20th century, scholars began to recognize the ecological impacts of urbanization coupled with environmental threats, particularly climate change. They highlighted the necessity of weaving natural elements into urban realms. The ecological and environmental dimensions were indeed not totally new concerns; they

were rooted in previous approaches, such as the concept of Garden City by Ebenezer Howard and Lewis Mumford's emphasis on balancing technological progress with ecological needs (Sachs, 2016; Larice and Macdonald, 2013). Concepts such as green urbanism and sustainable cities emerged in urban planning and design to promote the integration of nature and reduce ecological and environmental footprints. Several books have been published on urban design to increase architects' sensitivity to the mentioned issues, for example *Green Cities, Growing Cities, Just Cities?* (Campbell, 1996); *Ecocities: Rebuilding Cities in Balance with Nature* (Register, 2006); *Sustainable Urbanism: Urban design with nature* (Farr, 2011); *Ecological Urbanism* (Mostafavi and Doherty, 2010), and *Ecological Urbanism: The nature of the city* (Hagan, 2014). Developing urban areas with a minimum impact on the environment is an ongoing trend that is still taking shape. Despite significant emphasis on green and ecological urbanism, however, there seems to be a serious lack of focus on the social aspects of such urbanism. Moreover, there is a tendency to prioritize technical advancements regardless of their impact on the everyday lives of urban dwellers.

In sum, it is clear that urban design has been transformed either by attention to social needs or by environmental/ecological movements. With the exception of a few research cases however (e.g., Barthel, 2013; Erixon Aalto, 2017; Colding et al., 2022), these dimensions have yet to be viewed together. This has resulted in situations where ecological interventions may not consider the potential social consequences and vice versa. Creating sustainable and responsive urban design requires that social, environmental, and ecological factors are in balance and that their interdependence is both understood and addressed.

Urban planning and design have already been identified as crucial disciplines for decision-making in the context of urban stormwater management in research as well as in practice (Sörensen et al., 2016, Berndtsson et al., 2019). Urban design discourse considers the world in 3D experiential forms and seeks to bring things together as a whole and allow them to respond to a variety of different situations (Radford, 2010). Urban design bridges human aspirations and the material/technical facilities of the urban landscape and aims to efficiently position services in a socio-material context. The first paper

in this thesis touches on the critical role that urban design plays in raising the possibility of turning urban stormwater retrofitting projects into best practices. The paper points out the importance of relational thinking in the process of urban flood management and planning processes in achieving a multi-functional urban space by embedding technical landscape solutions (Mottaghi et al., 2016). It is crucial to give equal consideration to water professionals, spatial planners, and designers when planning and designing BGS (Suleiman, 2021). The relationship between the design of BGS and the area in which they are located has primarily been explored at a large urban scale or in quantitative studies (e.g., Bacchin, 2015; Ahmed et al., 2019) and rarely at local scales (Puchol-Salort et al., 2021). A shift in research and practice towards a more context-centered approach to achieve the potential benefits of BGS is accordingly highly recommended (Van Der Meulen, 2023).

By examining the interplay between blue-green technologies and the social, material, and cultural context of the Augustenborg neighborhood of Malmö, the thesis explores how BGS become part of urban settings and influence inhabitants' perceptions, desires, and matters of concern. In sum, the study avoids looking at BGS as segregated artifacts in the urban landscape and instead tries to explain the relationships between people and BGS from an ANT-inspired, STS-Urban design perspective.

The structure of this cover essay is as follows: Chapter 1, *Introduction,* introduces and situates the study. Chapter 2, *Drafting the Narrative*, presents a theoretical approach that forms the foundation for the links between papers and the discussion that follows. Chapter 3, *Dealing with Mess*, summarizes the research strategies and describes the methods in terms of the choice of techniques and the perspectives (minor theories) behind them. In Chapter 4, *Summary of Papers*, each of the five papers is presented with a brief description. Chapter 5, *Reframing the Narratives*, summarizes the key findings, discussing how they relate to the study's main objectives and questions. Finally, in Chapter 6, *Carescape of Blue-green Solutions*, the cover essay is concluded with an outline of the key findings, contributions to the field of study, and a short reflection on the applicability of my findings in practice.

Drafting the Narrative

2. DRAFTING THE NARRATIVE
Theoretical Foundations and Perspectives

This chapter outlines the theoretical basis of this thesis and introduces the main perspectives and concepts used in this investigation of urbanity focused on socio-material aspects of urban life. In this section, I discuss different theories and standpoints that have facilitated the exploration of the sociality of BGS and the contribution to STS and urban design discourses. The temporality of the space embracing BGS and the temporality of the social are particularly relevant for the choice of these specific theories. This chapter presents the speculative framework used to explore the temporal aspects and (co)effects of BGS.

Everyday Life

As mentioned in the introductory chapter, this study aims to contribute knowledge on how to improve the design of an environment with BGS from an urban design point of view to fix it more soundly in everyday life. STS, urban design, and everyday life thus shape my research environment (setting). As everyday life itself is not a theoretical construct but rather a product of the interplay between humans and their environments, I use it in this chapter to illustrate my entrance into the theory. Many concepts can help in researching everyday life. Since this study begins with a flat ontology approach however, it has borrowed specific relational perspectives for theory and methodology, with the initial intention of avoiding binary and hierarchical ways of structuring the context of everyday life.

In her book *Situating Everyday Life* (2012), Sara Pink refers to everyday life through concepts of place and practice as something that emerges from the interface between mind, body, and environment.

The interface generates humans' everyday practices, e.g., knowing, preferring, and consuming. According to Shove, Pantzar, and Watson (2012), social practices consist of three main elements that are integrated when practices are developed: materials as things and objects; competences as know-how and skills; and meanings. Practices, such as using an environment in a certain way, are thus interdependent and emerge from specific embodied situations. In addition, practices are also often seen as rhythmical, that is, they reappear over time. They tend to establish certain regularities; this is why Schatzki (1996) refers to the practice as sets of doings and sayings that are likely to be executed and performed, even if they ultimately are not performed. The spatio-temporality of the built environment influences and shapes patterns and routines of everyday life. While these regularities are usually not linear, they occur in an almost regular manner. In his book *Rhythmanalysis*, Lefebvre writes that "Everywhere where there is interaction between a place, a time and an expenditure of energy, there is rhythm" (2004: 15). Rhythms are characterized by returns and repetitions that always come back with some variations, and these variations may potentially also effectuate considerable change over time. Furthermore, rhythms exist as part of territorialization processes (Brighenti and Kärrholm, 2018). Territories are entangled with important meanings and values that form in space and time, and the processes are stabilized by rhythms. Rhythms do not exist in a vacuum, but always play a part in one territorialization process or another. A nuanced understanding of the environment can be achieved by examining the ways in which everyday life is territorialized and constructed around repetitions, rhythms, and regularities. BGS were initially introduced as ecological technologies to deal with some of the impacts of climate change. However, society and technology are not two different things (Latour, 2000, 113); they are produced together. BGS' meaning to society is thus produced through the ongoing interactions, negotiations, and constant translations by users of an environment. Understanding if and how BGS take part and stabilize in urban life requires the study of the spatiotemporal formation of meanings in order to grasp the means by which everyday life is constructed around and influenced by them. Everyday practices and spatial settings must thus be studied together. BGS *per se*, as objects (artifacts), mean nothing; they must be

understood according to how they offer different possibilities and consequently generate meanings, values, implications, perceptions, etc.

Actor-Network Theory

Although water is usually considered the most important target actor in decisions and planning for BGS, a network of relationships and heterogeneous connections influence the socio-material effects of BGS. BGS are not merely autonomous pieces of technology implemented in the environment; the technology is produced from a strong collaboration between BGS and their environment. Not only do their physical design attributes, such as size and function, produce effects, but the properties of the surrounding environment including terrain changes, weather conditions, land use and social structure, influence their effects as well as their use. With that said, the point of departure for this study is an acknowledgment of the diversity of agencies as presented in Latour's writings and Actor-Network Theory (ANT). In this research, we shift from the resilience perspective to the perspective of responsivity, and in doing so we also shift our view towards a flatter ontology. The hierarchy of an environment with BGS (where water is the primary actor, for example) is highly temporal and needs to be investigated and explained in relation to the situation. ANT is a valuable lens: it does not accept any pre-existing arrangement or order prior to exploration. Hence, drawing inspiration from ANT, this study has been formulated to trace the effects of the multiple actors and the multiplicity of agencies involved in the socio-material constructions of BGS. The ANT concept was first referred to in the 1980s by the French sociologist Michel Callon, who used the term 'acteur-reseau' (Mol, 2010: 253). ANT was also significantly developed in line with STS through collaborations between the sociologist John Law, STS scholars Michel Callon, Madeleine Akrich, Bruno Latour, and others, and presented as a "material-semiotic" method (Latour 2005; Muniesa, 2015). As a result, ANT maps material and semiotic relationships between objects and concepts by tracing actors as they form, stabilize, and pass through networks (Law, 2009). In ANT, the actor refers to something, human or nonhuman,

that can do things and can make a difference. The actor's effect is relational and produced in the network of relations. In addition, things have agencies, but the agency is not intrinsic to the object, and the object can take on a series of different actor roles. The agency is a synergistic effect, produced through the actors' performance in the network. ANT unfolds the fabric of life and underlines how the way we live in the world is not independent of material effects. How we live emerges through relational practice and is socially and materially constructed of heterogeneous actor networks (Jóhannesson and Bærenholdt, 2009). ANT is now accepted as an anthropological perspective in many different disciplines where materiality or technology is seen as part of social circumstances, including architecture and urban design. The perspective facilitates attentiveness to many actors and agencies that play roles in humans' interactions with the world and in describing the connections that define this interaction.

Affordance Theory

Although this research seeks to avoid accepting preexisting hierarchy in the context of everyday life relating to BGS, certain hierarchies are somehow always embedded in the nature of BGS; for instance, they have been designed for water – to address challenges related to it – aspiring at best to enhance the quality of urban citizens' life, adding value to it. Hence, water issues are always prioritized in the BGS planning- and design process. When BGS are implemented in shared urban spaces, other actors such as humans, animals, and plants are ranked below water as beneficiaries of the 'additional values' of the flood protection system. In addition, even if any preexisting hierarchy in the entity of BGS is disregarded, the level of stability and accomplishment varies between different networks and types of relationships. Since this study aims at emphasizing one specific kind of network of relationships between specific actors (humans) and the environment (nonhumans) and explores the intensity and depth of the relations as well, an ANT-inspired lens alone is insufficient.

Affordance theory allows us to avoid pre-conceived hierarchies and to emphasize the potentials of different actors and networks.

Affordance theory offers a relational perspective on how actions can take place within an environment. Psychologist James Gibson was the first to introduce the concept with reference to the possibilities for action that an environment offers to animals, including humans (Gibson, 1977; 1979). Affordance first emerged in the field of ecological psychology to describe patterns for possible behaviors and actions creating the ecology of social life; here, ecology refers to the relationships inside and between a complex system and its environment (cf. Heft, 2001: 271). According to Gibson, affordance is always present in the environment and does not adapt to the demands of the perceiver. However, affordance is relational in its entity and only exists as a relationship between the actors. For example, one individual might find a particular stone comfortable to sit on, while another would not. Affordances can also be situational (Nilsson, 2009); dependent on personal background (Kopljar, 2016); change over time (Heft, 2001); and manifest in a sequential manner, i.e., as nested affordances (Gaver 1991). Heft (1988) elaborated on Gibson's concept of affordance, focusing on the physical aspects of the environment that are particularly available to humans. He proposed a transactional perspective that takes into account the dynamic interaction between people and their surroundings (Heft, 2013). Heft (1989) defines affordances as relational properties of an environment that are reliant on the physical characteristics of both the user and the environment. He distinguishes between 'potential affordances' (action possibilities) and 'actualised affordances' (utilized possibilities, uncovered when actions are done). He further describes affordances as "perceptible properties of the environment that have functional significance for an individual" (Heft, 2010: 18). According to Norman (1999), there are two types of affordances: perceived affordances, enabled by the way an item appears, and real affordances, which refers to physical qualities that allow functioning. Later, Hartson (2003), from the field of interaction design, separated affordances into four categories: cognitive, physical, sensory, and functional affordances. Hartson's cognitive affordance is similar to Norman's perceived affordance and is a feature that facilitates knowing about something. He uses the term physical affordance, similar to Norman's real affordance, to describe a design attribute that enables users to physically carry out an action. He refers to sensory

affordance as a design feature connected to the sensations that support cognitive and physical affordances. By introducing functional affordance, he connects physical affordance to usefulness and refers to the design features helping to add purpose to actions. However, most scholars argue that affordances are perceived before functionality is discerned.

Placing BGS in existing urban areas influences and changes the affordances of the environment. The performance of BGS have been explicitly understood and considered in design with water as the main actor. However, with the insertion of BGS into open urban space, the boundary between operational and non-operational structures is blurred (Gandy, 2014). The main actor can no longer be water, as open urban space is important in urban life and is highly meaningful for the functionality of our cities in many ways. Achieving a multifunctional environment and increasing liveability by means of BGS requires acknowledgment of other types of interactions (affordances) and thus also the inclusion of other actors and agencies in the vision, strategy, and programming of blue-green infrastructure.

Bringing the affordance perspective to the study facilitates identification of certain actors and specific potentials that an environment with BGS brings to everyday life. It helps us recognize which network needs investigation, as well as how to investigate the intended network. Inserting affordance into an ANT-inspired perspective enables the discussion of if and how certain relationships produce specific types of human-related affordances. Inserting affordance theory into the theoretical framework still aligns with the rather flat viewpoint with which I initially started my research, and the study thus circumvents any pre-conceived ideas about the importance of specific actors. However, affordance theory facilitates a gentle focus on specific parts of the network (that are more pronounced) and on certain relationships, whose depth and importance may then be understood. Simply put, ANT is suitable for studying things that have happened, but not as efficient for capturing the qualities of what is happening or might happen. Affordance theory can be helpful when trying to understand complex, multifaceted relations between humans and the environment, or how some relationships are prioritized over others. While affordance theory in relation to design has primarily been used in the study of individual artifacts and designs (e.g.,

Norman, 1988), affordances that are directly present in an environment may also be applied to larger, complex milieus and infrastructures, such as blue-green infrastructure. Affordance theory is more suitable for understanding straightforward situations and settings and might not be as effective for analysis of other types of relationships and aspects of the environment such as attitudes and conflicts. Such aspects must thus be examined using other concepts that allow for exploration of disputes and expectations, which brings us to the notions *matters of concern* and *matters of care*.

Matters of Concern and Care

In my research, I read BGS from an urban design perspective. The urban design discipline aims to put everything in urban areas together in a relational dialogue and tries to address everything that matters in urban life so it will be efficiently supported, collaborated on, and shared. In other words, urban design is deemed successful when citizens are considered and cared for in the design. How can urban design better address the issues that residents of urban areas have? What really matters to them? What do they need? Latour (2004) suggests that we change our view on issues from matters of fact to matters of concern to arrive at a better sense of reality. He posits that the former is not more than one viewpoint or interpretation of reality, while the latter concentrates more on exploring, safeguarding, and taking care of reality. Latour starts by criticizing acceptance of issues and problems as matters of fact. He explains matters of fact as objective statements about the world that are not sufficiently critical. According to Latour, a shift in realist attitude is necessary in order to allow uncertainties and not view the world as something stable. The shift helps us to keep a critical mind and enhances reality. The view takes into consideration a wider range of experiences by including subjective issues and matters important and relevant to individuals and groups. Latour considers all matters to be matters of concern, since they are absolutely interconnected with social and political processes and constructed within a network of actors. This intertwining always influences our perceptions of matters.

Puig de la Bellacasa (2011) follows Latour and takes the concept still further. She maintains an appreciation of the de-objectification that Latour brings to matters of fact in STS and sees Latour's move to matters of concern as a response to the constructivist ethico-political criticism of things: Latour reads things not just as objects but as socially- and materially constructed, which calls for thinking beyond what objects do.

> This conception affects the way we think about the role of humans, culture and "the social". It is not much that "social" interests are added to nonhuman worlds by acting upon the scientifically driven course of technological development. Human intervention does not disappear, but agency is distributed. Interests and other affectively animated forces – such as concern and care – are decentered and distributed in fields of meaning-making materialities (Puig de la Bellacasa, 2017: 31).

Matters of concern entails a kind of critical thinking that carries "connotations of trouble, worry and care" (Puig de la Bellacasa, 2011: 87). By suggesting 'matters of care', Puig de la Bellacasa (2011) seeks to increase understanding of the process through which things are socio-technically assembled through care. She suggests new ways of thinking through the ethos of care to understand the sociotechnical rationality of things, introducing matters of care as a more effective approach and with a stronger commitment than matters of concern. Matters of care is a post-humanist interface that Maria Puig de la Bellacasa brings into the politics of care (Puig de la Bellacasa 2011; 2017). Looking at STS through the lens of feminist theory, she speculatively revises the ethical construction of care. Like other interdisciplinary types of STS research, she targets the border between nature and culture, or technology and society, and explores the establishment of artifacts in particular social, historical, or cultural contexts. Puig de la Bellacasa is very much inspired by Joan Tronto (1993) who elaborated on the connotations of care and its actualization from a feminist perspective. Tronto tries to understand care as an act, stating that "Providing an integrated, holistic way to meet concrete needs is the ideal of care" (p.109) and expressing the belief that society has a lot to gain from paying attention to "the place for caring" in everyday experience and in our morals (Tronto 1987: 663). Through matters of care, Puig de la Bellacasa (2017: 5)

understands care in practical engagements with its contextual situation and emphasizes that care is actualized through "tensions and relations" concealed in material conditions. Unlike Latour's matters of concern, matters of care are related to the accumulation of concerns (as interests and not necessarily as troubles). The objective of matters of care is to acknowledge the collective existence of concerns and reveal "the neglect of caring relationalities in an assemblage" (Puig de la Bellacasa, 2017: 56) while also addressing the specificity of the relationships. For Puig de la Bellacasa, the notion is not merely a tool to describe reality, as it is for Latour; instead, it emphasizes the importance of paying attention to and acting on concerns. With the concept matters of care, Puig de la Bellacasa highlights the significance of care in producing technoscientific knowledge. She explores the meaning of care in the human world and beyond; although she departs from a human-centric worldview, she also discusses the concept through e.g. objects, forces, living beings, and humans.

The concept of care is not strictly limited to mutual relationships between two parties; rather it is a relational construct arising from a complex interchange between socio-spatial conditions and actors (Gabauer et al., 2022). To care implies being affected by and having an impact on the issues that mean something to us. As matters of care are developed over time, meanings, perceptions, and preferences form; care is thus a dynamic process through which our perceptions and preferences are knotted together. The ontology of care is always relational and created through a crisscross of circumstances. The concept of care and the intersections between its various aspects have been acknowledged in various fields of research. Discussing different examples and angles of care can hopefully render clearer both the rationality of care and its interdependency in specific settings. To date, strategies and principles of care have been discussed and questioned predominantly in healthcare and related practices, and only recently have they entered other fields such as techno-culture (Haraway, 2011) and techno-science (Martin, Mayers, and Viseu, 2015). Metzger (2014) elaborates on the ethico-political concept of 'caring for place' in urban planning as a critical engagement into the territoriality of space and not as something fundamentally good or bad. As he writes,

> becoming attached to a place, enacting a territorial stakeholder subjectivity, in a way means both seeing oneself as part of and also as caring for a specific place, seeing the interests of the place to be one's own interests, and one's own interests to be a part of the interests of the place – in a way, to inscribe oneself in a collectivity (Metzger, 2013: 788).

For him, subjectivity is situational and not transferrable to other settings. It is "always potentially precarious achievements and it is important not to take for granted that the subjectivities enacted in a specific situation or setting will be easily transposable to other contexts" (Metzger, 2013: 781).

Scrutinizing design through care is important because care has no end. What is considered significant today might become insignificant in the future; priorities, expectations, and affirmations change over time and call for new types of environments. Hence, caring about socio-materiality in the design process of an urban environment is vital because of its influence on forming and stabilizing the fabric of everyday life. This research is about realizing spatial protection, concern, and care via design in urban areas. I argue that it is important to understand the impact of climate adaptation techniques such as BGS through the concept of matters of concern and care. The thesis' thorough examination includes the neighborhood level and real-life situations and positions itself critically to the statement that 'BGS enhances the quality of life', opening discussions on what and how to spatially care for everyday life by means of BGS. Care is a very temporal and constantly changing concept; what we care about or care for changes.

I use care as a provocation to study the co-effects of BGS in everyday life. The discussion of caring socio-materiality reveals new layers of complexity of the nature-culture of the urban landscape. It helps to start with an ethical commitment to acknowledge more than one agency, such as a human agency or a specific nonhuman agency such as water; this brings a broad range of perspectives and helps assess multifunctionality within a process and in existing and ever-changing conditions, instead of simply accepting that BGS always 'do good'. I borrow the notion matters of care in order to circumvent a normative explanation of if and how BGS benefit urban life. Instead, I focus on how caring about and taking care of urban life are

influenced by the spatiality of BGS. Discussing the notion in this context is also relevant as BGS' multifunctionality is generally understood as benefitting everyone and everything, including water, animals, vegetation, climate change and humans. In addition, matters of care and concern seem to work well in relation to affordance theory, as the affordances of an environment often raise matters of care and concern. Different aspects of care might also influence affordances. In such a diverse and complex environment, where every spatial layer is currently under transformation, perceiving the experiential dimensions of human life as something fixed and static would be counterproductive. With that said, planning, thinking, or designing something out of concern for humans and to take care of humans does not necessarily ensure that the outcome will work well with human life in a spatial sense, because human life cannot be isolated from its environment. As Puig de la Bellacasa puts it: "care is a human trouble, but this does not make of care a human-only matter" (Puig de la Bellacasa, 2017: 2).

In this thesis, caring is applied as an analytical concept providing a rational (coherent) pattern for the translation of moments of everyday life. In this study, I am interested in how care has evolved over time in relation to a specific built environment with BGS. Here, care is considered as an experiential aspect of life that arises from the interplay of human and nonhuman conditions. Each sub-study engages with specific agencies of care to reveal layers of an assemblage of concerns. Caring about co-effects leads to knowledge of who, what, where, when, and how to care. The link between care and shifting agencies – understood as a combination of different agencies that constantly turns the environment into something else – is considered the mainstay of this thesis. Understanding the link helps me to theorize the everyday use of BGS by reflecting on how their sociality depends on the ways in which they are embodied and entangled in spatial relations. Mapping the production of care can potentially serve as a transformative conceptual guide to reconsider what BGS really do and answer questions such as what is 'practical', 'beneficial', or 'good' from a critical point of view. Applying care as a perspective can give both macro and micro views of the production of meanings related to BGS. The perspective allows recognition of entities that may have been overlooked in decision-making processes. Urban

design has been generally viewed as a problem-solving approach, and it affects users' lives in many ways. With a care-oriented approach however, we can reveal ways in which urban design may be closely connected to the ongoing process of generation of concerns in everyday life.

Some studies have already acknowledged the relationship between urban design and the concept of care: Fitz and Krasny's book *Critical Care: Architecture and Urbanism for a Broken Planet* (2019) elaborates on the interplay of care, economy, ecology, and labor in architecture and urbanism. Fitz and Krasny draw inspiration from the critical care given in medical emergencies to highlight the alarming state of our planet; through a collection of care-centered essays, projects, and case studies, they emphasize the negative effects of climate change, pollution, industrialization, and extinction and explore how they can possibly be addressed in research and practice. The book examines the importance of architecture and urbanism for taking care of our planet, criticizes previous development methods that ignored the current state of things, and proposes a care-centric perspective in architecture and urbanism as a means of keeping alive hope for the future despite the planet's critical state. The book refers to scholars who have previously discussed the concept of care to understand the relationship between humans, nonhuman entities, and the environment; these include Donna Haraway, Joan Tronto, and Maria Puig de la Bellacasa, whose work acknowledges the interdependencies between humans and the environment via nonhuman entities and ecological systems and focuses on the entangled nature of the relationships beyond traditional human-centered approaches. In her book *The Caring City Ethics of Urban Design* Juliet Davis (2022) focuses on urban design's potential to perform care and explores how urban design can facilitate caring relationships and attachments to place. She criticizes the debate that pits urban design against the notion of care, for instance in relation to health concerns or water crises, and presents a convincing argument for the significance of design governance in fostering caring relationships and practices.

Previous studies have not covered or exhaustively examined all aspects of care, of course. The dynamic nature of cities and societies means that the dialogue concerning care and urban design will continue to evolve, providing new opportunities for future research

and exploration. However, while some studies have emphasized the crucial intersection between the concept of care and urban design, there is still a significant lack of reflection on this interplay in practice. In addition, the concepts of matters of concern and care are often criticized for being too theoretically complex, too idealistic, and not feasible. With my work, I aim to address precisely these concerns voiced against matters of concern and care.

Dealing with Mess

3. DEALING WITH MESS
Research Design and Methodology

This chapter describes the research design and the methods and approaches used to gather and analyze empirical data throughout the investigation process, as well as methodological concerns. As mentioned in the previous chapter, moving from the perspective of matters of fact to matters of concern and care implies a better standpoint for a more realistic interpretation of reality. However, reality is also affected by the methods of inquiry (e.g., Law and Urry, 2004), and the theoretical shift in what matters requires being open to methodological critiques, changes, and innovations. Being flexible in research design and choices of methods is important for this study in terms of uncovering the heterogeneity of socio-material concerns related to the design of areas with BGS. To gain a better perspective on inhabitants' perceptions of their outdoor environment and what BGS really mean to people, case study research with a mixed methods approach (combined qualitative and quantitative methods) and sometimes a multi-method approach (here with a combination of various qualitative methods) were employed. The study was divided into different sub-projects. Relevant literature reviews have been carried out in different stages of the entire project and its sub-studies. A quantitative survey was initially conducted and provided a common point of departure for all sub-studies, establishing consistent framework for the entire research project. Various qualitative methods were subsequently employed; these were adapted to the specific research environment and objectives of each sub-study. Overall, research method is viewed as a process rather than a product (Law, 2004). The entire PhD research design follows a kind of sequential design, where new methods were introduced as the study progressed. Methods were thus applied and mixed in different phases and in a complementary manner to provide a comprehensive understanding of the research subject (Table 1). The study gathered

data from individuals via various methods in accordance with the ethical guidelines of the Swedish Research Council. The research did not involve any physical intervention, nor did it have any potential psychological or physical impact on the participants. Moreover, no biological samples or sensitive individual information were collected or handled during data collection.

Mixed Methods Strategy

According to Creswell and Plano Clark (2011: 5),

> A mixed method is a research design with philosophical assumptions as well as methods of inquiry. As a methodology, it involves philosophical assumptions that guide the direction of the collection and analysis and the mixture of qualitative and quantitative approaches in many phases of the research process. As a method, it focuses on collecting, analyzing, and mixing both quantitative and qualitative data in a single study or series of studies. Its central premise is that the use of quantitative and qualitative approaches, in combination, provides a better understanding of research problems than either approach alone.

The mixed methods allowed for a better understanding of the complexity of everyday life and the relationships between humans and urban environments with BGS. This gave me a comprehensive overview of the meanings and expectations that BGS create or modify for humans and helped me with both general understanding, through the quantitative data, and in-depth knowledge, through the qualitative data. Although I was aware that mixed method research requires extensive time and many attempts, I chose to employ it, knowing that it allows mapping of a situation's complexity and that it suited the interdisciplinary nature of my project. I employ research design in accordance with Creswell and Plano Clark's (2011) notions, and I seek to fit methods to the different kinds of research problems, questions, and purposes that I address.

Table 1: Summary of research methods

Study	Method	Empirical technique	Time of data collection
Paper I	Qualitative	Document studies Observations Semi-structured interviews (individual)	Spring - Summer 2015 Spring 2015 Spring 2015
Paper II	**Qualitative** **&** Quantitative	Survey	Winter 2018
Paper III	**Qualitative** **&** Quantitative	Survey Observation	Winter 2018 Summer 2020
Paper IV	Quantitative	Survey	Winter 2018
Paper V	**Qualitative** **&** Quantitative	Survey Document studies Semi-structured interviews (go-along focus group)	Winter 2018 Spring 2023 Summer 2022

Measure–Value Environment Stance to Research Design

As previously mentioned, choosing a mixed methods strategy aligned with the multifarious nature of the research environment. In this thesis, the lens of measure–value environment has been borrowed for designing the research path, reflecting my specific interdisciplinary research landscape. The stance was considered in the planning of the entire research as well as in the formulation of the quantitative method. The design process of BGS is generally guided by multiple quantifiable units, such as the quantity of water, space area, rain, and cost. However, the unit is more than just a unit; according to Brighenti (2017), units also produce qualitative meanings. He proposes considering two facets for socio-spatial evaluations. His two-fold approach addresses two sides that are relevant: one extensive side (measures), and one intensive side (values). The extensive side usually concerns magnitude, for example, m^3 of water or m^2 of the designing

area, and the intensive side concerns quality-related facets of the magnitude, such as usefulness, preference, meaning, etc. For Brighenti, values are not always visible but become tangible in measures. He criticizes modern science for ignoring the phenomenon of value and concentrating largely on magnitude. While a measure can reveal values, it is crucial to realize that the measure per se cannot represent and insert a particular value (Brighenti, 2019). The measure-value environment perspective was useful when designing this research, as it emphasizes that the link between measure and value is rarely straightforward and separated. Brighenti gives us an example of their relationship: "flags are wind made visible but just as flags do not exhaust the wind rushing through them, value is never fully tamed by any measuring apparatus or any actualized measurement" (Brighenti, 2019: 227). A measure–value relationship leads to multiple processes of (extensive and intensive) territorializations and generates complexities in the use and meaning of space. The complexities need to be traced and mapped because they influence the matters of care and concerns, which are not always produced in a predictable way. Accordingly, it is important to realize that people's evaluations of their environment can be complicated, and various types of evaluations can interact and complement each other.

Case Study of Eco-city Augustenborg

Case study research is a (usually) flexible approach that applies combined strategies and multiple methods to collect data from individuals (and things) to explore and explain specific contextual and temporal dimensions. Robert Yin (2014: 16) defines a case study as "an empirical inquiry that investigates a contemporary phenomenon (the 'case') in depth within its real-world context, especially when the boundaries between the phenomenon and context may not be clearly evident". Linda Groat suggests replacing "investigates a contemporary phenomenon" with "investigates a phenomenon or setting" to better adapt the definition for architectural research and to avoid being limited to a certain time. She underlines that a case study can examine the socio-spatiality of a built environment and explain how a phenomenon or setting intersects with complex dynamics

(Groat and Wang, 2002). A case study allows the researcher to work closely with the case and its detailed characteristics, processes and implications and gradually develop an in-depth, context-dependent understanding of single or multiple situations (Creswell, 2013). A case study deals with a unique situation where other information and consequences are linked to the data sets. A case study tries to answer 'how' and 'why' questions and may have both a realistic focus, "assumes the existence of a single reality that is independent of any observer", and a relativist view in which "multiple realities having multiple meanings" (Yin, 2014: 17). The case study approach is suitable for this research to explore the matters of care and concerns set off in urban areas with BGS. The reason is that the matters we care about and the ways in which we care are very context-dependent and forever in a state of change, and "what care can mean in each situation cannot be resolved by ready-made formulas" (Puig de la Bellacasa, 2017: 60). Thus, it is very important to understand matters of care and concern produced or affected via BGS in their socio-spatial context, which is always unique and changes from situation to situation. The study case for this research is the Augustenborg neighborhood in Malmö with a population of 3 875 (Malmö stad, 2019, updated on 27 September 2019).

The Augustenborg neighborhood has been formed at different time periods. The area was initially developed in 1948-1952 and was based on a 'neighborhood unit' concept as a uniform, self-contained residential area with its centers, significant amenity features, and recreational space. The architect Gunnar Lindman was the head of urban planning in Malmö municipality at the time. He took over the project, which had already been adopted by the planning committee when the city engineer and urban planner Erik Bülow-Hübe retired in 1946. The project had a single developer, MKB municipal housing company. Augustenborg was MKB's first project as well as Malmö's first large-scale neighborhood unit and the first testbed for the national housing policy, which had been implemented recently, between 1945-47. Lindman continued Bülow-Hübe's work and sought to improve the plan without changing it much (Figure 4). He took responsibility for reviewing the plan and finding a solution that balanced his client's needs with an emphasis on natural light and vegetation. He played a crucial role in connecting the area as a whole

by preserving a central park and green spaces and intentionally creating a fluid boundary between the park and the residential plots (Tägil, 2021). The Garden City concept was also a relatively new urban planning ideal at the time, with unified outdoor environments, the influence of which resulted in the adoption of the concept of "house in the park," in the planning of Augustenborg's outdoor environment. The concept was a departure from the earlier method of building enclosed blocks surrounded by streets and traffic. Hence, following this concept, Augustenborg's outdoor environment was designed and implemented with a beautiful, large, open park, lawns and green spaces, and gardens in between them; together, they offered enough room for a variety of activities and purposes. The outdoor environment (gardens and courtyards) had a continuous design and was primarily designed by the landscape architect Birger Myllenberg (Persson et al., 2021).

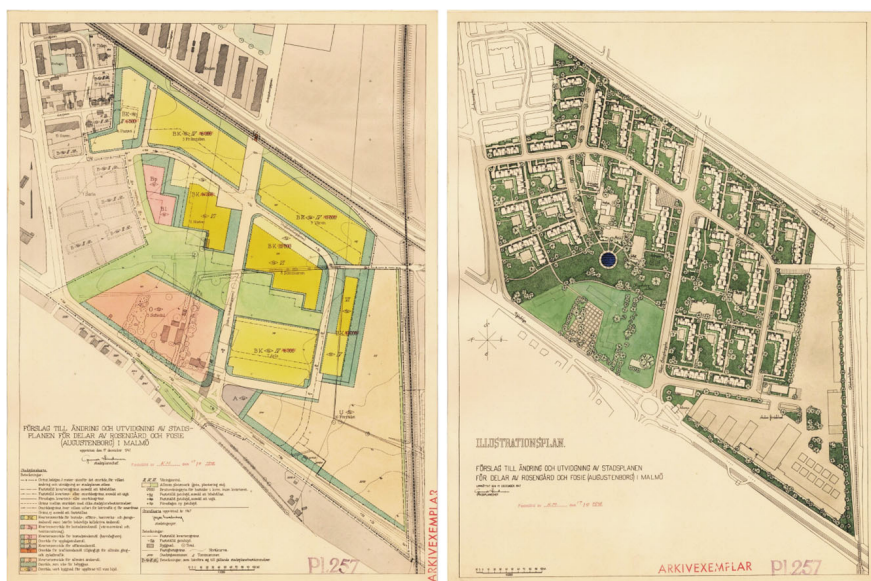Figure 4: Augustenborg municipal plan illustrations 1947, copyright: Malmö stadsbyggnadskontor.

In the 1990s, an economic and political crisis in Malmö resulted in a high unemployment rate and population loss (Holgersen, 2015). The crisis affected the Augustenborg neighborhood like many other areas in Malmö. The mayor and municipal leader Ilmar Reepalu, an architect and civil engineer, and his team provided a strategic plan for

Malmö based on creating attractive housing and establishing a university to guide the city through the crisis. Officials and involved partners were allowed to be creative and resourceful in their approaches (Persson, 2021). This general view ultimately played an essential role in the planning and implementation of many urban projects at that time. In 1998, a transformation project called Eco-city Augustenborg was initiated to regenerate the area and improve the social- and ecological conditions in the neighborhood. The project was launched with specific indoor (e.g., waste management) and outdoor objectives, including resolving stormwater issues, restoring the area's original character, and increasing the flora and fauna to enhance the biodiversity of the area (Persson et al., 2021). Indeed, after half a century, the initial neighborhood design and its flexibility have become vital parameters allowing creativity and innovation to regenerate the neighborhood's environment (Figure 5). The regeneration process was initiated by a group of key individuals: the development manager Peter Lindhqvist from the city department of internal services, Christer Sandgren (head of property at MKB), Peter Stahre (head of the city water utility), Gunnar Ericson (city gardener and director of the city streets and parks section), and Bertil Nilsson (headmaster of Augustenborg school). Furthermore, forming a steering group comprising political leaders from committees and municipal bodies and obtaining additional national and international funding facilitated the regeneration planning and implementation processes (Persson, 2021).

The main involved partners were MKB housing company and Malmö municipality (Dept. of streets and parks, water utility, and internal services). Later in the process, increasing the flood resilience of the area became the main driver of the transformation. With his environmental management background, Trevor Graham was recruited as the project manager for Eco-city Augustenborg (1998-2007). His primary focus was on social events and communication with the residents; this was both a requirement for the project and one of the prerequisites for funding. Some residents got involved (temporarily or more long-term), for example in designing the stormwater system. However, in many situations, participatory movements arose after projects in Augustenborg had already begun. One reason might be that the development was initially approached

Figure 5: Map of Eco-city Augustenborg showing blue-green solutions in urban open space. Illustration by the author, previously published in Mottaghi et al. (2020).

from a top-down perspective, i.e., from the municipality and MKB (Martinez Avila et al., 2021). The landscape architecture firms *Svenska Landskap* and *Mellanrum Landskapsarkitekter* were hired as consultants. The former was assigned with renovating the park and redesigning gardens with minimal changes, as well as designing an educational playground. The latter was responsible for designing a sustainable

drainage system. The idea was to improve the outdoor environment together with the residents via multiple sub-projects. However, in 2001, a landscape engineer replaced all of the landscape architects. Some ambitions were abandoned, some designs were changed, and the stormwater system was downgraded from a capacity to handle 25-year-rain events to 10-year-rain events (Persson et al., 2021). The transition project was over in 2003. The retrofitting comprised a series of BGS implemented in the shared outdoor space (Figures 6 and 7) as well as on some building roofs (not included in this study) and has since largely controlled urban flooding; the urban run-off has been reduced if compared to before the project.

Figure 6: Some of the blue-green solutions in Augustenborg. Photos by the author.

Figure 7: Some of the blue-green solutions in Augustenborg. Photos by the author.

The main reason for choosing this particular neighborhood as the study case is that the area is often referred to (nationally and internationally) as a reference flood-resilient urban project where the effectiveness of BGS has been extensively tested and proven (Figure 8). In addition, and perhaps more importantly, there has been sufficient time at the study site – more than two decades – for everyday life to be influenced and shaped by and to stabilize in the presence of BGS. Figures 9 and 10 show some spaces with BGS in between the buildings in the area interacting with mundane life. Urban space plays an important role in the urban design of a neighborhood,

Figure 8: Augustenborg, 1 September 2014, after the rain. Photos by Henrik Thoren.

Figure 9: Samples of residential areas in Augustenborg. Photos by the author.

as well as the social life there. The design largely has bearings on how we use a neighborhood, and since BGS introduce new socio-spatial interaction layers, the exchanges should be understood from an urban design perspective. The knowledge promotes a mutual understanding of a responsive design in which a flood-resilient neighborhood is

understood "not as casual descriptors of geographic location [without flooding] but as places that provide an essential context for daily life" (Talen, 2019 :1). It should be noted that this research only examines BGS implemented in publicly accessible outdoor areas and does not include e.g. green roofs.

Figure 10: Samples of the areas for children. On the left is the schoolyard with some BGS designed to be multifunctional. On the right is the musical playground in the park. Photos by the author.

Research Techniques

Survey

Questionnaires are one of the main tools in quantitative research and allow measuring by collecting data from a large group of people, such as the inhabitants of a neighborhood. Bryman (2008) explains that questionnaires enable researchers to distinguish between different categories (albeit not for categories with subtle differences). Measurement also provides a foundation for better estimates of the level of correlation between various concepts to explain how closely they relate. Compared to other techniques such as structured interviews, a survey may be faster and more cost-effective for the researcher, and responses are less influenced by the researcher. In this research, a postal questionnaire was used as a tool to gather information about Augustenborg residents' everyday socio-material

values and preferences. The questionnaire was collaboratively designed over the course of almost a year, from autumn 2017 to autumn 2018. The authors of Paper IV (Mottaghi et al., 2023), whose professional backgrounds range from water and environmental engineering to economy and architecture, actively discussed and participated in the design process. This was a learning process in itself. Already in the design phase, we sought to broaden the spectrum of understanding BGS from a perspective of technical functionality to a more socio-spatial perspective to investigate how inhabitants evaluate their environments in different ways. The questionnaire aimed to collect information about the interaction between everyday life and BGS, and it enabled us to investigate how inhabitants assign meaning to the use and economic value of BGS, respectively, as well as in relation to one another. As our theoretical framework for design, we borrowed the concept of affordance (Gibson, 1977) and the lens 'measure–value environment' (Brighenti, 2017) to discuss how different aspects might relate to people's evaluations, and how they for example lend value or give meaning to their environments. For more detailed information on the use of theory in the survey design, see Paper IV. Thus, we link both quantitative and qualitative properties of BGS to everyday practices and preferences. We apply a multi-level theoretical and methodological approach to propose new ways of measuring the efficiency of BGS by investigating the engagement in relation to different aspects of everyday life and blue-green environments. The questionnaire's focus is on this interaction between urban life and technology, where the interaction might influence the societal perception of the outdoor living environment. The questionnaire has two main sections: gathering information about inhabitants' possible mundane use, and willingness to pay (WTP). The first part deals with socio-spatial concerns and contains some designed and scaled items related to the residents' use of and experiences related to BGS. The second part embraces items with socio-economic concerns. Some open-ended questions were also asked throughout the questionnaire. The survey was in Swedish, and there were two initial pilot investigations with experts and a group of residents in the design process. The questionnaires were distributed by post to all households in the area, and a single reminder was later sent out. The questionnaires were then collected in one of two ways:

they were either sent by mail to the research team or delivered to the MKB office located in the area. Respondents who handed in the questionnaire at the MKB office were recompensated with two lottery tickets valued at 60 SEK (approximately €6). In the socio-spatial (urban design) section of the questionnaire, inhabitants were asked to rate several statements on five- and seven-level Likert scales about their daily use of environments with BGS. The items were formulated with the help of affordance theory (explained in more detail in Paper IV). Multiple sub-sections in this section address different kinds of affordances. Following this section, the respondents were given hypothetical neighborhood design scenarios from which to choose according to their preferences. The question was asked with the use of the photomontage technique, and respondents were asked to choose between an area with BGS and the same area without BGS (that relies on pipe systems). Respondents were then asked questions regarding willingness to pay (WTP) that are estimated through contingent valuation. Different statistical models were run in the software SPSS for the quantitative data analysis.

Observations

Everyday life is complex, and its occurrences and moments cannot be fully captured with solely quantitative methods such as surveys; there are serious limitations to such methods, for example, in the number and variety of questions, as well as the risk of missing vital data. A comprehensive and in-detail understanding of differences, patterns, and situations requires the use of additional and far more flexible techniques. Ethnographic approaches can refine our take on and explanation of happenings by uncovering additional details. Field observation is one of the best-known and most popular ethnographic approaches in urban studies, particularly in studies related to urban space and everyday life (e.g., Wirdelöv, 2022; Magnusson, 2016; Gehl and Svarre, 2013). On-site observation is one of the approaches used in this research.

During the observation, I, as the researcher, was positioned in the area being studied and did not participate in the activities being observed, but instead carefully monitored other actors and documented their behaviors. Various techniques were used to record
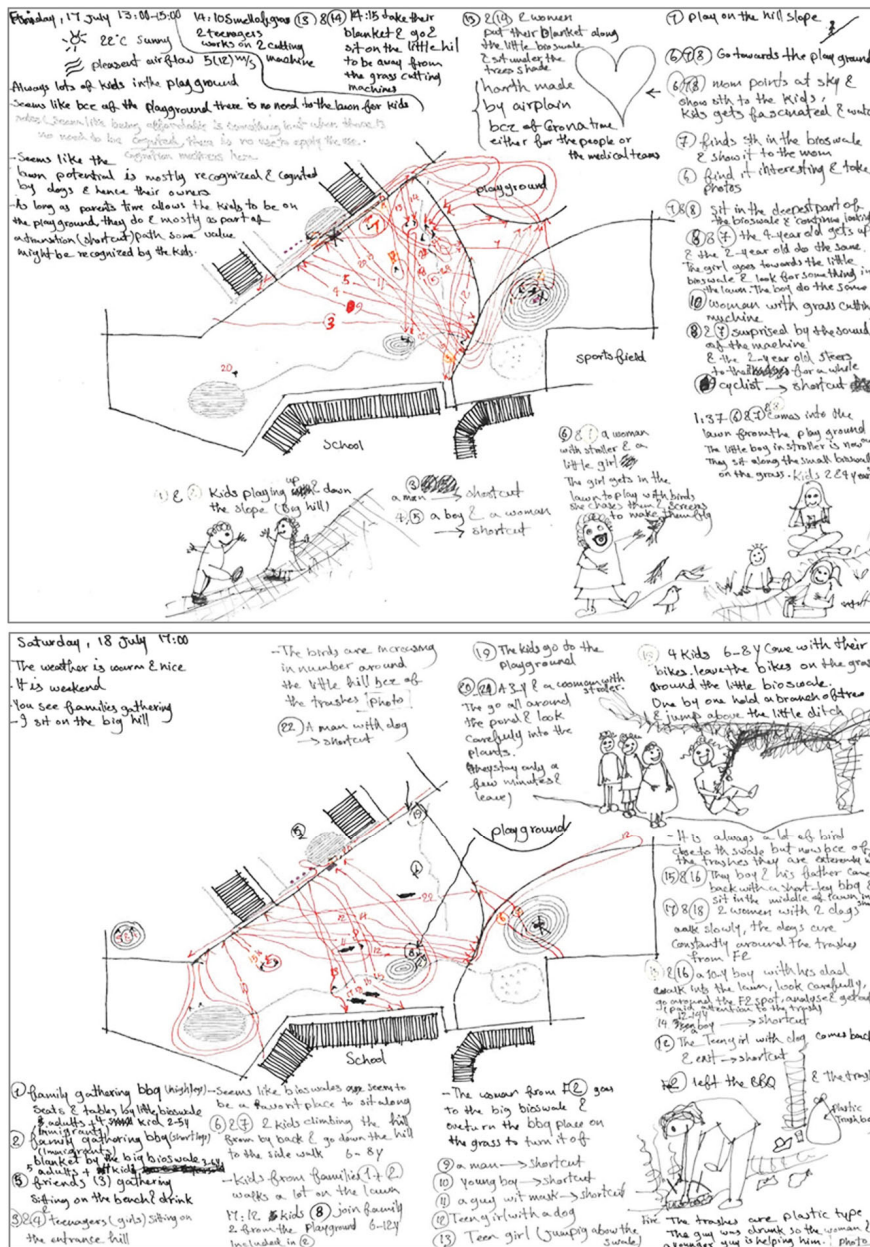
Figure 11: Examples of observation materials produced by the authors.

actors' activities and behaviors with minimal researcher intervention (Figure 11). Tracing actors is used to follow and register the movements in limited spaces by drawing lines on a plan of the researched area (Gehl & Svarre, 2013). While this method can map spatial movement, it has limitations in capturing the duration of

movements, stops, and changes in tempo. Throughout the observation, other methods such as note-taking, filling in assessment tools, sketching and taking photographs were used to record the details of different situations. A combination of methods enables the researcher to begin with an incident and to investigate the related connections to it, and it also facilitates the transition from individual interpretations to broader explanations at other stages (Lury & Wakeford, 2012). Moreover, collecting information through observational methods enables the researcher to reflect on mobility as an "experienced and embodied practice of movement" (Cresswell, 2010: 19).

Semi-structured Interviews

Interviewing people is one of the most common research methods in social studies. There are two types of interviews: Quantitative (structured) interviews are often used in measurement studies of key concepts to maximize reliability and validity. Qualitative (unstructured and semi-structured) interviews are more suitable for ethnographic studies and consider a broad generality in the formulation of inquiry, always leaving extra room for unpredicted explanations. Although the three steps of interviewing, the transcription of verbal content, and the analysis are usually considered particularly time-consuming, the flexibility of such interviews makes it a very attractive approach to many researchers (Bryman, 2008). Kvale (2007: 8) described the semi-structured interview as "an interview with the purpose of obtaining descriptions of the life world of the interviewee with respect to interpreting the meaning of the described phenomena." In a semi-structured interview, participants can express their perceptions, attitudes, and experiences as they wish and in their own words. Some prepared and open-ended questions with specific theme focuses are asked in semi-structured interviews. The questions have the steering role of the conversation. Interviewees are allowed to influence the direction of the interview however, although the interviewer sometimes tries to lead it toward the main interests of the research, e.g., through follow-up questions (Qu and Dumay, 2011). Semi-structured interviews for this thesis were conducted as individual and go-along focus group interviews. In Paper I, individual interviews were held in English and with some central figures in different water-, urban planning-, design-, and research sectors in Rotterdam,

Amsterdam, Dordrecht, and Delft in Netherlands. The interviewees all held key roles in influencing decision-making processes in urban flood management programs. Focus group interviews were conducted for Paper V. A focus group involves several people in an interview with a specific theme. This method, which has been gaining popularity in social research, helps individuals gain insights into others' particular viewpoints and reasoning and sometimes to reflect on or receive feedback on their own opinions. In addition, it "offers the researcher the opportunity to study the ways in which individuals collectively make sense of a phenomenon and construct meanings around [it]" (Bryman, 2008: 476). Two focus group interviews were conducted for the final paper. In the questionnaire distributed, participants were invited to share their contact information if they were interested in contributing to follow-up research. All respondents who showed interest were contacted. The interviews were in Swedish and carried out as go-along interviews, during which participants were asked to talk and walk around the studied environment, making stops at four chosen locations. Such interviews provide valuable insight into how people interact with their physical environment, not only through their bodies and in real-time (Kusenbach, 2003), but also through connecting to the space via their memories and previous experiences.

Document Studies

Existing documents may serve as an important source; they may for instance provide background information, raise new questions, unveil additional and unimagined data, draw images of changes, or even confirm knowledge from other sources (Bowen, 2009). In addition to the major research methods mentioned earlier, some documents obtained from the state and private sectors were occasionally reviewed, for example when searching for official statistics or planning documents. The documents usually contained a very heterogeneous set of data. The criteria for choosing the documents were their authenticity, credibility, representativeness, and meaning (Bryman, 2008). The identified stances, figures, or indicators in the reviews were used as starting points or to supplement data (to add to other sources of knowledge) in different sub-studies. Critically reviewing the available data helped provide a platform for developing insights into the matters and challenges concerning the design of BGS.

CHAPTER 4

Summary of Papers

4. SUMMARY OF PAPERS

Paper I

Integrated Urban Design and Open Storm Drainage in Our Urban Environments: Merging drainage techniques into our city's urban spaces

This paper can be viewed as a descriptive paper that illustrates a win-win situation for urban planning and urban water management that comes with integrating BGS into urban design as an alternative approach to stormwater management. This integration contributes to the sustainable transition of urban environments. The paper combines document- and literature reviews, interviews with experts, and site visits. A particular emphasis in the paper is the importance of reviewing the principles and strategies of urban design and urban runoff management in relation to each other, which has been recognized as helpful in mobilizing more support for urban life. The paper acknowledges that the integration of technical solutions into urban environments can boost social life whilst at the same time reducing environmental and financial risks. Through a review of best practices for urban flood resilience (mostly in Netherlands), it categorizes the necessary steps for flood-resistant urban design. Furthermore, it emphasizes the importance of ensuring that the design is practical for water collection as well as socially appealing. For instance, defining new aesthetic principles during the early development phase is crucial to making BGS visually attractive. The paper contributes to contemporary discussions on the importance of closer collaboration between urban development and water-resilient projects, as well as between urban planning departments and water utilities in cities. This collaboration is crucial for improving the liveability and capacity of urban spaces. However, applying a perspective from initial decision-making and maintaining consistency throughout is key to success (Mottaghi et al., 2016).

Paper II

Blue-green Solutions and Everyday Ethicalities: Affordances and matters of concern in Augustenborg, Malmö

The paper aims to understand how BGS become a part of an urban setting by exploring the impact they have on matters of concern and expectations in the Augustenborg neighborhood of Malmö. The material is derived from free-text answers to a questionnaire designed to comprehend the interplay between BGS and the social- and material context of the neighborhood. The study combines the concepts of affordances and matters of concern and care to investigate the social effects of BGS in urban areas. The analyses reveal that the affordances introduced by BGS go beyond stormwater management and include faunal, social, blue, and synergistic affordances. These affordances are not just there to be 'found' but are produced as socio-material relations that participate in the formation of everyday life. After identifying the main concerns and prospects raised by the residents, the study discusses how the implementation of BGS relates to the transformation of everyday ethical concerns related to shared urban spaces in the neighborhood. The paper concludes that the densification of actors (human and nonhuman) in a certain urban environment means that the place becomes a matter of concern for more people and animals, with new negotiations emerging as a result. Additionally, BGS participate in the territorial transformation and creation of a different type of place. In summary, BGS introduce a new sensitivity and intensification of concerns in existing urban environments, which have important social implications that require further study (Mottaghi et al., 2020).

Paper III

Blue-green Playscapes: Exploring children's places in stormwater spaces in Augustenborg, Malmö

The study examines the potential for BGS to be included in children's play activities. The Augustenborg neighborhood park was initially identified as a potentially attractive area for children's activities through a postal survey. Utilizing an assessment tool for children's

play environments that was designed and reviewed by other scholars, the study begins by analyzing the play opportunities and affordances that BGS offer to children. It then investigates how children use the BGS potentials in their everyday play via on-site observations. The study found that despite BGS satisfying children's play values, children were not using the play features offered due to existing socio-spatial structures and urban design. The paper further discusses how stormwater management may contribute to the actualization of play potentials in children's everyday living environments. The study suggests that to make BGS more accessible as well as complementary to other play areas, urban planners should concentrate on spatial design and hierarchy. It is crucial that BGS are more explicitly created and implemented with consideration for children's requirements and their specific circumstances, such as usually being accompanied by guardians with a variety of interests and socio-cultural practices. The study also emphasizes the benefits of combining several research techniques to grasp the complex link between children and their urban surroundings. By improving our socio-spatial understanding of this interaction, we can create more effective policies and investment opportunities to support the use of BGS as diverse places to spend time for both children and their guardians. The paper calls for further research to explore the behavioral patterns triggered by BGS in children and their responses to everyday needs (Mottaghi et al., 2021).

Paper IV

Caring for Blue-green Solutions in Everyday Life: An investigation of recreational use, neighborhood preferences and willingness to pay in Augustenborg, Malmö

The paper explores what residents of the Augustenborg neighborhood in Malmö care about in an assessment of their outdoor living environment with BGS. Data was collected through a questionnaire sent to all households in the area that focused on possible recreational use, neighborhood preferences, and willingness to pay in relation to BGS. The findings showed that residents had varied and sometimes contradictory relationships with BGS. The study demonstrates that the matters of concern and care related to

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BGS are multifaceted and transform over time. It also shows that both caring and not caring about BGS in an urban area can coexist. In this regard, the results highlight that the success of frequently used urban spaces with BGS does not necessarily translate into a preference for living in similar urban environments in the future. Furthermore, the study found that both using the environment for recreational activities and having knowledge about the function of BGS in flood mitigation increased residents' willingness to pay for such solutions. However, residing in the area for a longer period seemed to decrease it. The paper emphasizes the ongoing experience and practice that constantly challenge our understanding of a certain environment and transform its meanings. Moreover, it reveals that values are fluid and evolve over time, and that various combined methods need to be mapped out to measure the environment in order to understand how individuals assess and attend to their surroundings. By uncovering an evolving landscape of care, the paper implies that future planning and research should prioritize the relationship between BGS and its social utilization over an extended period. Hence, the study also proposes a shift in focus from designing and planning for BGS to exploring how BGS can be integrated and embraced into everyday life (Mottaghi et al., 2023).

Paper V

Blue-green Solutions and Territorial Negotiations Related to Rhythms: The case of Augustenborg, Malmö

Applying a rhythmanalysis approach, this article studies the relationship between space, time, and everyday life in relation to BGS in the Augustenborg outdoor environment. The study analyzes data from a questionnaire and focuses mainly on the outcome of follow-up go-along focus group interviews. It explores socio-material transformations in the neighborhood via BGS, concentrating on the links between rhythms and territorial productions. The article focuses on rhythms as patterns that come and go in time and are related to the use and meaning of spaces with BGS. The study shows that embedding BGS in an urban environment entails an entanglement of different kinds of rhythms, and that these rhythms have an impact on

territorial negotiations and disputes. BGS imposes certain rhythms on the environment that not only influence existing rhythms but also produce and insert new rhythms via different kinds of interactions with the urban context. The results highlight three important territorial aspects connected to the rhythms. First, BGS generate new territorial relationships between urban areas and at different levels. Second, BGS result in changing territorial use relating to weather. Third, BGS come with strong territorial meanings and (functional) shifts in relation to animals and plants. The paper concludes that the Eco-city Augustenborg project appears to cope insufficiently with the different rhythms (either produced by BGS or influenced by them). This has had some territorial consequences, as mentioned above, and these consequences indicate discrepancies between the use of the BGS and the design and maintenance of the area. The paper also emphasizes the importance of acknowledging rhythms in the planning, design, and implementation of BGS, particularly in an existing urban context. More specifically, it argues that rhythms should be considered in the regeneration of urban areas and addressed via the reproduction of urban design.

Reframing the Narrative

5. REFRAMING THE NARRATIVE
The Nature of Blue-green Solutions

This section reflects on the translations of some everyday situations influenced by BGS and highlights various aspects of socio-materiality that developed over time in Augustenborg's retrofitted outdoor environment. By analyzing the found assemblage of concerns, I aim to shed light on the complex and dynamic relations constructed around BGS in everyday life. The link between care and the accumulation of affordances and agencies is pivotal for this discussion.

Possibility and Performance

Improving the quality of urban life with the multifunctionality of BGS requires a comprehensive understanding of the BGS' socio-spatial significance as well as of how people perceive their material impact. A nuanced understanding of BGS' effects is essential for optimizing the socio-material benefits they offer in urban residents' everyday lives; such knowledge can facilitate enhanced BGS benefits in more effective planning and design processes. However, it is important to avoid generalizing the benefits of BGS and instead critically analyze the conventional understanding of their multi-functionality or co-beneficiality. We must recognize that BGS have potential beyond what we believe them to have or even what they currently offer. Thus, by understanding what BGS can and do effectuate – in other words, by identifying both the potential- and the actual effects of BGS – we can harness their full potential for co-effects or additional functions. When considering BGS in everyday life situations, it is important to distinguish between possibility and performance. Possibility relates to the idea that something can happen; possibilities refer to the various

potential opportunities of and in a particular situation. Performance, on the other hand, refers to the act and how well, efficiently, or successfully a (human- or nonhuman) actor's activity relates to a specific goal. Performance (the degree of capability or how successfully something has been performed) is usually easier to measure by assigning criteria and indicators. As an example of their difference, we can evaluate performance, i.e., the effectiveness of an actor (human or nonhuman) using various quantitative metrics, such as the number of attendees at an urban art performance per event, or the volume of runoff collected per hour. Possibilities, however, are more about likelihoods and are difficult to measure for many reasons. For example, predicting or even recognizing relevant criteria and scale is very difficult and demands thorough, context-based empirical investigations. However, it is fundamental to recognize that while possibilities and performance are not interchangeable, they are often related, and their inter-relationality is also very context-specific. The range of possibilities (embedded in an artifact) influences the performance of the artifact, and its performance (influenced by for example other objects' possibilities and often their performance) can also impact the range of possibilities available through that artifact. High possibilities are not necessarily synonymous with high-performance however. In addition, if something is high-performing, this may result in specific (pronounced) opportunities for performance and advancement, but this does not mean that it necessarily carries more possibilities.

The performance of BGS thus refers to what they do and how well they do it, whilst the possibilities they bring to an environment refer to the potential they have. There are dynamic relationships between possibilities and performance; this also aligns with the concept of virtual vs. actual (Deleuze and Guattari, 1987; Deleuze, 1994). The concept highlights the relationship between what is currently actualized in the world and the range of possibilities (or virtualities) that exist but have yet to be actualized. Deleuze argues that the virtual is not just a mere possibility that might later become actual, but rather a "real" domain of existence that coexists in conjunction with the actual world (Deleuze, 1994). According to Deleuze, the actual world is constantly influenced by the virtual, and the relationship between the virtual and the actual is very complex. The interaction and inter-

relationality between the performance (actual) and possibilities (virtual) of BGS is what determines the benefits and use or simply the reality of BGS. Deleuze uses the term 'becoming' for this interaction, emphasizing the importance of transformation in the process of creating new forms of existence – a transformation that involves a dynamic interplay between the virtual and the actual (Deleuze and Guattari, 1987: 237-239 & 293-294).

When making decisions or assessing the efficiency of BGS, then, it is important to take both possibilities and performance into account. An understanding of their inter-relationality may lead to more practical choices and improvements in the design and thus respond to a wider range of material situations and needs that are important to certain individuals and groups. The results from Paper III are an example of the interplay between possibilities and performance. Here, it was found that while BGS have the potential to offer various play possibilities, they did not really perform well as playscapes in Augustenborg Park. To enhance their performance as playscapes, it is necessary to design and implement them in a way that fully takes into account the other existing play possibilities and functions, entangled with the socio-spatial context of the neighborhood. This in turn requires a thorough understanding of the environment and its cultural- and urban design settings. Another concrete example is presented in Paper V. Previous studies confirm that BGS in Augustenborg demonstrate high performance when collecting and handling excess water in the area, which offers rich water-related possibilities. However, the results of Paper V showed that the water collection performance of BGS currently offers additional water potential (e.g., for ducks to swim) but as a result entraps ducklings and leads to their death when the water level drops. The study highlights the importance of considering the unintentional consequences of design decisions and the need for ongoing evaluation and adjustments.

What artifacts become in a certain environment must be explored with appropriate theoretical framework. ANT and affordance theory both aim to explain how humans and nonhumans interact with their environments and each other, and these two theories can contribute to a comprehensive understanding of the inter-relationality of the possibilities and performance of BGS. ANT and affordance theory

have different focuses, and combining them facilitates a better understanding of the embeddedness of BGS. ANT enables study of the performance of an object or system by examining the network of human- and nonhuman actors involved and the relationships between them. For example, in the context of BGS, ANT could be used to analyze the network of actors involved in the design, implementation, and maintenance of the BGS, as well as when they stop acting and so on. While I did not trace actors and their performances in the traditional, more meticulous way of doing ANT research, the theory helped me recognize the interactions and relationships between different actors and the effects these have on how BGS perform in a certain situation. The ANT perspective helped me see individuals and groups as part of a larger network of human- and nonhuman actors. An ANT viewpoint acknowledges interactions and relationships between actors and agencies that have a bearing on the effects of BGS and hence their performance in an environment. Affordance theory on the other hand is useful for understanding the potential opportunities or possibilities for action that an environment (or object) offers a user or actor. Affordances are related to the properties of the environment, and the properties suggest how the environment can be used or interacted with. In the context of this thesis, affordance theory helped with identification and analysis of the potential opportunities that BGS offers for everyday choices, activities, and experiences.

Previous research and evaluations have shown that the BGS in Augustenborg exhibit strong spatiotemporal performance in various water-related hydrological scenarios (Haghighatafshar, 2019). However, looking at BGS performance in relation to the diversity of everyday life, perspectives on what BGS actually perform can change. Whilst performing well in some functions (managing water), they might perform poorly in situations that were not foreseen earlier (as a safe habitat for the ducklings that the water attracts). Performances and possibilities are intertwined in a constant form-taking process with its own temporal peculiarities. Paper V for example illustrates how BGS' rhythmical performance transforms the use and meaning of the area when interacting with different rhythmic possibilities of everyday life (Figure 12) such as cultural, meteorological, faunal- and floral rhythms, etc.
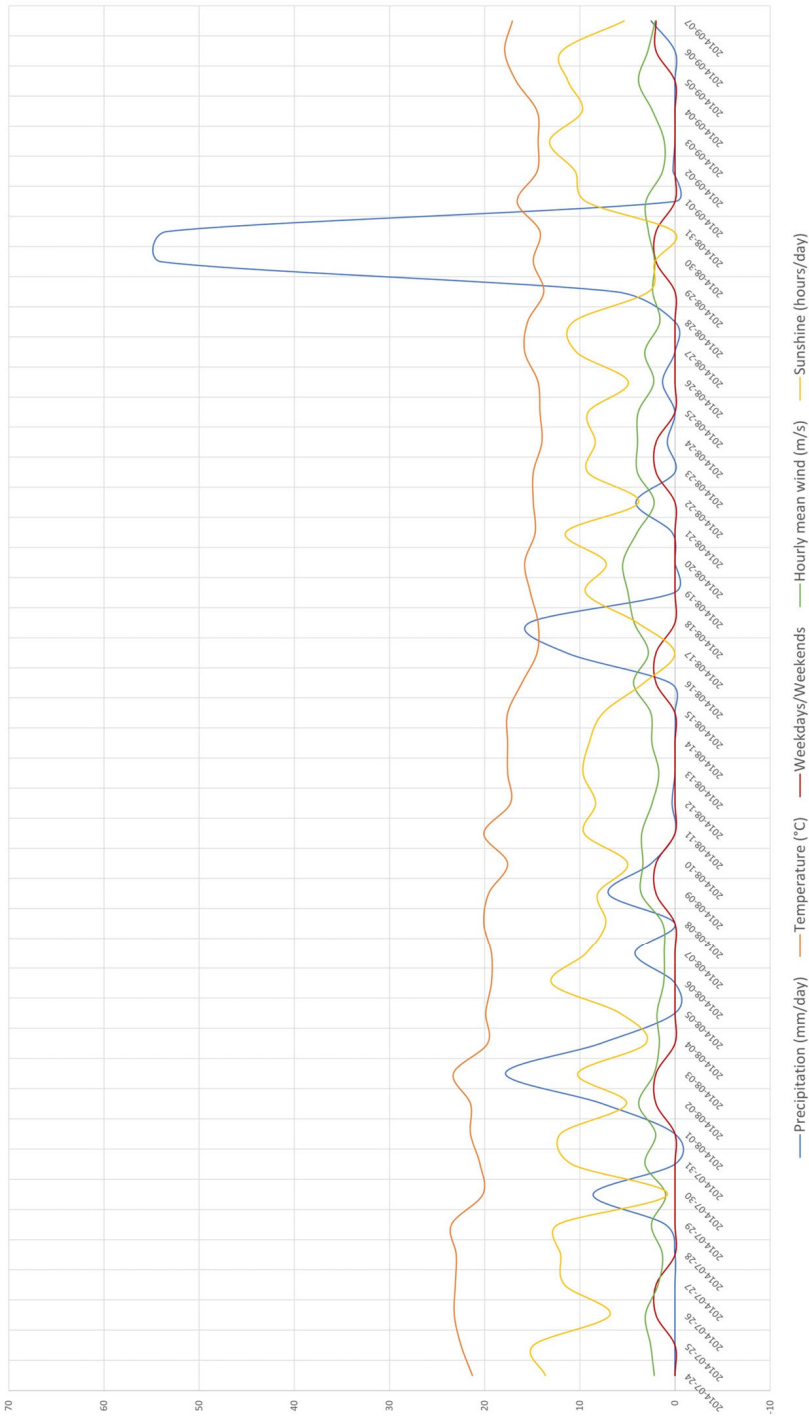
Figure 12: Entanglement of multiple rhythms around Malmö in August 2014. Illustration by the author.

BGS as New Becomings

Constructing BGS in existing urban areas entails temporal manipulation of the urban space. BGS are not something inserted into an environment, fix a problem, and leave some already known benefits. Their entities are not fixed and static, but instead continually evolving. They are in constant shaping and 'becoming' mode, emerging within the temporality of society and urban space. The notion of 'becoming' presents well the significant role of spatial and temporal entanglements (as influences) in shaping the relations between humans and the environment, emphasizing the synthesizing character of relationships in the formation process. The term becoming also highlights that the relationship is never fully fixed and finished, and that it is always subject to change in other spatiotemporal interaction circumstances. Thus, BGS are always up to a 'new becoming'. New becoming refers to a new way of being and could be understood as emerging possibilities for the transformation and change of an artifact – such as the Augustenborg blue-green space – that arise from the interaction and interplay between human- and nonhuman actors as well as the actual and the virtual. These new becomings could be established in various forms and entities (or new socio-material formations) and are the result of the ongoing process of becoming. This thesis suggests that the existence of BGS is based on a transformative process that continually leads to the emergence of a new way of being for BGS. 'BGS as new becomings' is a fundamental finding of this thesis. The study reveals some of the assemblages of the new becoming and discusses the different aspects of becoming in relation to BGS discovered in different sub-studies.

Paper II offers a tangible example of how new becomings may emerge in urban contexts via the introduction of landscape technologies. It shows that BGS can transform the material- and social landscape of the Augustenborg neighborhood, contributing to the development of new ethicalities that are formed around socio-technological practices and "born out of material constraints and situated relationalities in the making" with other actors (Puig de la Bellacasa, 2017: 145). BGS not only introduce new affordances but also affect the social, material, and cultural construction of the environment, which in turn gives rise to new forms of social conduct,

sensitivity, and intensification of concerns. Moreover, the paper represents another example of new becoming when referring to 'synergistic affordances'. The term introduces affordance as an outcome effect (of more than a dualistic relation) subject to how different actors get along to produce a synergistic effect. This is illustrated in Paper II for example:

> Some respondents suggested that more fruit trees are needed around the blue-green solutions. At first, fruit trees may not be directly related to the affordance of the blue-green solutions. Yet, when someone writes, "I would like to see more fruits and berries so when you are out there with kids or animals you can also eat," it means that being there, together with kids or pets, and together with fruit trees, the place affords you to do more and stay longer. It also affords you to experience something different, as it generates other types of affordances (such as attracting more animals and people) interacting with you, and perhaps enhancing the quality of your experience (Mottaghi et al., 2020: 139).

Paper V discusses another aspect of a new becoming and presents new types of possibilities and transformations in Augustenborg's outdoor environment that occur through the interactions and interplay of multiple rhythms and develop inter-rhythmical relationships and negotiations. The relationships are always in a new form and a new transformed state. The routines and patterns of using the environment are in constant formation, re-formation, and transformation. The changes impose territorial shifts (Figure 13) and sometimes territorial negotiations; for example, we saw how changes in water level or the state of the water can lead to new territorial associations at critical moments. The results also indicate that everyday rhythms are neither fixed nor randomly created. They are the outcome of never-ending ongoing socio-material interactions between people and their surroundings. Moreover, the results also show that our design not only enables the shaping of an environment through the creatures' active engagement in the environment; it also shapes human, animal, and plant behaviors and in some cases even interferes with or poses risks to their existence. The results indicated for instance that ducks and fish struggle for their territory, but that their likelihood of success and survival is sometimes very low because the human-centric design in the area cannot accommodate different

rhythms connected to other species or life forms. It is important to note that similar points have been highlighted in previous research and the human-centric perspective has been widely criticized. For example,

Figure 13: Examples of the territorial shifts in Augustenborg. The photos show how the park and basketball court transform into part of the waterscape during and after rainfall. Photos by Henrik Thoren on 1 September 2014.

in her book *Urban Animals: Crowding in Zoocities*, Tora Holmberg (2015) argues that urban spaces must be designed to consider urban animals as integral parts of human urban life. Similarly, Donna Haraway (2016) stresses the importance of creating a new form of coexistence between human- and nonhuman lives in her book *Staying with the Trouble*, where species' interconnectedness generates new possibilities for being and living together. My research on Augustenborg's open space thus supports their findings.

Paper III offers another example of how BGS can be seen as new forms of becoming, touched upon through meta-reflection. The findings indicate attention to the future of design and how the design outcome can transform and evolve. Paper III can be read as an example of how the concept of new becoming can be applied to urban planning, urban design, and landscape architecture, shifting the focus from traditional models that prioritize e.g. functionality and performance to more holistic approaches that adapt to new challenges (i.e., posed by urbanization, lack of outdoor space, and climate change) whilst also recognizing the diverse and changing needs and perceptions of different users, including children. In addition, the paper highlights the need for new ways of thinking through continuous learning and discovering new ways to explore, understand, program, and design our urban spaces.

In short, it became evident that the employment of BGS in urban space entails a kind of time-space extension of the urban space and hence puts the area in the state of a new becoming. This highlights that each socio-material situation in relation to BGS is unique and never repeatable. It is within the modes of becoming that the relationships between actors change and new relationships are shaped. These changes continuously influence the agencies and hence the use of an environment with BGS.

The Multifaceted and Dynamic Essence of Care

The study argues that utilizing the perspective of care can help to acknowledge entities that have been left out in the decision-making process for improving the flood resilience of urban areas. The viewpoint is effective in uncovering how people relate to BGS in their

everyday lives in the Augustenborg neighborhood. The results illustrate a landscape of care that is formed and transformed via BGS. The research highlights the importance of understanding BGS with regard to the mundane use of the environment, and the outcome recognizes the complex and entangled patterns of concern and care that people develop for their shared urban environment over time. The patterns are interrelated, and they are also related to the production and reproduction of preferences and meanings related to the environment.

Paper II demonstrates that BGS could create a particular range of affordances, concerns, and expectations that generally intensify the area's social and material dimensions. This creates a new ecology of care where human- and nonhuman creatures are affected, and so new routines and processes are formed for the neighborhood's inhabitants regarding what should and should not be cared for. Additionally, the paper emphasizes the importance of identifying and comprehensively addressing the diverse range of human- and nonhuman actors earlier in the design to ensure that their needs are met and properly addressed. The papers also confirm that the implementation of BGS in urban spaces results in more complex environments; this in turn adds to the complexity of inhabitants' everyday interactions with the environment. Accordingly, attention and consideration are thus required from various stakeholders. The implementation of BGS in existing urban areas seems to be linked to the densification of new issues and actors in the area, forcing the inhabitants into different kinds of negotiations which in turn affect and alter the meaning of the BGS. Paper III investigates the area with a stronger magnifying lens. Focusing on a specific user group – children – in the Augustenborg outdoor environment, it argues that children's everyday life should be generally of concern via the implementation of BGS. The study highlights the importance of understanding and addressing context-based matters of concern and care in the design and planning of BGS to support children's play in relation to densification processes. The paper shows that the playing performance of BGS in Augustenborg Park is low as play-related possibilities (embedded in the setting) were neglected both during and following the retrofitting process. The study suggests that realizing BGS play affordances requires the identification of multiple parameters critical in the interaction

between BGS and children's needs, and that these must be considered in early decision-making stages. If striving to provide opportunities for BGS to be perceived and performed as diverse places to play, urban planners must take into consideration the socio-spatial constructions and hierarchy. In addition to considering all groups of users, the heterogeneity of care must also be recognized and responded to. Paper IV confirms that matters of concern and care can be constructed differently for individuals regarding different aspects of BGS. What matters for the inhabitants of Augustenborg is strongly related to the way they develop criteria to evaluate the environment. This also underlines the need for constant review of the built environment and hence innovative and in-depth mixed-method strategies for measuring users' perceptions and preferences. While the study explores some aspects of matters of concern in everyday life it depicts, issues of whether to care for, what to care for, and how much to care for are also associated. While caring to use BGS, caring to live in a neighborhood with BGS, and caring to pay for BGS are interrelational, they can also be perceived differently and evaluated with varying and sometimes contradictory criteria, as seen in Paper IV in relation to using BGS, preferring BGS, and Willingness to Pay (WTP) for BGS:

> Caring to use something is a positive response, but use was also related to a tendency not to prefer BGS when moving in the future, which means that it can also be related to a more negative or dissenting evaluation of the environment. To take measure of one's environment by engaging in stationary recreational activities might thus result in both an affirmative and a dissenting evaluation at the same time (as in, "yes, I like to use it, but given the opportunity I would prefer another environment"). We saw a similar trend with respect to WTP, in that experience and understanding might both increase (through engaging in stationary activities) and decrease (through longer residence at the place) the WTP for BGS. (Mottaghi et al., 2023: 14).

This is why, following the argument by Brighenti (2017), we assert that the measure–value relationship should be viewed as an environment and not a simple correlation. What may hold significance in one situation may be insignificant in another. The finding highlights that matters of concern and care in relation to BGS are in constant

transformation, and moreover, both caring and not caring about BGS in an urban context can coexist. Another key finding of the research is the identification of care as a temporal assemblage. Paper V shed light on the rhythmicality of care; it seems there is a certain regularity and pattern to how people care for an environment with BGS over time. The coming and going of patterns contributes to stabilizing the human perception of the environment. This is an important insight, as it suggests that care is neither static nor a 'one-time thing', but instead shapes and evolves in the entanglement of multiple rhythms. In addition, the finding identifies the emergence of some in-between situations as critical moments in forming matters of concern, for example too much water vs. no water. It appears that certain modes of transition or transformation can be particularly meaningful to people and should be carefully considered in planning and design. The paper also highlights the important role of water in changing landscape dynamics and creating matters of concern for the inhabitants; water's role in intensifying matters of concern and care has become particularly notable. Water makes the environment more complex and subject to more attention and consideration. As a highly dynamic and temporal substance, water plays an important role in territorial shifts and concerns. This also has a share in stressing the importance of understanding the temporal aspects of care and how they shape our perceptions of the environment.

All sub-studies confirm that BGS influence the affordances of the environment. Affordances affect matters of care and concern regarding the environment. The concerns have a bearing on the affordances of the environment and what that means for society. This again shifts socio-material concerns, expectations and so on. The interaction, or dialectical relationship, between affordances and matters of care is dynamic, evolves over time, and never ends. By changing the landscape of affordances, BGS take part in forming concerns related to power relations about who can do what, where, and how. The affordance perspective helped show how future designs of BGS must aim to contextualize and address socio-material concerns and not to stir up urban matters of conflict. On the whole, the thesis shows that the existence of BGS has a strong impact on how people in Augustenborg perceive their urban space. Here, we are dealing with a landscape of different matters of care, which also relates

to the previous discussion on 'BGS as new becomings', accentuating the dynamic and evolving socio-material nature of care in connection to the embedded technological systems in the urban landscape. In this regard, this thesis may be considered a spatiotemporal contribution to the discourse of matters of concern and care.

Carescape
of Blue-green Solutions

6. CARESCAPE OF BLUE-GREEN SOLUTIONS

This thesis highlights the entangled patterns of concern that people develop for their urban environment. Caring for these concerns is important. They are affected by affordances, which in turn impact societal perception of the environment. As shown in the previous chapter, the presence of BGS has a strong influence on what an area means to people. The potential and performance of BGS are interrelated, and the environment is a constant emergence that arises within their relationships. The thesis argues that new insights, innovative methods, and holistic strategies are needed to identify, evaluate, and address socio-material concerns influencing the perceptions and preferences of urban inhabitants. In short, this thesis considers BGS to be more than isolated artifacts in urban areas, and it employs a kind of STS-urban design view to explain the relationship between people and BGS. The thesis also contributes to the discourse of matters of care and concern by utilizing the perspective of urban planning and design.

Each chapter of this cover essay (*kappa*) and its subsections has built on the chapters preceding it. Together, they have revealed distinct dimensions of BGS in everyday life and insights into understanding them. Over the course of the study, I have gradually shifted from a technological conception of BGS to a more human-centric understanding of how BGS can be used in everyday human life, and eventually to a more relational understanding of how meanings and uses are shaped around BGS through the relationship between humans and nonhumans. This thesis builds on the research of other scholars and expounds on the connection between urbanity and care. Throughout the thesis, I have shown that 'matters of care' could be a helpful lens for addressing questions of regeneration when it comes to urban areas, and that the concept can be addressed as a

spatial issue and used as an important concept in urban design. The work also shows that the need to develop blue-green infrastructure is an excellent opportunity to embody care in urban environments and reflect upon issues of support in urban life. I explored how BGS can be caring and foster care as long as we recognize that BGS need to be read in their unique context, and I acknowledged urban design as an effective tool to construct and implement BGS as supportive and responsive environments.

This chapter, called "Carescape of Blue-green Solutions" is a recap of the explicit and practical findings of this thesis. In the study, the Augustenborg outdoor environment with BGS was researched as a place for caring, with focus on the possibilities for BGS to perform multiple benefits and functions. The term 'Carescape' may be associated more with the healthcare industry. I was mainly inspired to use the suffix '-scape' by anthropologist Arjun Appadurai, who has applied it to describe various phenomena that arise from the interaction between different actors across physical and conceptual space. Appadurai (1990: 296) uses the suffix -scape to present the five dimensions of the global cultural economy, terming these (a) ethnoscape; (b) mediascape; (c) technoscape; (d) financescape; and (e) ideoscape. I also drew inspiration from other sources. "Scape" can also refer to a scene or view; and carescape can thus also be interpreted as a careview. Although BGS are generally known as water-related landscape solutions, my work shows that they are much more than that; they are also about many other (often fluid) kinds of landscapes that form and transform via a complex relationship between humans and the urban environment. Carescape also emphasizes the importance of collectivity and contextualization in urban landscape design, expressing that the design outcome should be understood and defined through the lens of matters of care.

Decoding the Complexity of Benefits

In the following, I aim to provide an overview of the factors, components, and procedures that play a role in shaping meanings (and potentially enhancing the co-benefits) of BGS in Augustenborg. Uncovering meanings requires a deep understanding of why things

happen, what they consist of, and how they occur and may be understood. This section aims to frame a comprehensive overview of the everyday use of BGS. According to the study, relying on the concept of resilience alone is not enough to ensure the multiple benefits of BGS in everyday life. To achieve multi-beneficiality, the objectives of resilience design need to be revised by shifting towards the responsivity of BGS, the ability to cope with any socio-material situation. Here, the concept 'matters of care' makes the move highly feasible. The study started with acknowledgment and analysis of inhabitants' concerns in relation to BGS and continued with exploring the connection between the assemblage of concerns and the accumulation of affordances (and agencies) of the environment. When I had gained an understanding of the relationship, I drew a landscape of care, revealing some of the neglected issues and unknown consequences of the embedded BGS. At this point, contextual design processes were recognized as a tool for implementing matters of care and achieving social and environmental togetherness in urban areas via BGS.

In the planning and realization of the eco-city project, the existing urban design of the area – originally designed in the 1940s with the concepts of 'neighborhood unit' and 'houses in the park' – was without a doubt the key factor that actually allowed the regeneration of the area with BGS. However, the study shows that the Augustenborg outdoor area with BGS appears insufficient for meeting the diverse expectations of its inhabitants, sometimes resulting in inopportune decisions such as cutting vegetation to curb smuggling activities (which led to the loss of wildlife habitat). Simply providing green and natural environments is not enough to both meet ecological targets and support humans. To achieve a common ground for humans, animals, and plants, it is essential to comprehensively understand, mobilize, and implement various specific measures that address the needs and concerns of both human- and non-human entities. The study moreover demonstrates how BGS influence the temporal and territorial aspects of the environment and concurrently create new temporalities, physical boundaries, and hence places. For instance, as this work shows, rhythms are part of ongoing adjustments in the territorial landscape of BGS. As rhythms become stable over time, routines, expectations, and sometimes conflicts emerge.

Rhythms can transform routines and territories, thus result revealing new concerns and care, as noted (in Paper V) in relation to how human-centered design and management of urban spaces can disrupt cohabitation (with other beings).

The thesis highlights the complexity of achieving the multiple benefits by implementing BGS in urban areas, and it also decodes it to some extent. The thesis argues that to simplify complex ideas, we must first decode them and then explain them in a way that is easy to understand; this is crucial in both teaching and practical applications. The results also underscore the importance of continuously assessing the built environment and its design. It is vital to employ innovative approaches and combine qualitative and quantitative as well as site-specific strategies for the review and analysis. The meanings are best measured and valued using a combination of comprehensive mixed-method designs. It is important to note that what may be considered pronounced in one situation and with a specific method may not be detectable in another situation and via another method of measurement; it may be necessary to use various lenses and approaches to obtain a thorough understanding of user concerns, perceptions, and preferences.

Heterogeneous Places and Collectives

More broadly, the thesis contributes to the enhancement of blue-green infrastructure by highlighting what municipalities and decision-makers should consider essential when encouraging residents and private property owners to appreciate BGS on a daily basis and to participate in their development process, whilst also improving urban fauna and flora. The thesis argues that the complexity of the urban environment must be simplified in some way in order for urban issues and needs to be addressed effectively. Such simplification could be the use of typologies and stereotypes in various fields to clarify complex concepts. While typologies and stereotypes can be helpful, for example as teaching aids or templates for practice, it is also important to critically evaluate and refine them over time. An expert or decision-maker preparing to care for or via BGS should not start with questions about what kinds of BGS to implement and where or

how to implement them. Instead, one should begin by taking a step back, deciding how to determine what to consider in this unique context, and then looking into these considerations through the lens of care. Taking decisions through care is not a question relying on expert knowledge regarding facts, e.g., through conventional typologies. The knowledge must also be updated and reproduced based on new matters of concern that emerge. By understanding these concerns, grouping them, and paying attention to them, new typologies can be produced.

In the Augustenborg Eco-city project, taking residents seriously and involving them in the process was without question considered and applied as an important driving force. In most cases, a participatory approach is a valuable method in various fields of practice, and it enables individuals and groups to be involved in decision-making and development processes. The approach is highly respected for its ability to improve the relevance and effectiveness of a project. However, the study shows that resident involvement has not been fully achieved in Augustenborg, as many of the residents' concerns and expectations appear to have been neglected, and many more of course developed much later, when the BGS had already been implemented. An important part of participatory processes is to start by finding answers to questions, such as: how should people be engaged? how should their thoughts be evaluated and implemented? It is very important to consider the residents as users as well as actors who play a vital part in the production as well as the reproduction of the area. As this study has demonstrated, the implementation of BGS entails numerous adjustments and reproductions, for example in terms of maintenance, spatial configuration, and inhabitants' culture.

To increase the capacity of responsivity of urban areas, all fields involved in making cities suitable for human life should focus on incorporating climate adaptation strategies, designs, and products into everyday life while remaining adaptable to changing needs and preferences over time. In parallel, the collective and reproductive nature of urbanity calls for a focus on the care perspective. "Urban" and "Care" are both inherently collective terms. Understanding urbanity through care can greatly benefit all the disciplines involved in city production, including urban water- and landscape management. The concept of urbanity involves a continuous process of

reproduction. While modern urban planning and design greatly emphasizes the production of new technologies, buildings, and artifacts, we can, through the concept of care, find ways of making planning and design more responsive to urbanity and to the different manifold processes of reproduction that comprise urban environments. In short, utilizing the concept of care can help us understand urbanity better. This understanding enables us to challenge and review conventional strategies, visions, and designs (such as common typologies), and open opportunities for flexibility, contextualization, innovation, and creativity. This aligns with the principle of learning from past experiences and incorporating these learnings into urban planning and management. In a world where recognition can be unequal, learning involves understanding how groups have emerged from individuals and gradually gained recognition from decision-makers throughout the planning process. It is not – and never has been – easy to achieve a just city, but one way has been to acknowledge and to some degree respect minority groups, which are often quite large groups; e.g., women, LGBTQ, disabled, migrants, etc. However, we also need to consider leaving room for the existence of new groups or not-yet groups, and these can sometimes be identified through joint matters of concern. According to my study, it could include groups such as animal friends, homeless people, fish lovers, animal catchers, smugglers, green enthusiasts, alcoholics, dog walkers, insects, seagulls, or rabbits: groups that must be acknowledged regardless of categorizations such as good and bad, respectful or disrespectful, absorbing or repelling, vermin or pets, etc. This perspective allows for a more nuanced and contextualized approach to the implementation of urban artifacts such as landscape technologies. In Sweden, there is both potential and willingness to care about and show concern for everyone's well-being when developing urban infrastructure. This can be seen as a positive step that has already been taken. There is still a long way to go, however. A fair and just city is not a finished product, but a process. Giving space to all members of the community (including the human- and nonhuman end users of BGS), regardless of their role, is one important aspect of this process.

Care with Urban Design – Urban Design with Care

Identifying urban inhabitants' expectations and concerns is crucial for developing a holistic approach to addressing complex issues such as climate change in an urban context. This research elaborates on the social implications of new technologies in urban areas from a relational perspective, recognizing the complex systems of interactions and processes as the drivers in shaping the meanings that surround a given urban environment. The study examines the constantly changing landscape of care, discovering some aspects of concern, influencing the use of a given environment, that are more emphasized and stable than others, which shows how specific patterns of care emerge over time.

The thesis argues that the "matters of care" lens can be very practical in architecture and urban design (so far, a mainly human-centric discipline), not only in increasing the use and effectiveness of the final products but also in promoting the sustainability of the built environment by acknowledging the need for the design to be responsive to many uncertainties and needs. Increasing the responsivity of design requires a slight shift in the focus of urban planning and design towards the acceptance and applicability of strategies, designs, and products (e.g., for climate adaptation) in everyday life, as well as leaving space to follow up and respond to the changing mundane socio-material needs and preferences over time.

Among all the disciplines involved in shaping the urban environment and its embraced life, urban design is the only one that focuses on the physical form and function of cities, specifically on the human scale. Urban design is a collaborative discipline that involves shaping cities through contributions from architectural design and planning sectors, as well as numerous other disciplines. At the same time, urban design has collaborative objectives that aim to meet the everyday needs of its target groups. What kind of groups are these, and how have they been shaped? The response should never be taken for granted, considering that the intertwined links between humans and nonhumans in an environment are what form the construction of groups. In any making procedure, it is crucial to consider the groups and their evolving entities and needs. If we fail to acknowledge the existence of different groups – and consequently, the existence of a

collective life form – we will never be able to incorporate them into our design.

The discipline of urban design is and has always been about creating and managing urban areas to be functional, aesthetically appealing, socially and environmentally supportive, and just. This often requires identifying the involved actors in the context and considering the needs and well-being of different groups of people and addressing them in design. In this research, applying the perspective of matters of care first helps us to ensure that we do not increase possibilities for some human actors at the cost of other human actors in the environment. For example, retrofitting an environment to cope with flooding should not merely focus on the satisfaction of adults (e.g., lowering the cost of damages); it should also focus on not reducing certain possibilities for other groups; e.g., the elderly people who walk there or children who play in the area. In addition, the perspective highlights another ethical aspect of design in relation to nonhuman faunal-floral actors that are also involved in the environment.

This thesis emphasizes the potential of urban design to be used as an effective tool for incorporating BGS into the urban landscape. The study does not focus on the structural aspects of urban design but rather on the realization that we can integrate care into the planning and implementation of BGS via urban design. "Care with Urban Design – Urban Design with Care" emphasizes the importance of an ongoing, never-ending dialogue. This thesis demonstrates that a process-oriented approach is essential for obtaining multiple benefits from BGS (and probably many other landscape technologies). Caring BGS have a great deal to do with the urban design of an area. Here, constant reproduction of urban design is necessary if we want to achieve a caring environment. The reproduction process per se adds knowledge to the urban design discipline whilst at the same time resulting in living, hopefully more supportive urban environments – which is urban design's main objective.

Care with Urban Design – Urban Design with Care supports the integration of natural systems into urban design and planning processes by focusing on the relationships between everyday life and (climate-resilient) urban environments. In this thesis, the relationship between care and urban design is seen as context-specific, stressing that socio-material concerns can be used to improve the performance

of landscape technologies towards an increasing responsivity of open urban space. The view also supports human-nonhuman co-existence and acknowledges human-nonhuman relationships (e.g., Haraway, 2016; Holmberg, 2015). It promotes social dimensions of urban environments, prioritizing public spaces, designing with the human scale and for the community, and it also elaborates on the ecological aspects of the area and supports the urban design discourses that are rooted in acknowledging nature and connecting ecology with urbanism. The entanglement of social and ecological aspects of urban design helps define the material and ethical implications of a technological implementation in the urban landscape. First, it ensures that their (e.g. climate-adaptive) technical performance should not negatively impact everyday life possibilities. Second, design should consider more forms of life than only humans, and third, design should not increase inequalities or harm others (human or nonhuman) by favoring one specific form of life. The design mission is not fulfilled with a fixed design alone; it should be closely connected to the ongoing generation of concerns in everyday life. Care with Urban Design – Urban Design with Care brings matters of care to the core of introducing sustainable and climate-resilient technologies in urban areas, specifically when implemented in existing settings. As matters of care and concern form over time, certain expectations regarding the environment follow, which requires that the environment be continuously re-read, revised, and sometimes re-considered. The results indicate that some issues are stable matters of concern; they should not be understood only in their traditional and conventional form. For example, the maintenance of BGS should already be included and addressed in the design phase. This could be achieved by e.g., committing the designer to the maintenance of the environment or allocating a specific budget to approach it as a vital and integrated part of the design challenge.

This thesis confirms that "It matters what matters we use to think other matters with" (Haraway, 2016: 12) and argues that while implementation of BGS in Augustenborg has enhanced certain qualities of urban life, closer integration with urban design and better translation into other aspects of the built environment would have produced better results. The thesis argues that urban design has an important role in the development of blue-green infrastructure,

emphasizing the need for careful planning, additional responsibility regarding the design consequences, and integration between multiple aspects of the built environment to elaborate on the sustainability and liveability of urban environments. Overall, the findings highlight the importance of considering the evolving landscape of care and integrating the consequences of the design process, such as maintenance, into the design process itself, to ensure the long-term sustainability of urban environments. The study reveals that temporal aspects are important to urban design and elaborates on how to think through urban design from a more temporal perspective. The thesis also emphasizes that implementing BGS (or any added technology) in existing urban areas should be seen as a new becoming, the birth of a new kind of environment. However, the perspective introduces a critical challenge, namely, finding the balance between designing the technical artifacts as overly fixed or excessively fluid. An overly fixed design focuses on what we know and protects what we have, leaving less room for new ideas and approaches. An excessively fluid design focuses on uncertainties and what we do not yet have and might thus result in the design being too unpredictable and not efficient enough. This study confirms that urban design must be anchored in research, driven by and connected to it. It is essential to avoid making design decisions in isolation and simply predicting outcomes in a disconnected manner. Designing without having conducted a thorough analysis can result in unintended and undesirable consequences. More is required here than reliance on intuition and existing knowledge. Design teams must conduct empirical research outside the studio to gain first-hand insight and ensure a more accurate and effective design process. Moreover, enhancing the social and environmental effectiveness of BGS via the reproduction of urban design calls for a holistic approach that considers both aspects in conjunction and as equally important. Thus, it is crucial to comprehensively examine and assess the multifaceted aspects of this interdependence in future research endeavors.

Popular Science Summary

Humans do not want to give up living on Earth, and the last few decades have seen constant work on various options to extend the habitability of our planet. These continuous efforts are concentrated on finding solutions to issues that are often interconnected, such as environmental pollution, increased carbon dioxide emissions, loss of greenery and biodiversity, lack of resources (e.g., raw materials and water), limited energy supply, etc. Climate change is also a challenge we hear about daily. There are frequent headlines reminding us that climate change demands our immediate action; the climate is changing at an alarming rate; our future depends on how we address climate change; we need to increase awareness about climate change, and adaptation to climate change is key for human survival, and more. One way of adapting to and mitigating climate change is by initiating and developing various sustainable technologies. These technologies aim to achieve different goals, such as renewable energy, water waste reduction, energy efficiency, public transportation, resourceful and organic agriculture. Some of these technologies require a significant amount of open and outdoor space, making it a real challenge to embed them in cities, mainly because of compact constructions and population densities leaving little free space, and also because they must interact with people and urban life.

Urban areas are more vulnerable to the consequences of climate change and the increasing frequency and extent of extreme weather events such as flooding, droughts, and hurricanes. A flood resulting from heavy rainfall in a dense city can have a significant effect on many lives and properties. Underground pipe systems often lack the capacity to handle heavy loads of water, and thus various open landscape- and sustainable techniques have been developed as complementary solutions. These solutions utilize the ground surface (usually green) to lead, store, and clean the rainwater with minimal environmental impact. Different terms are given to these techniques.

One of them is blue-green solutions (BGS), assigned to reduce the effects of flooding in urban areas. However, manipulating urban space influences the various ways in which the place is used. When planning and designing BGS, it is important to consider protecting the area from flooding as well as improving the quality of people's lives and addressing their daily needs.

This project investigates if and how existing BGS have been integrated into the daily lives of residents in Malmö's Augustenborg district. The study seeks to elaborate on who, what, why, when, and how to care for in the design and implementation processes of BGS in urban neighborhoods. The study seeks to answer three questions: What aspects seem to matter in an environment with BGS, and how do they influence our day-to-day routines related to the use of outdoor space? Which research methods can better improve our understanding of the co-benefits associated with BGS, and how? How can we ensure that users' expectations and concerns are considered in the BGS design process?

The results show that although BGS has great potential to enhance the quality of human experiences in the Augustenborg outdoor environment, there is a noticeable difference between the potential benefits and the actual impact BGS has on the inhabitants' everyday life. The effect of BGS on urban life is influenced by various factors beyond their technical design. These factors include their locations, the surrounding design and land use, the existing urban furniture around them, other meanings and qualities of the environment, and the inhabitants' culture and habits. The findings also indicate that due to the presence of water, BGS turns the environment into an extra-temporal place with different characteristics. For instance, the same urban space with BGS can become a completely different place during the rain, after a flood, on a hot summer day, or in freezing temperatures. One important finding of this study is that the presence of BGS increases the relationship between humans and other creatures to a great extent by creating a special kind of habitat for urban animals and plants, which may often collide with the interests of some groups of people. This aspect requires extra design considerations to form and maintain the environment as a common place for all human and nonhuman creatures, and it is essential for all forms of life to be valued and considered.

The study shows that each research method can only reveal specific aspects of the design- and use of BGS. Employing mixed methods has clearly benefited this research. Although using a questionnaire answered by the inhabitants of Augustenborg gave us a general and fair statistical understanding of perceptions related to the BGS, it was impossible to gain a rich and deeper knowledge of the human use, concerns, and expectations without additional applied methods such as interviews, observations, and sketches. The research moreover underscores the significance of continuous evaluation of the built environment and the utilization of innovative methods to gain a better understanding of the influence of BGS on urban life.

Finally, the thesis introduces 'Care with Urban Design – Urban Design with Care' as a critical design approach, allowing future follow-up and responding to the needs and preferences of the users over time. Care with Urban Design – Urban Design with Care provides opportunities to seamlessly integrate BGS into the urban landscape through a continuous dialogue and a process-oriented approach. The approach focuses on incorporating natural systems into urban design and planning, enhancing the performance of landscape technologies, and making the environment responsive to the ecological and social aspects of urban space, which are interlinked. In addition, it highlights the need for assessment and improvement of conventional classifications and typologies of whatever forms urban areas by caring for the changing needs and perceptions of society about the environments in decision-making procedures.

Abstract in Swedish

Omsorg, Vardagsliv och Blågrön infrastruktur: En socio-materiell studie av en landskapsomformande teknologi

I takt med att befolkningen växer och städerna blir mer tätbefolkade, blir det också nödvändigt med hållbara tekniker för att hantera frågor såsom klimatförändringar. Att integrera dessa tekniker i staden är ibland utmanande, exempelvis kan det vara svårt att hitta plats för att lagra översvämningsvatten efter kraftiga regnfall, och därmed förebygga skador som påverkar människor och fastigheter. För att mildra översvämningarnas inverkan har olika landskapslösningar utvecklats. Dessa har fått olika namn, som t.ex. blå-gröna lösningar (BGL). BGL utnyttjar öppna ytor, gör oss mindre beroende av avlopp och försöker på så sätt minimera de miljömässiga skador som kan uppstå vid en översvämning. Eftersom att öppna ytor spelar en viktig roll i befolkningens vardag, kan deras funktionalitet dock inte enbart begränsas till att ta hand om vatten. Det vill säga, en förbättring av översvämningskapaciteten måste också adressera invånarnas vardagliga behov.

Forskningen som presenteras i den här avhandlingen, undersöker hur BGL påverkar vardagslivet i Augustenborg (Malmö, Sverige), en stadsdel där BGL introducerades redan för tjugo år sedan. Studien använder sig av ett relationellt perspektiv där vardagsliv ses som något som formas kontextuellt och som får sin mening i relation till den socio-materiella miljö där det äger rum. Avhandlingen använder både kvalitativa och kvantitativa metoder för att söka svar på frågor som: Vilka aspekter är viktiga att överväga i en miljö med BGL, hur är dessa aspekter rumsligt situerade, och hur relaterar de till ett pågående vardagsliv? Hur kan de olika sidoeffekter som BGL bidrar till (vid sidan av sin rent tekniska funktion) studeras och förstås över tid? Hur kan vardagliga aktiviteter, förväntningar och intressen tas bättre till vara vid gestaltandet och implementeringen av BGL? Avhandlingen ser begreppet resiliens som otillräcklig i detta sammanhang, eftersom

situationen aldrig är densamma före och efter en översvämning. I stället används begreppet responsivitet för att betona att dessa miljöer behöver vara mottagliga för och svara mot en rad olika vardagliga behov, även under översvämningar.I studien betraktas BGL som en integrerad del av stadsmiljön och, inspirerad av *affordance*-teori och aktörnätverksteori, undersöker den relationen mellan människa och BGL med hjälp av begreppen *matters of concern* (intressefrågor) och *matters of care* (omsorgsfrågor). Samspelet mellan samhällsfrågor och blågrön infrastruktur ses framför allt från ett stadsgestaltnings- eller urban design-perspektiv, men studien kan också ses som ett bidrag till fältet *science and technology studies* (STS).

Studien visar på ett samband mellan *affordances* (erbjudanen eller möjligheter) i stadsmiljön och de olika frågor som väcks av att leva med BGL över tid. Nya och komplexa relationer skapas mellan vardagligt liv och den socio-materiella miljön över tid. Studien använder sig av en rad olika metoder för att försöka fånga denna komplexitet och visar på hur det performativa och det möjliga i en viss i miljö inte alltid samspelar. En miljös performativitet och de möjligheter den bär på interagerar dock på olika sätt, och relaterar även till BGL användning. BGL påverkar både ett områdes rumslighet och temporalitet, och det bidrar också till ett slags ständig tillblivelse där relationer mellan människor, djur, växter etc. hela tiden omförhandlas och förändras. En miljös olika erbjudande (*affordances*) verkar här påverka invånarnas förväntningar och vad de anser vara angeläget i sin vardag, samtidigt som detta i sin tur påverkar vilka erbjudanden och betydelser som miljön verkar ha. Över tid och i relation med den socio-materiella miljön formas och omformas på detta sätt ett slags omsorgslandskap för de boende.

Genom att se området i termer av ett omsorgslandskap kan vi få syn på aspekter som ofta glöms bort i utvecklingen av blågröna infrastrukturer. Avhandlingen bekräftar att BGL kan facilitera samlevnad mellan människor, växter och djur, men det krävs då ett större engagemang och att fler aktörer visas hänsyn under designprocessen. Avhandlingen betonar också vikten av att utvärdera och förfina de konventionella designmetoder som finns för miljöer med BGL, och att en kontinuerlig utvärdering och anpassning av miljön behövs för att säkerställa en användbarhet över tid. Avhandlingen förslår *Omsorg med hjälp av urban design – Urban design med*

hjälp av omsorg som ett kritiskt tillvägagångssätt för att integrera BGL i det urbana landskapet, och som ett sätt att bättre inkorporera olika system och landskapsteknologier i en miljö som är responsiv både vad gäller ekologiska och sociala aspekter.

ساکنین ایفای نقش می کنند؟ از کدام طریق می توان تاثیرات چنین فضاهایی را به عنوان مصنوعاتی با ویژگی های فنی خاص، و ماهیت متغیرشان در وابستگی آنها به پارامترهای زمانی، بر ابعاد دیگر زندگی روزمره بررسی کرد؟ چطور می توان پاسخگویی به انتظارات و دغدغه های روزمره ساکنین مناطق شهری را در بهینه سازی فرایند برنامه ریزی و طراحی این فضاها لحاظ کرد؟ این مطالعه در ابتدا بر عدم کارایی طراحی تاثیرپذیر از دیدگاه تاب آوری فضا (resilience) تاکید کرده، چرا که این مفهوم بر لزوم حفظ وضعیت محیط اصرار می ورزد. در حالی که شرایط فضای شهری در پیش و پس از وقوع سیلاب و یا هر رویداد آب و هوایی غیرعادی دیگری هرگز نمی توانند یکسان باشند. در عوض عنوان می کند ارتقا کیفیت فضاهای باز شهری و ابعاد تجربی و اجتماعی آنها از طریق بکارگیری راه کارهای آبی-سبز تنها در صورتی امکان پذیر است که طراحی فیزیکی آنها متناسب با بستر اجتماعی-فضایی محیط و بر پایه پاسخگویی به هرگونه موقعیت مادی، از جمله ونه تنها سیل، صورت پذیرد. لذا این تحقیق از مطالعه تمهیدات آبی-سبز به عنوان مصنوعات مستقل در منظر شهری اجتناب کرده و به کمک نظریه شبکه کنشگر (actor-network theory) و به ویژه با استفاده از نظریه استطاعت (affordance) تلاش می کند روابط بین انسان و این مصنوعات طبیعت محور را از دریچه مراقبتی (matters of concern and care) برونولاتور و ماریا پیگ دلابلاکاسا توضیح دهد. این پژوهش تعامل میان انسان و فضا را از دیدگاه طراحی شهری مورد بررسی قرار داده و به عنوان یک مطالعه زمانی-فضایی، در جهت پیاده سازی مفهوم مراقبت در زندگی روزمره شهری، تلاش می کند بر مطالعات علم و فن آوری (STS) با تاکید بر رابطه در هم تنیده تکنولوژی با جامعه بیفزاید. این مطالعه نشان دهنده وجود ارتباط نزدیکی میان امکاناتی (affordances) که تمهیدات آبی-سبز برای استفاده کاربر فضا به ارمغان می آورد و تولید دغدغه ها و انتظارات پیرامون فضا در کاربر می باشد. این ارتباط نیازمند پاسخگویی و مراقبت در سطوح مختلف است چرا که بر وجوه مختلف جامعه مادیت محیط تاثیر می گذارد. از سوی دیگر تفاوت میان مفهوم پتانسیل (possibility) و عملکرد (performance) یک فضا را گوشزد کرده و تاکید می کند این دو اگرچه در ارتباط تنگاتنگ بوده اما لزوما به هم تبدیل نمی شوند. این تحقیق همچنین تایید می کند که تعبیه تمهیدات آبی-سبز در محیط می تواند منجر به شکل گیری رابطه عمیق تری بین انسان با گونه های حیوانی و گیاهی و پذیرش فضای شهری به عنوان زیستگاه مشترک و دربرگیرنده زندگی با مفهوم واحد گردد. این بررسی همچنین بیان می کند که بکارگیری مفهوم مراقبت می تواند به شناخت ماهیت های نادیده گرفته شده در روند طراحی و اجرای این مصنوعات در جهت بهینه سازی زیر ساخت شهری آبی-سبز کمک کند. این امر نقش مهمی را در ارتقا توامان جنبه های اکولوژیکی و اجتماعی فضاهای شهری دارد.

چکیده‌ی رساله

جمعیت شهرنشین جهان و به دنبال آن تراکم ساخت فضاهای شهری به سرعت رو به افزایش است. این امر گاها پاسخگویی شهرها به برخی از نیازهای شهروندان را با مشکل جدی مواجه می کند. نیازهایی که برآورده شدن پاره ای از آنها مستلزم مقابله با پیامدهای ناشی از افزایش گازهای گلخانه ای و تغییرات اقلیمی می باشد، از قبیل نیاز به دسترسی به آب، انرژی و هوای پاک. یکی از راه کارهای مؤثر استفاده از تمهیدات و فن آوری های پایدار است که در انواع و اشکال گوناگون طراحی و اجرا می شوند. از این میان می توان به لزوم توسعه زیرساخت های پایدار آبی-سبز اشاره کرد که یکی از رهیافت های مواجهه با حجم بالای رواناب شهری تولید شده بر اثر باران های سیل آسا می باشد و در کاهش هزینه های جانی و مالی شهروندان موثر واقع می شود. عملکرد این زیر ساخت بر اساس اختصاص دادن فضاهای باز شهری به مازاد آب باران و هدایت، ذخیره و در صورت امکان بازیافت آن بوده و شامل فضاهایی همچون جوی های آب، تالاب ها، باغ ها و باغچه های باران و فضاهای باز چند منظوره نظیر پارک ها، پارکینگ ها و زمین های بازی-ورزشی باز با سطوح نفوذ پذیر می باشد. در حالی است که فضاهای باز شهری در کیفیت زندگی روزمره شهروندان نقش به سزایی ایفا می کنند. نه تنها به هیچ عنوان نباید در عملکرد اجتماعی آنها، بر اثر پیوستن به ساختار مدیریت آب شهری، خللی ایجاد شود، بلکه بخصوص با توجه به کمبود شدید فضاهای عمومی شهرها لازم است که طراحی و اجرای تمهیدات آبی-سبز (blue-green solutions) در راستای افزایش امکانات رفاهی و اجتماعی محیط شهری انجام گیرد. این رساله به بررسی فضاهای آبی-سبز در محله مسکونی آگوستنبوری واقع در شهر مالمو در سوئد و چگونگی مواجهه و پاسخگویی آنها در موقعیت های متفاوت زندگی روزمره ساکنین می پردازد. این تحقیق با اتخاذ یک دیدگاه رابطه ای به زندگی روزمره به عنوان چیزی که با در هم تنیده گی در زمینه و جامعه مادگی (sociomateriality) محیط فرم می یابد می نگرد و توسط شیوه های ترکیبی کمی و کیفی به این سه پرسش پاسخ می دهد. کدام ویژگی فضاهای آبی-سبز در تجربه ساکنین اهمیت داشته و این ویژگی ها چگونه در شکل دادن به زندگی روزمزه

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Paper V
Mottaghi, M.& Kärrholm, M. (Submitted). Blue-green solutions and territorial negotiations related to rhythms: The case of Augustenborg, Malmö. (Manuscript Submitted)

Author's contribution to the papers

Paper I
I was the main author of this paper. I was responsible for all parts of this paper. Henrik Aspegren and Karin Jönsson had the role of supervising this work and gave comments on the text.

Paper II
I was the main author of this paper. I was responsible for all parts of this paper. Catharina Sternudd contributed to data collection for this work. Mattias Kärrholm contributed to the theoretical framework and the discussion of the results.

Paper III
I was the main author of this paper. I was responsible for all parts of this paper. Catharina Sternudd initiated the study. Sandra Kopljar contributed to the theoretical framework. Maria Kylin contributed to formulating the work and analyzing the results.

Paper IV
I was the main author of this paper. I was responsible for all parts except statistical analysis. Jonas Nordström was responsible for this part. He was the second author of this paper and was also responsible for the data collection part in relation to willingness to pay. Other co-authors contributed to different parts by giving comments, co-writing, and revising different parts, according to their different specialties.

Paper V
I co-authored this paper with Mattias Kärrholm. I was the main author and responsible for all parts of this paper. Mattias Kärrholm contributed to the theoretical framework and to the discussion.