



UNIVERSITY OF GOTHENBURG
SCHOOL OF GLOBAL STUDIES

CHILDREN'S ACCESS TO NATURE IN THE CITY

A study on preschools in Gothenburg



Photo: Viktoria Janovskis.

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ABSTRACT

There are countless studies showing that nature benefit children's physical and psychological health and many are concerned over the trends indicating that children's health is getting worse. Urban areas do not provide an environment that is safe nor invites for children to play outdoors and nature is mostly pushed aside. Since nature has proven to be an important element for children's development, the study therefore focuses on access to nature on a local scale in an urban setting. The research questions are: To what extent are different elements of nature present on preschool yards in the Northern Centre (NC) of Gothenburg?; How are the preschools in the NC of Gothenburg located in relation to nature areas, as a complement to their own yard?; How do preschool directors in the NC of Gothenburg view children's relationship to nature during the preschool activities? The study focuses on how current scientific knowledge is implemented in contemporary city planning of young children's environment. The results is analysed based on studies on nature's benefits to human well-being and children's development in relation to nature contact. The results showed that the access to nature and nature elements among the preschools are unevenly distributed in the NC of Gothenburg. There are also other external factors limiting children's access to nature in the city. The views of children's relationship with nature among the preschool directors were positive, saying that nature is important for the child's own development but also in a larger urban sustainability perspective.

Key words: **Human-Nature Relationship. Preschool yards. Urban children. Urban sustainability. Nature's benefits to people.**

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1 INTRODUCTION

Western-oriented studies, especially Scandinavian, indicate that children's play in nature environments have positive impact on their health, their physical movements, their balance and motoric skills, as well as on their ability to concentrate (Fjørtoft 2001, 111; Fjørtoft and Sageie 2000). Further, access to nature environments inspires creative-, imaginative- and social play (Fjørtoft 2001, 111; Fjørtoft and Sageie 2000). Nature has a positive effect on non-gendered games since it does not consist of any indicative playground equipment (Änggård 2011). Nature is unstructured and diverse and it inspires children to use their imaginary abilities and eagers them to discover more (Fjørtoft 2001, 111; Fjørtoft and Sageie 2000; Kim 2011). Contact with nature in early age opens up for a deeper interest and respect for nature as they grow up (Fuller and Irvine 2010, 135; Berg 2015). Fostering environmentally conscious citizens through nature experiences is important in order to decrease nature deficit, particularly in urban areas (Prévo, Clayton and Mathevet 2018, 274).

Despite that, studies indicate that children move less and spend most of their daily time indoors which leads to obesity and bad health (Fjørtoft 2001, 111; Kim 2011, 292). The increased use of electronic devices has further changed the pattern of how children play and interact with each other which to some extent limits children's creative abilities (Kim 2011, 292; Kvarnlöf 2018). The reasons for these negative trends are likely many, but one may be that over half of the world's population lives in cities. People's geographical distance to nature has thereby increased because urbanization and densification of cities push vegetation aside. Another reason can be increased sense of insecurity and risks. Parents may fear to let their child play outdoors in their neighbourhood due to heavy traffic, or simply do not trust the area (Fuller and Irvine 2010, 135). Moreover, children are more frequently car-driven to places instead of walked or brought by bike (SKL 2013).

In Boverket's guidelines for the construction of schoolyards for preschool children, it is stated that each child should have at least 30 square metres (Jensfelt 2017) but the content of these square metres is not prescribed in those guidelines. Children are more vulnerable than adults to bad air quality in cities. Vegetation such as trees and forest/groves can therefore help to offset for the bad air quality, as well as to upholding other ecosystem functions in cities (Gaston, Davies and Edmondson 2010, 40-45). For example, if those 30 square metres were inspired by nature, having some kind of natural cover, trees, water, and bushes, it could be a way to reconnect the urban child with nature. The preschool can thereby play a significant role in providing every child with their right to access and to interact in a greener space (Jönsson 2010). As suggested by

Specht et al. (2014, 44), installing cultivation boxes for edible plants be a concrete way for children to gain insight in ecological life cycles as well as knowledge of where the food comes from.

This is the background to the present study which will have a focus on children's access to nature in preschools in the city centre of Gothenburg.

1.1 Aim

The aim of this thesis is to find out to what extent green preschool yards are installed in the Northern Centre (NC) of Gothenburg today and additionally how the preschools are located in relation to nature areas as a complement to their own yard. The preschool directors' views on the importance of children's relationship with nature during preschool activities will be explored to enlighten the current situation. The purpose is to contribute to the discussion on how present scientific knowledge is implemented in contemporary city planning of young children's environment and to shed light on the present situation in a typical urban setting.

1.2 Research questions

In order to fulfil the aim, the following research questions will be addressed in the study:

1. To what extent are different elements of nature present on preschool yards in the NC of Gothenburg?
2. How are the preschools in the NC of Gothenburg located in relation to nature areas, as a complement to their own yard?
3. How do preschool directors in the NC of Gothenburg view children's relationship to nature during the preschool activities?

1.3 Delimitations

The reason why the study focuses only on preschools is as follows:

- Nature contact in early age predicts active environmental engagement and a higher understanding of the value of nature;
- Young children are more sensitive to externalities in urban environments, such as bad air quality and heat waves;
- Cities are not built for children and neither do children choose where they grow up (Naturvårdsverket 2017, 9-10) the current preschool situation is therefore interesting to analyse.
- Preschools are a place where children spend most of their daily life, the features of the preschool, therefore, is an important provider of inspiration features and knowledge.

1.4 Area of study

The NC of Gothenburg has characteristics of a big city-environment which allows the study to be applicable to other urban environments. The NC of Gothenburg is for example more exposed to heavy traffic than the Southern Centre, SC (Centrum 2018, 14), which is the reason the focus is only on the NC of Gothenburg. The NC includes the city areas; Lorensberg, Vasastaden; Inom Vallgraven, Stampen, and Heden illustrated in Figure 1, below.

There are 16 preschools listed at Gothenburg city's web page within the NC, these are the following: Lilla Samskolan; Molinsgatan 23; Vasa Kyrkogata 7; Folke Bernadottes Gata 4; Lasarettgatan 7A; Nedre Kvarnbergsgatan 17; Färgaregatan 7; Friggagatan 3b; Baldersplatsen 2; Levgrensvägen 3; Skånegatan 18; Hallandsgatan 7; Valhallagatan 4; Engelbrektsgratan 34 E; Lennart Torstenssonsgatan 11; and Montessoriförskolan Centrum. There are 14 municipal preschools and two private preschools.

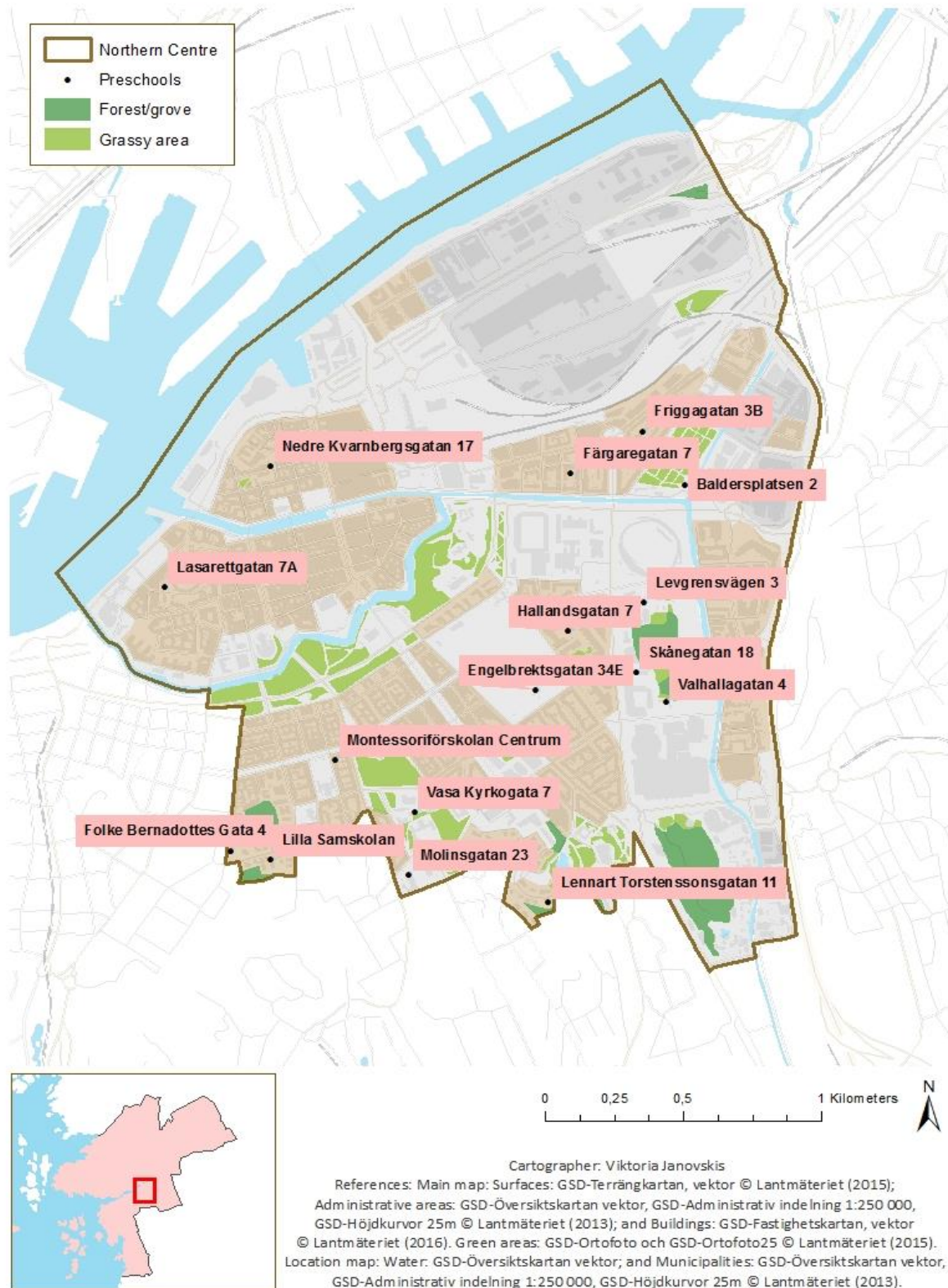


Figure 1: Map illustrating the preschools in the Northern Centre of Gothenburg.

All Preschools in the NC of Gothenburg are presented with their respective names. The figure further illustrates grassy areas and forest/grove in light and dark green respectively, buildings in brown, industrial areas in gray and river in blue. The map in the bottom left illustrates Gothenburg municipality in pink and the area NC is framed in red.

1.5 Relevance to Global Studies

The focus is based on a local scale, on Gothenburg's urban core; however, the themes and subjects are applicable and can be analysed in a westernized global context. Urbanisation is experienced in most countries today and the health-related issues that occur in urban settings are global issues. Both human health-related issues, but also biodiversity loss, change in ecosystem functions and anthropogenic induced climate change, are all related to urban environments. Urban sustainability is, therefore, an interdisciplinary area concerning all scales, local, national, international and global. This study focuses on a local scale within the field of urban sustainability.

1.6 Reading instructions

The second chapter called 'The urban child' will present previous research. Chapter 3, 'Preschools in Sweden', gives a background on the present laws, regulations, goals, and guidelines concerning preschool yards and environmental education. Chapters 4, 5 and 6 present the 'Theoretical Framework', 'Methodology' and 'Results'. The theoretical framework is based on studies on nature's benefits to human well-being (Russell et al. 2013; Fuller and Irvine 2010, 136) and children's development in relation to nature contact (Fjørtoft and Sageie 2000; Kim 2011; Lloyd and Gray 2014; Fischer 2013; Berg 2015; Chawla 2007; Malone 2012; and Fuller and Irvine 2010). The methods chosen are threefold, firstly an empirical data collection looking at the natural elements on preschool yards, secondly a Geographical Information System (GIS)-analysis focusing on the preschools location in relation to nature areas, and finally semi-structured interviews and a complementary questionnaire with preschool directors for an understanding of their view on children's relationship with nature. The 'Analysis' and 'Discussion' of the results will be presented in chapter 7 and 8. 'Conclusion' and 'Future research' is presented in chapter 9 and 10, respectively, followed by 'References'. Additional information, such as images of the different natural elements and the preschool yards is found in the 'Appendices' at the end of the thesis.

2 THE URBAN CHILD

This chapter presents children's preconditions in modern urban areas. Cities today are not built for children but instead planned for vehicles and adults. The urban condition leads to children and teenagers being inclined towards indoor activities instead of interacting with each other's and with nature. The lower amount of real-life interactions with others may hinder children's development (Kvarnlöf 2018; Kim 2011; Fjørtoft 2001). Parents may fear to let their children

play outdoors since they do not trust their neighbourhood (Fuller and Irvine 2010, 135). This tendency has also been acknowledged in a study made by Swedish municipalities and counties (SKL 2013). They studied the reason for why parents drive their children to school. The results were fivefold: the location of preschools and schools made it easier to reach by car; time efficiency is more important than money and the environment; driving the child can be seen as an indication of engaged parents; parents tend to overprotect their children; and finally, driving a car is a habit (SKL 2013, 29-30). The only time younger children living in urban areas are allowed to run freely is in preschool (Naturvårdsverket 2017, 10). Naturvårdsverket (2017, 9) therefore states that it is “alarming” that it is not prescribed in regulations that preschools must have a yard of their own.

Being outdoors, in general, has a positive effect on children’s well-being, but it also comes with risks since children are more sensitive than adults when being exposed to bad air qualities. The explanation lies in that children have less developed immune systems than adults and they tend to move more, thereby inhale a larger amount of air. Children are therefore estimated to get 10-20 percent more contaminant particles in their lungs than adults (Naturvårdsverket 2017, 9).

Children that grow up in an environment with bad air qualities, therefore, reap a higher risk of respiratory infections, asthma and lung function impairment (Naturvårdsverket 2017, 6). Many schools and preschools in urban areas are located in the city centre, or nearby roads with heavy traffic (Naturvårdsverket 2017, 9). Consequently, many children spend most of their daily time in locations being exposed to this bad air quality. Naturvårdsverket (2017, 48) therefore provides suggestions on ways to raise children's awareness of how different actions affect the environment and people without adding anxiety to the child. Naturvårdsverket (2017, 48) argues that preschools have the possibility to provide every child their right to learn about nature and to gain environmental knowledge and competence, which is also acknowledged by Jönsson (2010) and Specht et al. (2014, 44).

Additionally, young children are more sensitive to warmer temperatures, UV exposure, and noise (Naturvårdsverket 2017, 6). Climate change means increased risk for warmer summers, infections and longer pollen seasons, among others. In the same report (Naturvårdsverket 2017) it states that warmer climates affect children more severe than adults since children’s ability to regulate temperature and water intake is not as developed. This is especially a risk for children with chronic diseases. The report explains that children reap a higher risk of getting heatstroke since their bodies are not as developed and do not regulate heat as well as adults. Children tend to move less in a warmer climate which may affect their abilities to concentrate and therefore lowers their opportunities to learn. These impacts are especially critical for urban children since the

temperature in cities increase even more due to ‘heat island effect’¹ (Naturvårdsverket 2017, 42-43). Additionally, a report made by Boldemann et al. (2005, 8) explains that being sunburned in young age increases the risk of getting skin cancer as an adult. The reason is that the skin is less thick on younger children. In a study on the preschools in Gothenburg on sun- and noise exposure and air qualities (Hulth, Molnár, Ögren and Holm 2016, 40-41), the results showed that at the Northern Centre most preschools reached the goals concerning sun exposure, less than half reached the goals on exposure for high noise, and only one preschool reached the goals needed to have good air quality (see [Appendix 4](#) for a table with the results from the study on the preschools in the NC of Gothenburg).

Trees and especially groves and forests can function as supporting elements and thereon lower children’s health-related problems in urban environments. If trees are planted in a good location it can help to improve the air quality through the uptake of gaseous, aerosol and particulate pollutants (Gaston et al. 2010, 45). Vegetation generates a cooling effect due to the leaves and by providing shade. Shade is especially important for children since they are more sensitive to UV-exposure (Naturvårdsverket 2017, 5). Boldemann et al. (2005, 8) found that children on preschool yards with much vegetation (trees and bushes) moved more and had lower UV-exposure, despite spending more time outdoors compared to a preschool yard with low vegetation. Structured environments should thereby not be seen as a substitute for a more diverse nature environment, such as a forest since children do not gain the same benefits from an organized park or playground (Molander and Agvald Jägborn 2015, 4). According to Fjærtøft (2001, 112), children prefer a more unstructured and wild environment over an organized playground.

Additionally, trees can store water due to its root-system which means that distribution of natural grounds and trees can minimise the magnitude of flooding (Gaston et al. 2010, 41). Therefore, the introduction of vegetation can to some extent counteract bad effects from heavy traffic, impervious surfaces and climate-related effects² (Gaston et al. 2010, 45). Saving nature areas in urban environments may also help to counteract nature alienation caused by urbanization and thereby have a substantial positive effect on the individual level, on a societal level, and on biodiversity (Fuller and Irvine 2010, 136).

¹ ‘Heat island effect’ means that an urban area get considerable higher temperature than the surrounding landscape due to emissions from vehicles and impervious surfaces, among others (Gaston et al. 2010, 36-37).

² Important to note, is that cities are estimated to be responsible for 75-90% of the global anthropogenic CO₂ emissions which means that vegetation into urban areas cannot by itself compensate for those emissions (Gaston et al. 2010, 44).

3 PRESCHOOLS IN SWEDEN

This chapter will present the following: national policy documents (3.1) and goals and guidelines concerning preschool education (3.2); national policy documents and guidelines concerning the preschool outdoor environment (3.3 and 3.4); finally, documents related to preschools in Gothenburg (3.5).

3.1 The national evaluation of preschools

The curriculum for preschools was first introduced in 1998, ten years later was the reformation of preschools evaluated for the second time. The main points from these evaluations which are relevant to this study are presented below.

The main objective of the reform was to have a common objective and goal as the primary school's curriculum concerning knowledge, development, and education. It is described as "educare", meaning that teachers should take care of children but they should also prepare the children for future higher education (Skolverket 2008, 10).

The first evaluation of the reform was positive toward the curriculum and its goals and guidelines since it supported preschool teachers in their pedagogical work. However, it had no effect on municipal frames or resource distribution. This critique was mainly toward children group size since preschool teachers experienced it harder to educate in larger groups. The results showed that the group sizes between preschools differed mostly within municipalities, but also between municipalities. The first evaluation furthermore indicated that preschools turned into a goal- and result-oriented education system, where the pressure is put on the preschool and on the individual child's development. This led to municipal pressure to evaluate whether children in their preschool reached these goals, which according to the evaluation was not the intention of the curriculum (Skolverket 2008, 10-11).

The distribution of responsibilities and resources has decentralized since after the implementation of the preschool reform. It is in most cases the preschool director that decides how the resources should be distributed, for example concerning tools and equipment, staff and food, but also in decisions such as group size. Preschool directors decide over approximately 60 % of the resources concerning facilities whilst the rest are kept on a municipal- or management level (Skolverket 2008, 21).

There are different systems concerning resource distribution. Some municipalities, such as Gothenburg, have so-called *barnpeng* which means that resources are provided to each preschool

according to how many full- or halftime children they take in. The preschool directors have therefore the freedom to decide how many or how few children they enlist.

3.2 The curriculum for preschools

The Swedish national agency for education revised the curriculum for preschools (Skolverket 2010) so it now has an extensive amount of goals and guidelines concerning children's environmental education. These are specially raised in the part *Norms and Values* and in *Development and Learning*.

The child should, for example, learn to *"respect for all forms of life, as well as care for their immediate environment"* (Skolverket 2010, 8). The preschool should ensure that each child *"see interconnectedness and discover new ways of understanding the surrounding world"*, they should develop their interest and understanding *"of the different cycles in nature, and how people, nature, and society influence each other"*. They should also ensure that each child develops *"their understanding of natural science and relationship in nature, as well as knowledge of plants, animals, and also simple chemical processes and physical phenomena"*. Apart from exploring natural science, they should also *"develop their ability to distinguish document, put question to and talk about natural science"* (Skolverket 2010, 10).

The preschool teachers are responsible for that children meet up to these goals by providing the children *"opportunities for learning and developing"* and encourage them *"to use the whole range of their abilities"*. They should make sure the children *"experience a sense of enjoyment and meaningfulness in wanting to learn new skills, experiences and knowledge as well as learning what is new, and are stimulated and challenged to develop their interest in natural science and technology"* (Skolverket 2010, 11).

The work team should furthermore challenge children's curiosity and their growing understanding of natural science. They should give them *"the opportunity of understanding how their own actions can have an effect on the environment"* and *"to become familiar with their own immediate environment, and those functions which are important in daily life"* (Skolverket 2010, 11).

3.3 The education act

The education act mentions the environment once and in this sentence, it is more about school environment in general, social as environmental (Regeringskansliet 2010). It is said:

"(...) and furthermore, that the children, in general, are offered a good environment" (SFS 2010:800).

3.4 Complementary guideline to the planning and building act

There are no direct binding regulations concerning whether the preschool yard should include nature elements. There are however some general complementary guidelines to the Planning and

Building Act (2010:900) namely, 'FRI 1 - Boverket's General Advice on Free Play for Games and Recreation at Recreational Centres, Preschools, Elementary Schools and similar operations/facilities' (Boverket 2015, 1) which says:

"(...) the free space can be used for play, recreation and physical and educational activity for the activities for which the free space is intended. The free surface should be so spacious that it without difficulty or risk of extensive wear and tear, can arrange for varied terrain and vegetation conditions. The free surface should be characterized by good sun- and shadow conditions, good air quality and good sound quality" (FRI-1 2010:900).

3.5 Gothenburg city

Green strategy

The Park and nature board (Park och naturnämnden 2014) in Gothenburg says that schools should be located so that green space is accessible within a geographical distance of 300 metres. They argue that nature areas and green space have a significant meaning for children and human health and that being able to walk, bike or reach the nature area by public transportation increases accessibility (Park och naturnämnden 2014, 42). There are different requirements for accessibility based on what type of nature area it is, this is presented in Table 1 below (Park och naturnämnden 2014, 43).

Table 1: Shows the targets and formulations for parks and nature areas in Gothenburg's green strategy (Park och naturnämnden 2014, 43).

Type of area	Access to home without any barriers	Size	Qualities
Parks and nature areas close to residences, smaller green areas which can be used by the residents and occupied in the neighbourhood.	300 m from residences. Without crossing any motorways, rivers or varied terrain.	At least 0,2 ha.	Resting and meeting point; diverse vegetation and animals; green oasis, area, park nature.
Neighbourhood park, park mainly visited by the people living in the area	1 km from residences, 15 min walk. Without crossing any motorways, rivers or varied terrain.	At least 2 ha.	Resting, meeting point, picnic, games, walk, play; varied characteristics between nearby neighbourhood parks; diverse vegetation and animals; green oasis, area, park nature.
City park, multifunctional park attractive for people from all parts of Gothenburg.	30 min with public transportation.	Big enough so that it without difficulties can hold many people without being easily damaged.	Outstanding characteristics; variation between different city parks; Rich diversity of vegetation and animals.
Bigger nature and recreation area, large nature area with several biological and recreation values.	30 min with public transportation.	Big enough so that it without difficulties can hold many people without being easily damaged.	Outstanding characteristics; Rich diversity of vegetation and animals.

Budget 2018 for preschools in Gothenburg

The priorities for the budget 2018 for preschools are organized of smaller groups and more preschool teachers, organic food and sun protection on preschool yards. There is also a suggestion to evaluate the possibilities for preschool excursion buses for pedagogical purposes, economic reasons and to increase environmental impact (Göteborgs stad 2017, 25-26; Centrum 2018, 44). How this is related to environmental impact is not elaborated in the rapport.

The traffic should be designed in a way so that it will not affect children's safety or abilities to move freely. Children should be able to walk between different places, this is especially important for areas surrounding preschools and schools. The traffic situation will be investigated by the Byggnadsnämnen (Building management) during 2018 for the purpose of developing a car-free environment by new schools- and preschools entrances (Göteborgs stad 2017, 41).

Reorganization is taking place during 2018 in Gothenburg city. Today, Gothenburg is divided into 10 administrative areas and these will go together and create 2 bigger administrative areas. According to Gothenburg city, this is an attempt to centralize decisions and therefore enabling a more equal resource distribution (Göteborgs stad 2017, 27).

Children groups in Gothenburg city centre

Private and municipal preschools were provided financial support from the Swedish government 2016/2017 aiming to make the groups in preschools smaller (Skolverket 2017). The financial support was enough to hire 10 new full-time preschool teachers. However, Gothenburg was one among other municipalities that needed to pay back some of the financial support since they could not manage to decrease the size of the groups. According to the chief of education, Hans Wetterby, the area centre received more children than expected and they, therefore, did not have the ability to create smaller groups. Another reason is that facilities, in general, are highly expensive and hard to find in the centre which makes it hard to open up new preschools or expand the existing ones. Educated preschool teachers are also hard to find (Nyström, 2018).

3.6 Concluding points on preschool regulations

The preschool teachers have a large number of goals to meet up to, including providing children knowledge concerning the environment and interconnectedness between people and nature. However, there are not any detailed regulating guidelines concerning the construction of preschool yards and access to nature in the surrounding environment.

4 THEORETICAL FRAMEWORK

The theoretical framework is based on studies on nature's benefits to human well-being (Russell et al. 2013; Fuller and Irvine 2010, 136; Beery 2013; and Díaz et al. 2015) and children's development in relation to nature contact (Fjørtoft and Sageie 2000; Kim 2011; Lloyd and Gray 2014; Fischer 2013; Berg 2015; Chawla 2007; Malone 2012; and Fuller and Irvine 2010; Wight et al. 2016; and Änggård 2011) which is summed up in the following three sections related to the aim of this study: nature's effect on child development; nature's effect on children when they become adults; and nature's effect on people.

4.1 Nature's effect on child development

A study by Kim (2011) focused on children's ability to think creatively with the results showing that children's creativity and imagination had significantly decreased since 1990. This especially applied to younger children. Kim (2011, 293) discusses that children are provided less time to reflect which is necessary to develop creative thinking. Children are simply occupied too much, for example through spending longer time with electronic devices. This reflective abstraction may to some extent hinder the development of the child's creative personality (Kim 2011, 239).

'Playscape' is a concept introduced by Frost (1992) which describes different play environments. He argues that elements of nature are important features of a playground since it allows for better learning opportunities. Wight et al. (2016) investigated children's exploratory and inquiry play on a designed playscape built for the purpose to connect children with nature in urban environments. The playscape strives to imitate nature as much as possible by including elements such as trees, grass, water, soil and loose parts which can be found in nature. Fjørtoft and Sageie (2000) also use the term playscape but in their study, they look at children's play in a forest. Therefore playscape can mean all from a designed playscape in an urban setting as well as a forest. Both studies analyse how a nature-like setting affects children's development compared to a traditional playground.

The playscape that Wight et al. (2016, 518) focused on is built for the purpose of moving away from hard surfaces such as asphalt and artificial cover which dominates urban environments. They compared children on a playscape and children on a traditional playground and found that there was a higher diversity of activities on the playscape. The most popular setting was the water patches and the interior of the forest/grove (Wight et al. 2016, 533). The science-specific language was more common on the playscape. This use of language was mostly observed on the path and by the water, as well as in the groves and gravel pits. Their results suggest that the opportunities to explore and foster inquiry are larger on a playscape since it offers more diversity

(Wight et al. 2016, 523). Activities were needed to be led by teachers on a traditional playground in order to generate the same level of inquiry as on a playscape. The experiences from these playscapes are that they generate a positive development on children's environmental knowledge leading to environmentally responsible behaviours, where children learn to respect and care for nature (Wight et al. 2016, 518-519).

Fjørtoft and Sageie's (2000) study was set in a forest (which, as mentioned, also is considered as a playscape). They focused on nature environment's effect on children's health in comparison to a traditional preschool yard. The study mapped the different preschool settings, what elements they contained and identified how the children moved and what games they played. Their results indicate that the nature-setting had a significant effect on the children's motoric development. A rock invites e.g. climbing or hiding (Fjørtoft and Sageie's 2000, 83) and trees were important in symbolic play³ and constructive play⁴. They often played by shrubs, building shelters, or for example, played inside the shrub or used it just for hiding. Shrubs were found to influence all types of playing activities (Fjørtoft and Sageie's 2000, 93). Varied topography allows for more exercise and natural hills or slopes provide variation and diverse impressions through climbing, sledging on winter, or by just observing the view. The children on the nature setting in Fjørtoft and Sageie's (2000) study furthermore showed better abilities to concentrate in preschool and got improved health compared to preschools without access to nature. This is for example because movement provides better opportunities to concentrate and abilities to learn (Bunketorp Käll 2015; Utbildningsstyrelsen 2012). It additionally had effect on the type of games that were played such as more non-gendered games (Fjørtoft and Sageie's 2000, 93). This development is supported by Änggård (2011) who studied children's non-gendered and gendered games in nature environments.

Another study by Fischer (2013) looked at the outcomes from a forest-immersion programme in early age on children's use of language. The study focused on two groups of children under the same teaching philosophy, but with the only difference being that one applied a forest-immersion programme and the other did not. The students in the forest-immersion program expressed greater numbers of ideas and reached higher creativity scores. The study suggests that a more varied natural environment has the potential to impact children in their use of language. Nature's effect on science-specific language has also been observed by Wight et al. (2016, 526-527).

³ **Symbolic play** is children's ability to use ideas, actions or objects to represent other ideas, actions or objects as play.

⁴ **Constructive play** is when children manipulate their environment to create and build things, experimenting with materials.

Based on the above introduced studies (Frost 1992; Wight et al. 2016; Fjørtoft and Sageie 2000; Bunketorp Käll 2015; Utbildningsstyrelsen 2012; Änggård 2011; and Fischer 2013) is the diversity of nature, such as in a forest, one setting that contributes to children's physical movements and creative- and imaginary personality. This may answer to Kim's (2011) finding on children's loss of creativity, namely that the limited access to nature in urban areas may contribute to children's loss of creativity.

Berg (2015, 25) and Wight et al. (2016, 518-519) argues do the cultural and societal view of nature's matter in the development of a child's relationship with nature. The tradition of Scandinavian preschools is that children should be free and learn by experiencing the surrounding environment (Einarsdóttir 2003, 115) and preschools are about preparing children for future higher education. Therefore, preschool teachers should not just care and guide but also to some extent teach (Einarsdóttir 2003, 115). In order to teach, there needs to be an environment inviting enough for children to want to explore and learn. Therefore, society and culture play a significant role in making nature accessible for the children (Beery 2013; and Fuller and Irvine 2010).

4.2 Nature's effect on children when they become adults

Lloyd and Gray's (2014), Berg's (2015), Chawla's (2007) and Malone's (2012) studies show that children spending time and playing in nature settings impact their environmental engagements as adults which for example is visible in their choice of career path. For example, those that choose an academic career in ecology, in most cases, have a connection to nature from their early childhood (Prévot et al. 2018, 274), this also applied for nature- and social science regarding nature conservation. This is also noticed in Lloyd and Gray's (2014) study on place-based outdoor learning and environmental sustainability, arguing that being and seeing nature predicted active engagement and environmental commitment. This is important for sustainable development reasons and in order to overcome the growing nature alienation-trend which is visible in urban areas (Fuller and Irvine 2010, 136). The increasing number of child obesity, the lower frequency of real-life meetings and physical activity, among others, are examples presented in contemporary scientific studies, reports, and in media (Kim 2011; Fjørtoft 2001; Wight et al. 2016; Faskunger 2008, 19; Kvarnlöf 2018; Ahlm 2012).

According to Berg (2015, 17), if a child has freedom and space to explore their nearby natural environment, then the child will be eager to explore more which will lead to a wider environmental knowledge and competence, as visible in Wight et al.'s (2016, 518-519) study. This idea is based on Chawla's (2007) model; positive interaction cycle of accessibility, mobility, and

engagement with the environment presented in Figure 2, below. The model was adapted by Malone (2012, 22) who incorporated place attachment and environmental stewardship due to the importance of outdoor education. Place attachment is related to spending childhood time in e.g. a forest, might lead to emotional attachment to that area and willingness to engage in adult age. Environmental stewardship means that since humans are responsible for depleting the environment, we need to take the lead in restoring nature. There are also studies which show that outdoor education provides means to relate to nature which will lead to a lifelong learning, environmental morals, and active citizenship (Lloyd and Gray 2014, 4). The most important factors to enable such a development are the quality of nature and access to nature as a child, the adult’s engagement in promoting activities in nature, as well as the cultural and societal view of nature (Berg 2015, 25).

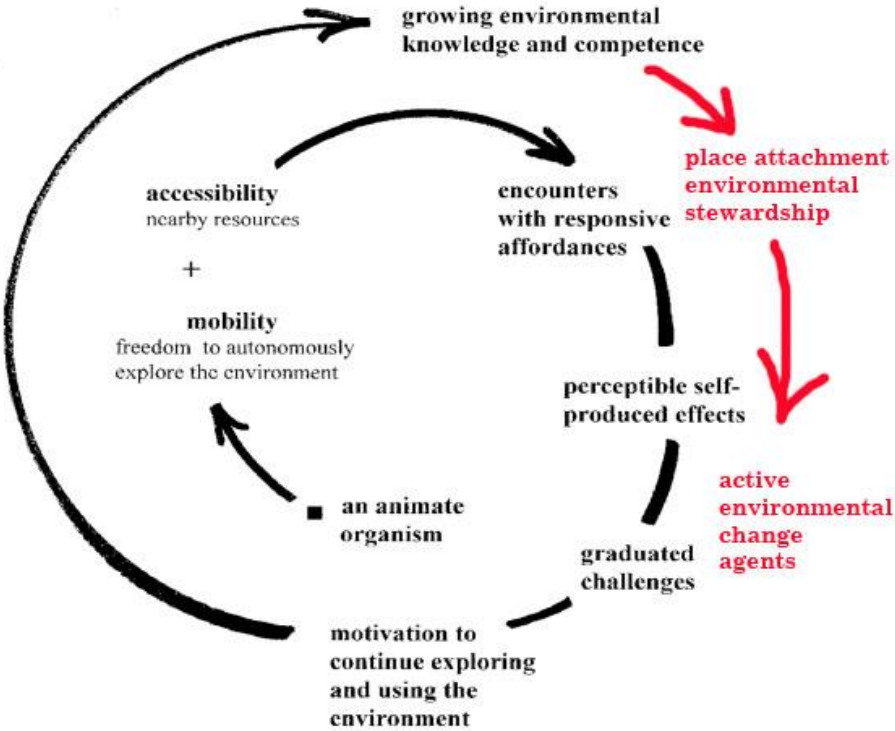


Figure 2: Positive interactive cycle of accessibility, mobility, and engagement with environment leading to active environmental change agency (Malone 2012, 30 adapted from Chawla 2007, 155 and Lloyd and Gray 2014, 3).

4.3 Nature’s effect on people

The Intergovernmental Platform on Biodiversity and Ecosystem Services (IPBES) Conceptual Framework (CF) describes through a highly simplified model how nature affects human well-being through the benefits that people derive from nature (Díaz et al. 2015). This was also

discovered by Russell et al. (2013, 479) in their multidisciplinary research studying nature's benefits to human well-being through non-tangible connections. They discovered that empirical tests and hypothesis across ecosystems and cultures have shown consistent results of nature's benefits to human's physical- and mental health. The wide-ranging evidence demonstrates that viewing, interacting with, and living in natural environments can have an effect on people through: "reducing stress, increasing patience, increasing self-discipline, increasing capacity for attention, increasing recovery from mental fatigue or from crisis and from psychophysiological imbalance" (Russel et al. 2013, 482). The nature environments in the identified studies were different types of nature settings, such as a green park or biologically diverse ecosystems, but also close contact with animals, such as a dog (Russel et al. 2013, 482). Nature also affect people without needing to interact with nature. Passively viewing nature through a window generated a faster recovery of the studied person's heart-rates, compared to when they were viewing a TV-screen or a brick wall. Nature therefore to some extent benefit people's physical health directly merely by perceiving nature (Russel et al. 2013, 479).

Further, Díaz et al. (2015, 8) describe how institutions and governance systems and other indirect drivers play a role in balancing anthropogenic assets and nature because this affects how people perceive nature. This balance could, for example, be between artificial ground covers and nature ground covers on playgrounds, so that children do not believe that nature is substitutable.

The theoretical framework focuses on different ways in which nature benefit's people and fosters environmental consciousness and responsible behaviours through exposure to nature in early age, as part of the larger puzzle toward urban sustainability.

5 METHODOLOGY

Mixed methods were chosen in order to address the research questions, these are the following: empirical data collection in field studies; GIS-analysis; and semi-structured interviews with a complementary questionnaire.

5.1 Empirical data collection

The first research question: *To what extent are different elements of nature present on preschool yards in the NC of Gothenburg?* is addressed by the empirical data collection.

The 16 preschools were visited on two occasions during a period of two weeks. The field study took place during the weekend since most preschool yards in Sweden are accessible when the preschools are closed and with the intention of not to interfere with any preschool-activities. The

field visits were made twice on each study site due to the need for some adjustments in the classification of identified elements. By walking around on the preschool yard, the elements in each preschool yard were recorded, identified and classified according to the list in Table 2. At each field visit, the general description of the yard was also recorded as well as the surrounding environment (see [Appendix 1](#) for photos demonstrating examples of the different elements).

Table 2: Lists nature elements that were identified during the field visits. The types of natural elements were classified inspired by Chronvall's (2010) extensive study on preschools' outdoor environment.

Elements	Description
Has a preschool yard	If a preschool does not have a yard, the remaining elements in this list are not relevant.
Singular/Isolated tree	Surrounded by a fence or similar construction and/or stands one by one (see Figure 10 in Appendix 1).
Grove	Many trees in an area, forest-like environment (Figure 8).
Singular/Isolated bush	Surrounded by a fence or similar construction and/or stands one by one (Figure 11).
Shrubs	A larger bush and/or several small bushes (Figure 8).
Rock	To sit or to climb on (Figure 12).
Grass	Natural grass, not artificial grass (ex. Figure 15, 16 and 17).
Cultivation boxes	(Figure 13).
Natural heavy material	Such as logs to climb or sit on (Figure 14).
Natural loose material	Such as branches and wooden sticks (Figure 14 and 15).
Varied topography	Challenging for a child up to 5 years old (Figure 8, 16 and 17).
Natural slopes/hills	Of rock, grass or mud (Figure 8, 16 and 17).
Natural hard ground cover	Such as rocky slopes/hills or other types of stone-surfaces (Figure 18).
Natural soft ground cover	Includes elements such as grass, sand, and soil (Figure 8, 16, 17 and 18).
Artificial hard ground cover	Wooden deck and asphalt (Figure 18 and 19).
Artificial soft ground cover	Fall protection surface of rubber or artificial grass (Figure 19).

5.2 GIS-analysis

The second research question: *How are the preschools in the NC of Gothenburg located in relation to nature areas, as a complement to their own yard?* is addressed by a GIS-analysis.

The geographical analysis was performed in the Geographical Information System (GIS) programme called ArcGIS. GIS is used to analyse geographical data and is mostly used in city planning and environment monitoring, but also for commercial purposes (Harrie 2013, 21).

The GIS-lab used in the study was at the Department of Economy and Society, on the unit Human Geography at the University of Gothenburg. The data source for the GIS analysis was obtained from Lantmäteriet (Lantmäteriet, n.d.). A base map (1:250 000) was downloaded

covering topography, rough land use and land cover (grass, trees etc.), administrative areas and built up areas over entire Sweden.

The map was adjusted to cover only the targeted area of Gothenburg. Adjustments were also made on the grassy areas and forest/groves in order to get a better match of the reality, based on a satellite picture (Ortofoto/Ortofoto25).

The preschools in the NC of Gothenburg have different types of buildings; some are situated in several buildings next to one another whilst some are placed within a courtyard. The location of the preschools is therefore illustrated by points which also make the measurement of the distances between preschools and nature more accurate.

Nature areas are divided into forest/groves and grassy areas which are illustrated on the map with different types of green colours. The purpose was to differentiate between a more diverse nature environment (e.g. forest/grove) to less structured, as parks or grassy lots.

Zones with a radius of 300 metres were created surrounding the preschools within which existence of nature areas as grassy areas and forest/grove were recorded. Distances between the preschools and the nature areas were calculated by a program in ArcGIS.

Additionally, two GIS-maps are made: the first illustrating the result from the empirical data collection presented in [Chapter 5.1](#) and the second illustrating the results from the empirical data collection and the results on nature areas within 300 metres distance from the preschools. The reason is to enable a better analysis of the current situation.

5.3 Semi-structured interviews and complementary questionnaire

The goal of the interviews and the complementary questionnaire is to collect data in order to address the third and final research questions: *How are the views among Gothenburg NC's preschool directors on children's relationship to nature in preschool activities?*

Semi-structured interviews were used since it allows for a more open discussion giving much space to the interviewee whilst the questionnaire is a complement for those that could not participate in an interview. Two preschool directors and one preschool director assistant participated in interviews and additional three answers were received from the questionnaires. The participants are together in charge of 9-10 out of the 16 preschools in the NC of Gothenburg (the reason for not knowing exact number is because the questionnaire is anonymous).

The difference between the two methods is that the questionnaire does not enable the interviewer to follow up on the respondent's answers. The questions from the interviews and the questionnaire are available in [Appendix 3](#).

5.4 Analysis of data

By using three different sources of data (empirical data collection, GIS-analysis and semi-structured interviews and questionnaires), it enables the analysis of the result to account for a wider view. If only one of the methods was used, it might leave out other important details of reality and attitudes surrounding the relationship between children and nature in the preschools in the NC of Gothenburg.

6 RESULTS

6.1 Empirical data collection

The content of nature elements identified during the field visits of data collections in the preschool yards is summarized in Table 3. Artificial ground covers are presented in Table 4. Preschool's ID numbers in the tables are as follows:

(1) Lilla Samskolan; (2) Molinsgatan 23; (3) Vasa Kyrkogata 7; (4) Folke Bernadottes Gata 4; (5) Lasarettgatan 7A; (6) Nedre Kvarnbergsgatan 17; (7) Färgaregatan 7; (8) Friggagatan 3b; (9) Baldersplatsen 2; (10) Levgrensvägen 3; (11) Skånegatan 18; (12) Hallandsgatan 7; (13) Valhallagatan 4; (14) Engelbrektsgränd 34 E; (15) Lennart Torstenssonsgatan 11 and; (16) Montessoriförskolan Centrum.

Table 3: Results from the empirical data collection on the nature elements and natural ground cover on the preschools in the NC of Gothenburg. The total number of elements is counted excluding ‘has a preschool yard’. For explaining examples of the element classifications – see Table 2, Chapter 5.1.

Elements / preschool ID	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Has a preschool yard	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Singular/isolated tree	X	X	X	X	X	X		X	X	X	X	X	X	X	X	
Grove															X	
Singular/isolated bush	X		X	X	X	X	X	X	X	X	X		X	X	X	
Shrubs						X							X		X	
Rock	X								X	X			X	X		
Grass	X		X	X		X			X	X	X		X	X	X	
Cultivation boxes	X	X		X		X			X	X	X		X	X	X	
Natural heavy material	X		X	X					X	X	X	X	X	X	X	
Natural loose material			X	X	X					X			X		X	
Varied topography			X								X				X	
Natural slopes/hills			X			X					X				X	
Natural hard ground cover			X			X					X				X	
Natural soft ground cover	X		X	X		X					X				X	
Total nature elements (excl. 'has a preschool yard')	7	2	9	7	3	8	1	2	6	7	9	2	8	6	12	-

Table 4: Results from the empirical data collection on the artificial ground covers on preschools in the NC of Gothenburg.

Elements / preschool ID	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Artificial hard ground cover	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
Artificial soft ground cover	X	X	X	X	X	X	X	X		X	X			X	X	
Total	2	2	2	2	2	2	2	2	1	2	2	1	1	2	2	-

The general impressions from the preschool yards are presented in short comments below.

Images of the elements and on the different preschool yards are available in [Appendix 1](#) and [Appendix 2](#), respectively.

(1) Lilla Samskolan

The preschool yard is relatively flat. The ground cover is mainly asphalt. The preschool is located close to green areas and vegetation, which are visible from within the yard. There are cultivation boxes.

(2) Molinsgatan 23

The preschool yard is built on top of a parking lot. It therefore is flat, mainly of asphalt, with a section of artificial grass and one section of sand. There are some cultivation boxes that seem to be in use, a tree stands in one of the cultivation boxes. There is an outdoor atelier with a roof.

(3) Vasa Kyrkogata 7

The preschool yard is divided into different sections which offer a sense of having many nature elements. There are quite large trees both inside and outside the yard as well as bushes. The surface is mainly natural ground cover and the topography is varied. The preschool yard has natural soft- and hard surface in terms of grass, rock and sand and it also has several both loose- and heavy materials.

(4) Folke Bernadottes Gata 4

Flat preschool yard, slightly sloping and is divided with a fence into two parts. The preschool yard has quite large trees and both natural and hard surface in terms of asphalt and grass. There are a water-station and cultivation boxes.

(5) Lasarettgatan 7A

The preschool yard is small but divided into different sections. The dominating material of the surface is sand, a wooden porch, and fall protection surface of rubber. There is one tree and a few bushes, but the bushes are mostly alongside the fence outside the preschool yard.

(6) Nedre Kvarnbergsgatan 17

The preschool yard has a natural rocky slope but it was unfortunately too steep (more like a wall) to be of any use for children's exercise. It is however a nice element visually for children and adults. The playground is flat apart from the rocky wall. The surface is of pavers, grass, sand and artificial grass. There are cultivation boxes, trees and bushes, the bushes are big enough and grown in a way that enables a child to go inside of them.

(7) Färgaregatan 7

The preschool yard is flat and hard with a singular isolated bush, being the only nature element. It is on an inner courtyard so the view from the yard is high buildings.

(8) Friggagatan 3B

The preschool yard is flat with artificial ground dominating the surface: asphalt, fall protection surfaces, and artificial grass. There are a wooden deck and a sandpit and some isolated vegetation. The preschool yard is located on an inner courtyard so the view from the yard is high buildings.

(9) Baldersplatsen 2

The preschool yard lies in between a cemetery and a river, where the river separates the yard from a heavy road. The yard has several natural elements and something that was especially noticed was the stones in a circle and the trees that are used as a composition, a hut or perhaps a

roof (illustrated in Figure 12 and 9 in [Appendix 1](#)). The surface is mainly sand, pavers and a wooden porch. There are cultivation boxes.

(10) Levgrensvägen 3

The preschool yard is flat with a fall protection surface of rubber dominating the yard. It has a smaller section of grass and several loose and heavy natural materials. The preschool yard has cultivation boxes.

(11) Skånegatan 18

Skånegatan 18 has two preschool yards. One yard has surface based on grass, asphalt, and a rocky hill. The surface is varied due to the rocky hill. This yard has cultivation boxes. The other preschool yard has mostly artificial cover based on artificial grass and fall protection surface of rubber. The topography is varied due to built-up hills, covered with artificial grass.

(12) Hallandsgatan 7

The preschool yard is on a wooden porch and has two singular trees and some isolated plants. The preschool has a green public area on an inner courtyard right next to their yard. The public area is however not included in the valuation of Hallandsgatan 7's own preschool yard.

(13) Valhallagatan 4

The preschool yard is flat but manages to give an impression of being a "wild" yard. It has many nature elements and based on the different artistic projects and the way loose nature elements were to be found on the preschool yard, indicating children's play with the elements. The surface is based mainly on asphalt, grass and sand. There are cultivation boxes and both heavy and loose natural materials on the preschool yard as well as trees, shrubs and rocks.

(14) Engelbrektsgatan 34 E

The preschool yard is big and flat with a large open space offering no hiding possibilities. The fall protection surface of rubber and artificial grass dominates the yard. There are cultivation boxes, some bushes, trees and sandpits. The preschool yard is surrounded by a heavy traffic road, a public playground, and a football court.

(15) Lennart Torstenssonsgatan 11

The preschool yard lies in direct contact with a forest which slightly continues onto the yard. It offers a challenging terrain that requires fitness- and motoric skills in order to go between the different zones of the yard. Natural loose and heavy materials were to be found in most areas of the preschool yard and a traditional water pump was also noticed. There are cultivation boxes.

(16) Montessoriförskolan Centrum

Montessoriförskolan Centrum does not have a preschool yard.

Figure 3, below illustrates the distribution of nature elements on preschools in the NC of Gothenburg based on few- medium- and many nature elements.

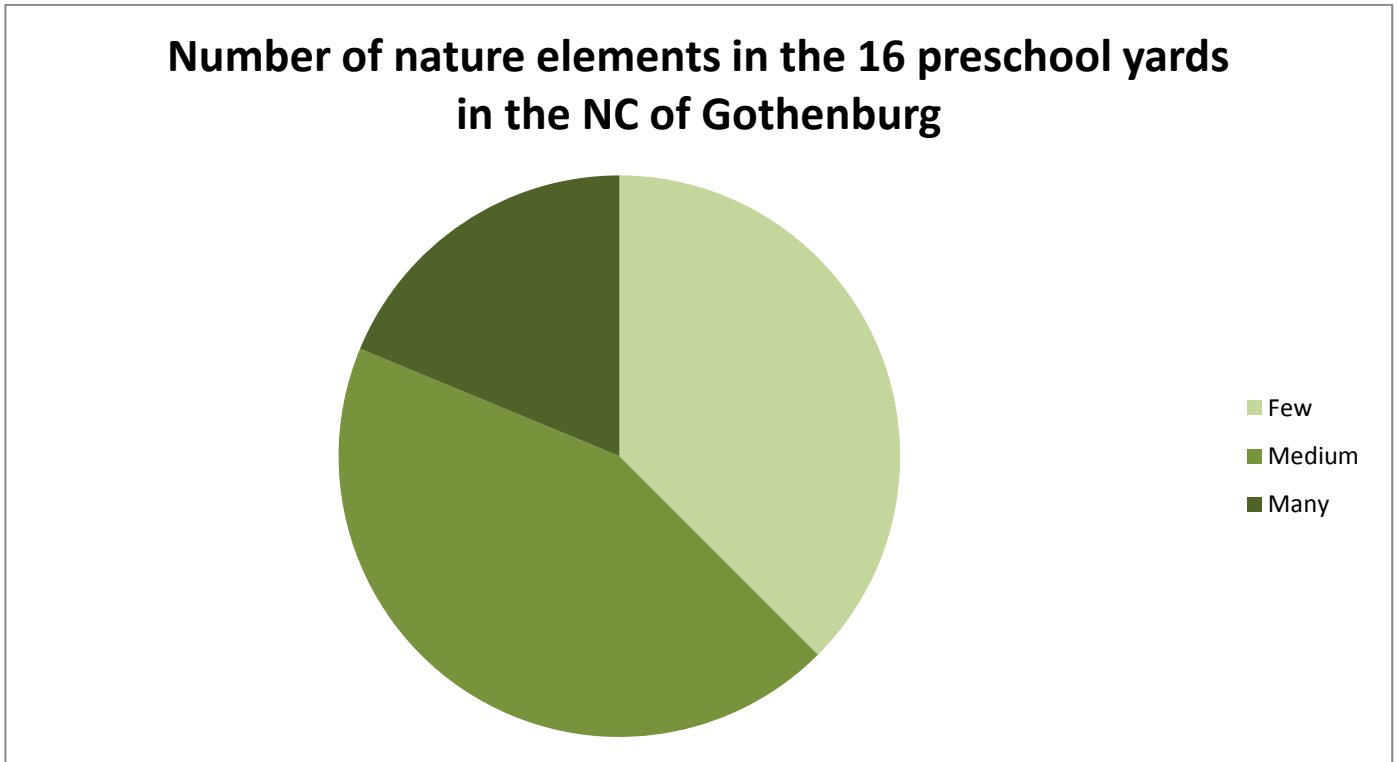


Figure 3: The number of nature elements identified in all the studied preschool yards in the NC of Gothenburg. The data is divided into three classes, few- (0-4 elements), medium- (5-8 elements) and many (9-13) nature elements (excluding "has a preschool yard" and artificial ground covers).

The general outcome of the empirical data collection shows that there is a clear difference between preschools in terms of the number of nature elements on their preschool yards. Further, larger varied elements of shrubs and groves were rarely observed. Among the preschools that have a preschool yard have some type of tree and bush, but these were in most cases isolated. They were isolated with fences, heavy stones or placed in a way so that they were out of reach for the children, indicating that they are for observing and not for playing with.

Figure 3 in [Chapter 6.1](#) illustrates that approximately 40 percent have few-, 40 percent have medium- and 20 percent have many nature elements respectively, according to this field study. There is, therefore, a big variation between the preschool yards and fewer of those with many nature elements.

The features on all the preschool yards with few numbers of nature elements have isolated vegetation (except the preschool that does not have a yard). The other elements visible on these preschools yards are natural heavy and loose materials, such as wooden logs or smaller pieces of wooden materials and one has cultivation boxes. Natural cover is almost non-existing, and most of the preschools with few elements are situated inside a courtyard and in a hard-surface area in the urban core.

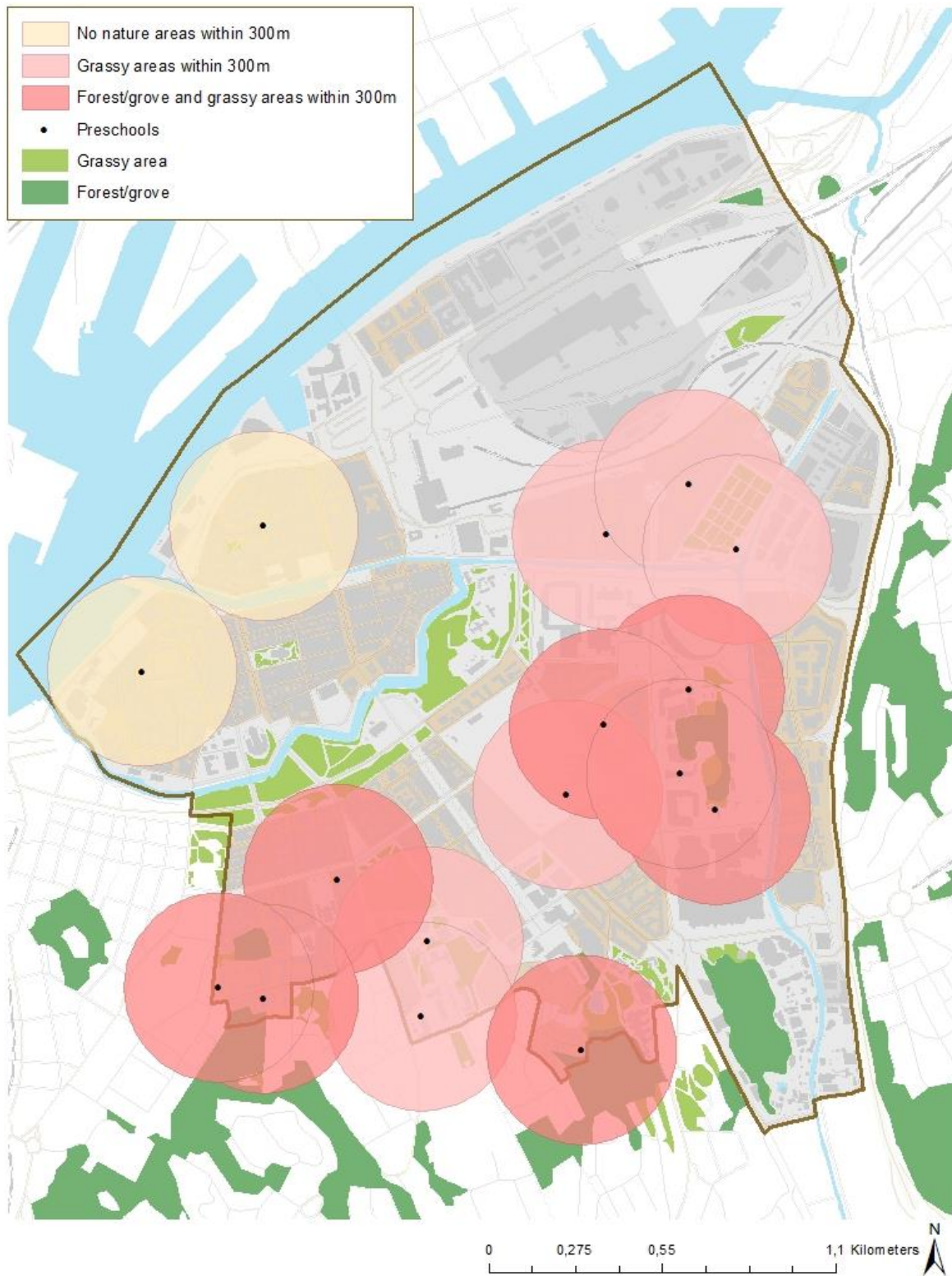
The preschool yards with medium number of elements have isolated vegetation, grass, cultivation boxes and most of these preschool yards also have rocks. The elements: varied terrain and natural loose and heavy material was observed on a few preschools among those with medium nature elements and some have natural ground covers.

The preschools that have many nature elements have almost all the elements presented. In contrast to medium, all preschool have natural loose and heavy materials and challenging typography. One has shrubs and a grove (see Figure 8 in [Appendix 1](#) for an image of these elements).

Those with few elements rarely have nature elements or elements available for children to use in their play, in contrast to those with many nature elements which have a diversity of nature elements, varied typography, loose materials, and larger vegetation available for children to use in their play. There is one preschool that stands out from the others having almost all elements and direct access to nature on their preschool yard. The preschool has a forest/grove entering the preschool and it is located in a part of NC of Gothenburg characterized by hilly terrain and fancy facilities. The preschool itself is situated in a facility with high cultural value.

6.2 GIS-analysis

The result from the GIS analysis is presented in the two figures below: Figure 4 illustrates the preschools' location in relation to grassy areas and forest/grove within a 300 m radius and Figure 5 presents the distances to nature areas from each preschool.



Cartographer: Viktoria Janovskis
 References: Main map: Surfaces: GSD-Terrängkartan, vektor © Lantmäteriet (2015); Administrative areas: GSD-Översiktskartan vektor, GSD-Administrativ indelning 1:250 000, GSD-Höjddkurvor 25m © Lantmäteriet (2013); and Buildings: GSD-Fastighetskartan, vektor © Lantmäteriet (2016). Green areas: GSD-Ortofoto och GSD-Ortofoto25 © Lantmäteriet (2015).

Figure 4: The preschools in the NC of Gothenburg with surrounding circles of radius 300 m. The colours of the circles indicate the distance to ‘grassy areas’ and ‘forest/grove’ – see the legend in the figure.

Preschools that are situated close to the river *Göta Älv*, the central station, or near bigger roads in the city, have lower access to nature areas such as forest/grove and grassy areas. Two preschools by the river do not have any nature area within 300 m. Six preschools have grassy areas within this zone but not any forest/grove, whilst eight preschools have both grassy areas and forest/grove within this zone. The latter is located in an area characterized by varied topography. The surface is harder and more artificial and industrialized the closer the river, around the central station, and near heavy traffic loaded roads in the area NC of Gothenburg. These areas also contain heavy traffic of different vehicles in terms of trams, trains, cars and other vehicles as well as people in movement.

Valhallagatan 4, Levgrensvägen 3, Skånegatan 18 and Hallandsgatan 7 have close access to a preserved forest/grove in the middle of a ruff city environment. Baldersplatsen 2, Friggagatan 3b and Färgaregatan 7 have close access to a grassy area in terms of a cemetery. The preschools in the south-west (bottom-left of Figure 4) have close access to the city park with both forest and grassy areas. The rest of the preschools have access to different types of preserved groves and some landscaped grassy areas.

The distance from preschools to nature areas is presented in Figure 5, below. One preschool stands out having further than 1000m to forest/grove. The same preschool has, however, less than 100m to a grassy area. The rest of the preschools have less than 750m to forest/grove. The preschool with the furthest distance to a grassy area also has the second furthest distance to forest/grove. Three preschools have more than 100m (but <400m) to grassy areas whilst the rest had less than 100m to grassy areas. In general, all preschools have closer to grassy areas than forest/groves.

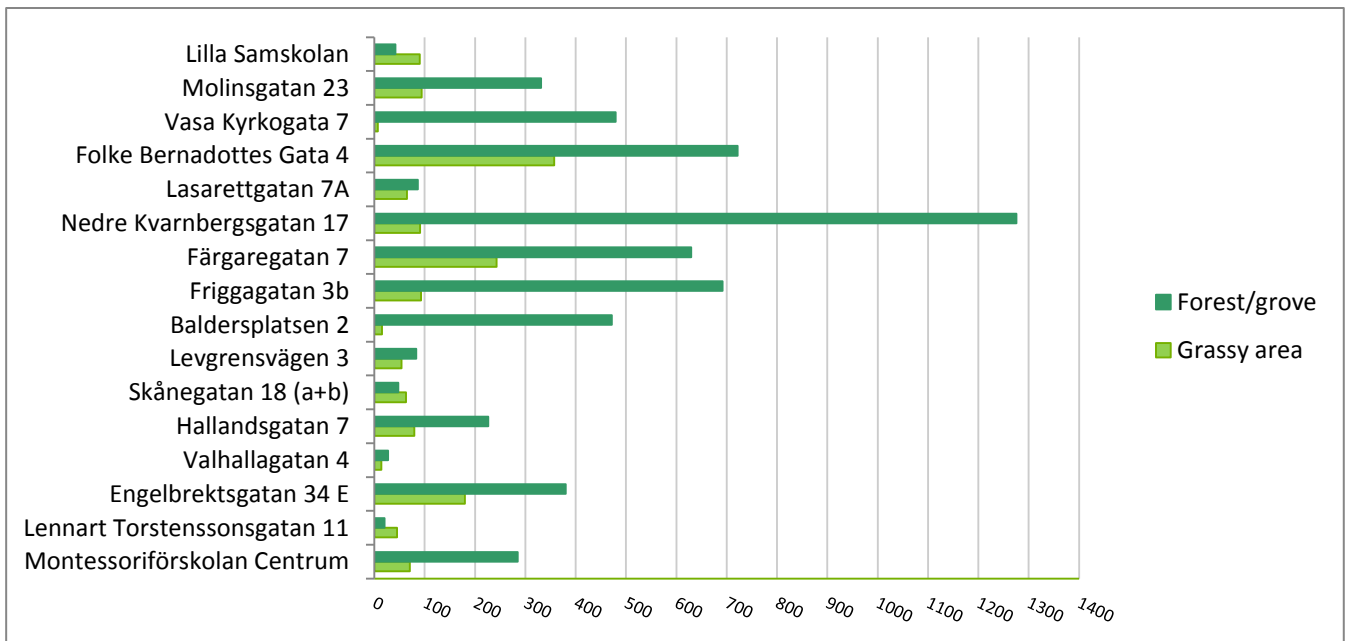
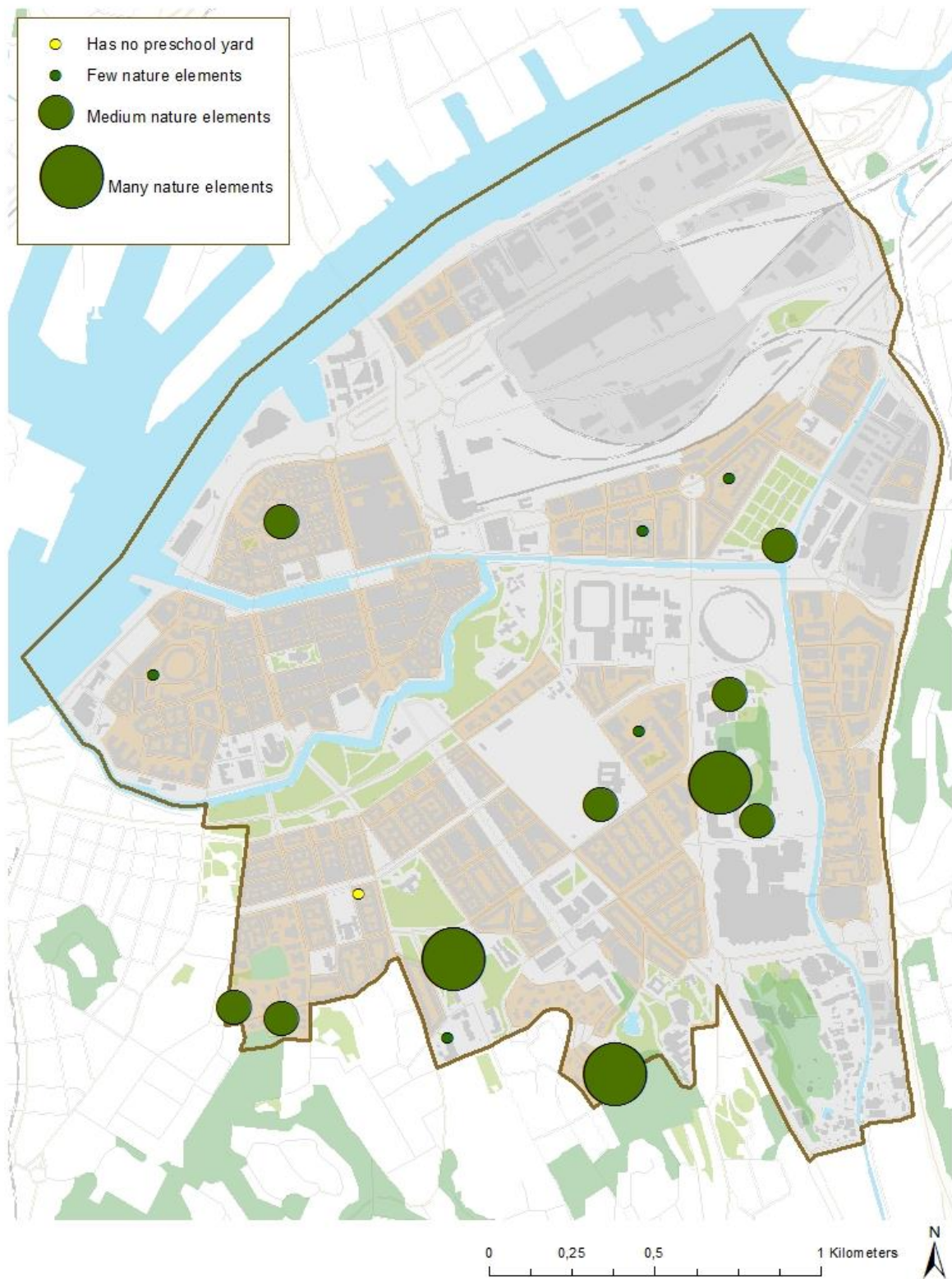


Figure 5: Graph illustrating distance to nearest ‘grassy areas’ and ‘forest/grove’ from the preschools in the NC of Gothenburg measured in meters.

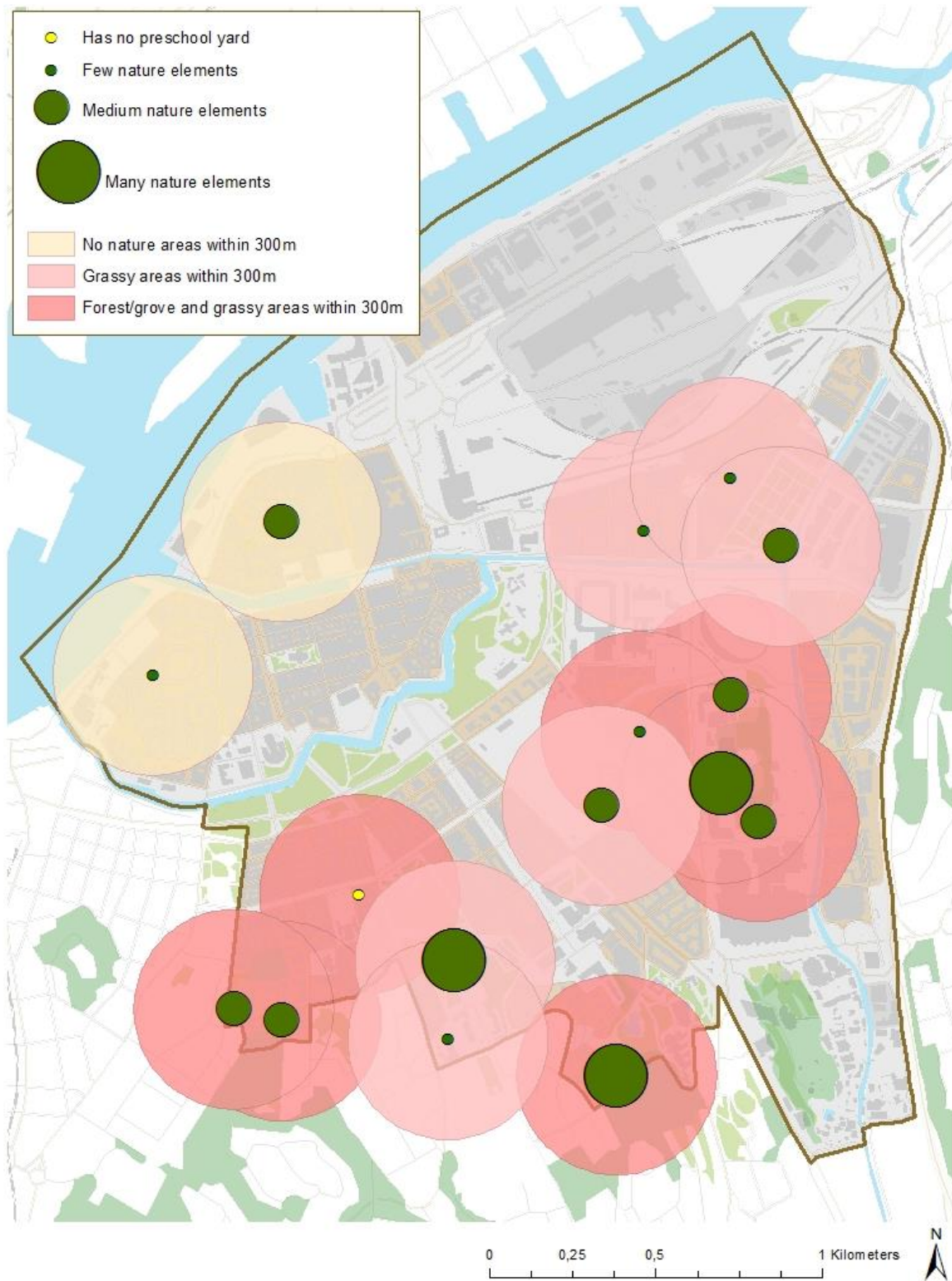
It is difficult to access nature areas from some of the preschools in the NC of Gothenburg. There are two preschools that have no nature areas nearby; these two are situated close to the river in a rough city environment. Three preschools have access to a grassy area in form of a cemetery. Eight preschools have access to a forest/grove; which means that half of the preschools in this area of Gothenburg have access to a more diverse nature environment. To reach nature areas some preschools have to cross bigger roads. These types of barriers the GIS analysis in this study not take into account when analysing nature accessibility and the zones surrounding the preschools can, therefore, be misleading if not using mixed methods.

The result from the empirical data collection presented in Table 4 (Chapter 6.1) is illustrated in a GIS-map, in Figure 6 in order to enable a better-connected analysis of the results. The figure illustrates the numbers of elements on the preschool yards divided into the classification presented in Figure 3 (Chapter 6.1): the small green circles stands for few elements, medium circles for medium elements, and the bigger circles for many elements on the preschools in the NC of Gothenburg. Figure 7 illustrates the results from the empirical data collection on natural elements on preschool yards (Chapter 6.1) together with the results from this section, on the preschools’ relation to nature areas (illustrated in Figure 4, Chapter 6.2).



Cartographer: Viktoria Janovskis
 References: Main map: Surfaces: GSD-Terrängkartan, vektor © Lantmäteriet (2015); Administrative areas: GSD-Översiktskartan vektor, GSD-Administrativ indelning 1:250 000, GSD-Höjddkurvor 25m © Lantmäteriet (2013); and Buildings: GSD-Fastighetskartan, vektor © Lantmäteriet (2016). Green areas: GSD-Ortofoto och GSD-Ortofoto25 © Lantmäteriet (2015).

Figure 6: Map illustrating the number of nature elements on the preschools in the NC of Gothenburg based on the classification of the results presented in Figure 3, Chapter 6.1.



Cartographer: Viktoria Janovskis

References: Main map: Surfaces: GSD-Terrängkartan, vektor © Lantmäteriet (2015); Administrative areas: GSD-Översiktskartan vektor, GSD-Administrativ indelning 1:250 000, GSD-Höjddkurvor 25m © Lantmäteriet (2013); and Buildings: GSD-Fastighetskartan, vektor © Lantmäteriet (2016). Green areas: GSD-Ortofoto och GSD-Ortofoto25 © Lantmäteriet (2015).

Figure 7: Map illustrating the number of nature elements on the preschool yards in the NC of Gothenburg and their access to nature areas in terms of grassy areas and forest/grove in the NC of Gothenburg.

6.3 Semi-structured interviews and complementary questionnaire

The acronyms for the preschool directors from the interviews and the questionnaire are the following: R1, R2 are the preschool directors that were interviewed and R3 is the preschool director assistant that was present in one of the interviews; R4, R5, and R6 are the three preschool directors that answered the questionnaire.

What is the preschool director's view on the children-nature relationship?

Nature is an important aspect of children's lives as well as building a relationship with nature according to all respondents (R1, R2, R3 R4, R5, and R6). The relationship was especially important for sustainable development reasons (R4 and R5). According to one preschool director is a sustainable future one of their most important missions. They have to contribute to building children's relationship with nature (R5). The important knowledge of animals and plants was also lifted (R4). The relationship is important because children need to devote a careful approach to nature and the environment as well as understand their place in nature's cycle (R5). Since we today live over our assets and depletes nature; children need to grow up with nature so that they get the ability to understand the value of nature (R4).

Does the relationship differ today compared to, say, 50 years ago?

People have a greater awareness of their relationship to nature today which is different from 50 years ago – people in the city are aware of not having easy access to nature (R4 and R5). It is rather seen as an interest, a hobby, for example, to live organic (R5). 50 years ago when nature was more present and accessible to everyone, people were not aware of its presence (R4 and R5). However, children's relationship to nature has not changed, children still appreciate spending time in nature. What has changed is nature accessibility both in terms of distance, but also due to the frequent use of electronic devices. Children today have the ability to experience nature without actually being in a forest thanks to electronic devices. 50 years ago it was more common to visiting a zoo, whilst children today can experience nature through virtual technology (R4). The relationship has changed depending on where in Sweden you live (R6).

Earlier, much focus was placed on the structure of the outdoor environment, for example, focusing on children's motoric development; today, we also see an increased focus on children's learning. The outdoor environment needs to contribute to children's educated knowledge such as water cycle and other cycles of nature. Cultivation boxes are popular in preschool yards for the purpose to teach children about nature's cycle and to learn to cultivate plants. In Sweden, we have realized that preschools are essential to build a ground for the children's continued carrier path (R1).

What effect does nature have on children?

Spending time in nature is important since it offers more of all the components available in a preschool yard. Being outdoors on a preschool yard benefits children's motoric development which differs from the possibilities indoors. However, a preschool yard is generally well and informatively planned and tells the child what to play and what to do with the different elements of the yard. For example, a swing tells you to swing, and a sandbox to dig. This is in contrast to nature which is unstructured and therefore triggers the child to use their imagination and eagers children to explore (R1, R2, R3, R4, R5, and R6). Preschool teachers have observed other children constellations and a different group dynamic when playing in nature (R1), and furthermore, nature allows non-gendered games since nature is not gender-coded (R4 and R5).

Nature forces children to use their motoric skills and balance in more challenging ways than in a preschool yard. Asphalt yards do not challenge children's motoric skills in the same way as in a natural terrain, this is due to a more varied topography where they need to lift their feet higher and use their balance when walking around in a forest (R1). Children can play so that they get dirty (R5). Natural environments have an effect on children to move more, even children that usually do not move much at all (R2). Nature gives children the opportunity to run free and for example climb in trees (R2), building a hut with twigs and branches or looking at insects, simply, work with their creativity (R1 and R2). Besides, nature allows children to use all their senses (R3).

Creativity on the preschool yard also occurs: explained by one preschool director, one day a week they remove indicative playground equipment such as bikes so that children needs to come up with something else to do (R2). However, different from the preschool yard does new setting boost creativity more, because it is new. A new setting does not have to be a forest, it can also be another place in the city, but a forest increases imaginative games which do not occur to the same extent in cities (R2 and R3).

How do preschools work with environmental education?

All preschools have a *green flag* label which is a marking meaning that they are working with sustainability and environmental education. Examples of environmental education are work with water and with soil and plants in cultivation boxes (R1, R2, R4, and R5) and to attend different educational events organized in the city (R2). One preschool grows plants almost all year round, both plants that look pretty, but also spices and vegetables which are used for cooking their food. The preschool teachers have had an extensive environmental education including e.g. sustainable futures, ecology, and non-toxic preschool environments and buildings (R5). Being in nature is an important part of environmental education for example by experiencing the different seasons and

finding tools and items that can be used in the education of nature science, “*They find ice and talk about ice. They freeze and defrost things*” (R1). One preschool brings iPads when visiting nature areas in order to encourage the teachers to document children’s nature experiences (R5).

What indirect factors impact children’s relationship with nature?

In urban areas there are other priorities than nature, this has led to some children never having the opportunity to experience nature, other than in structured parks. This applies both to the city core but also to those children living in the outskirts (R4). Parent’s interest and the location of children’s homes, therefore, have an effect on the children’s relationship to nature (R4 and R6). Children that are not used to spending time outside might show resistance to go outdoors at first, but afterward, it usually leads to a joyful relationship. If the outdoor environment is inviting, it will trigger children to spend more time outdoors (R6). Available parks and nature areas in the city have decreased and centralized to a few which are visited by many people every day (R4).

What prevents nature elements on preschool yards?

Reasons for not having nature elements on preschool yards were mainly based on accessibility (for wheelchairs), security reasons (R1) and due to the preschool yards being too small for the current number of children which leads to nature elements being easily torn (R1 and R4).

Most of the nature elements were removed on one of the preschool yards and replaced with asphalt. The reasons were for example that wheelchairs need to be able to roll over the schoolyard, and they, therefore, replaced grass with asphalt. Grass quickly turns into mud when many children are playing in a small area which therefore in most cases is replaced by other ground covers such as asphalt or artificial surface (R1 and R4). Vegetation is surrounded by a fence because when children played in it they broke the twigs and it thereon decreased in size (R1). This is a reason why most preschool yards have fences surrounding their vegetation (R1 and R4). A tree was removed since it was poisonous (R1). The reason for excluding rocks or having a more varied topography is for security reasons; the teachers have to be able to have an overview over the entire yard in order to see all children and prevent accidents. Parents are more afraid today than before, and especially in cities which have put more pressure on the preschools since they take the blame if accidents occur. It is, therefore, safer to have a flat preschool yard with a low number of elements (R1). Beyond this, preschools are accessible to the public when closed which contributes to this wear and tear of the preschool yard (R4).

Are there any funding’s aimed for nature initiatives on the preschools?

Some respondents (R1, R2, R3, and R4) have applied for funding destined for green initiatives on their preschool yards. One preschool received state funding (Boverket 2017) aimed to hire an

architect which planned how the preschool should be better designed for the children (R1). LF (Lokalförsljningsförvaltningen) provided financial support for developing one preschool yard which included the children's desires in the process. The result was cultivation boxes and a maze made out of willow (R2). Another preschool has applied for contributions to a roof for sun protection so they can spend more time outside during the summer (R4). There have been discussions concerning developing the preschool yard, but is, however, concern over the wear and tear issue and the public access (R4). Every year preschools can apply for *Rebus – green schoolyards* through LF (R5).

Are there any obstacles preventing visits to nature areas?

Accessible playground in the city has decreased since public playgrounds in the city have been decreased numbers in Sweden (R4). Some preschools still have close access to nature areas and mostly visit parks when they go on excursions (R4, R5, and R6). Obstacles from visiting public parks can be that private schools, perhaps without having an own preschool yard, are using the public ones regularly which hinders other preschools to go there (R4). Large groups (R2, R3, and R4) and temporary preschool teachers can also be an obstacle since it is a question of safety (R2 and R3). The weather and children with special needs were also put forward as possible obstacles explaining that in spite of location relatively close to nature and parks still some preschools mostly visit indoor places such as museums (R6). There are preschools in Sweden spending almost all their time outdoors, called *I Ur & Skur* (easily translated into *out in all weathers*), but here the parents have the right mind-set, are involved and prepared and provide their children with the right clothes. Therefore, when children do not have the clothes necessary to spend time outdoors, it can prevent visits to a more diverse nature area (R1).

Do the preschools in the NC of Gothenburg reach the goals in the curriculum?

The preschool yards do not enable the teachers to reach the goals in the curriculum, it is therefore, essential to have a green area nearby (R1). Groups that are too big and children not having good enough clothes are obstacles that prevent visits to nature environments and thereby the possibility to reach the goals in the curriculum for preschools (R1, R2, and R3). Learning about nature science and human-nature interconnectedness is easier if viewing, watching, feeling, experiencing (R1). If the main teachers are sick, locum tenens are needed which may prevent visits to nature areas since they do not know the children so as well (R2 and R3). Other obstacles are the low amount of time left for preschool teachers to plan and to follow up nature excursions. The lack of time for continuous education of the preschool teachers is another obstacle to environmental education. It has been suggested by Skolverket to allocate extra time

for continuous education in natural and environmental science for preschool teachers (R4). Results from the questionnaire show that the ability to reach the goals in the curriculum for preschools was appreciated between 3-5 on a scale 1-5 (R4, R5, and R6).

How would the optimal schoolyard be designed according to the preschool directors in the NC of Gothenburg?

The optimal schoolyard should be designed big enough so that it will not easily get torn (R1 and R4). Separated yards were brought up, so the children can switch environment from day to day (R2 and R3). The preschool yard should have varied topography with grass and many trees and bushes enabling the ability to build, for example, small scale and large scale huts (R3 and R4). Possibilities to build huts made out of garment was also suggested (R4). Preferably, it should have a large storehouse with barn doors functioning as an outdoor atelier as well as small storage boxes connected to the different areas of the preschool yard (R2, R3, and R4). Having a water-station and access to water is important for environmental education (R1, R2, and R4). An extended roof over outdoor tables so that they can sit and eat outdoors despite the rainy weather (R4). Furthermore, cultivation boxes, a vegetable garden and a garden house big enough for a group of children is important for environmental education (R1, R2, R3, and R4). To hire a gardener was suggested in order to take care of the preschool yard, especially over the summer when the preschool is closed (R1). A high fence surrounding the schoolyard with a lockable gate is needed so that people cannot go in and tear and steal toys and equipment. Playground equipment should be better adapted to the topography of the yard. Small playhouses and kitchen sinks should be connected to the sandpit. Finally, logs and other elements were suggested on the preschool yard so that children can practice and develop their balance skills (R4). *More* nature elements and *less* indicative playground equipment were especially noted (R1, R2, R3, and R4).

Summary

The attitudes from preschool directors' shows they find it important for children to have access to nature because of the positive impacts related to developing motoric skills and balance and to build a sustainable relationship to nature. Nature furthermore allows for more imaginative and creative games and as well as non-gendered games. The reasons for not having nature elements on the yard presently were mainly for safety and maintenance reasons.

6.4 Connections

There is a tendency toward an uneven distribution of access to nature in the NC of Gothenburg, both in terms of elements on the yard and access to other nature areas. Preschools that have few

nature elements on their preschool yard are also those preschools which have lower access to larger diverse nature areas, illustrated in Figure 7 [Chapter 6.2](#).

Nature elements are also unevenly distributed between the municipal preschools and the same applies for private preschools. The difference between municipal and private preschools in the NC of Gothenburg is that one private preschool has no preschool yard at all. There is, according to the chief of education, other factors from the urban society creating obstacles to have bigger preschools yards and smaller groups (Nyström, 2018).

From the interviews and the questionnaire, it is seen that the preschool directors want to follow their mission in foster children in environmental education, to raise children's awareness and competence about nature, for the future. They also want to make it possible for preschool teachers to continue educating themselves in environmental education and in nature science.

7 DISCUSSION AND ANALYSIS

7.1 Environmental education

The quality of the nature environment plays a significant role in children's environmental engagement and competence as an adult, but this is not the only factor since the cultural and societal view of the value of nature also plays a significant role (Berg 2015, 25). Interestingly, all preschool directors believe that nature is important for children's development which implies good conditions for achieving this development. It seemed like the preschool directors believed they have a mission in connecting children to nature through environmental education and nature experiences. They brought up many factors related to the previous research presented in [Chapter 2](#) and in [Chapter 4](#). The preschool directors, for example, said that nature is good for children's motoric development and balance skills. Nature is good for exploring and building interests and non-gendered games were also acknowledged. Environmental education in terms of fostering environmental conscious and sustainable attitudes toward nature was mentioned as the preschool's central missions. This applies to Figure 2 in [Chapter 4.2](#), which says that if the child has the freedom to explore a nearby diverse nature environment, then it will lead to the children being more engaged in environmental issues in adult age (Malone 2012, 30; Chawla 2007, 155; Lloyd and Gray 2014, 3; Berg 2015). The preschools in the NC of Gothenburg do in general meet up to the factors 'cultural and societal view', based on the answers from the interviews and the questionnaire.

According to the curriculum for preschools, children should understand their impact on nature and how society and nature are interconnected (Skolverket 2010, 10). If nature areas and natural

ground covers are substituted with parks and an artificial ground cover of rubber then, in contrast to the model in Figure 2 (Chapter 4.2), it may teach children that nature is substitutable. As described in Chapter 4.3, the relative availability of anthropogenic assets such as playground equipment and artificial ground covers influences how people perceive nature's benefits, such as grass and trees (Díaz et al. 2015, 8). The balancing between anthropogenic assets in relation to nature is therefore also important in environmental education in order to meet up to the extensive goals presented in the curriculum for preschools (Chapter 3.5).

The focus seems to be on learning without encountering that learning is easier whilst moving and playing. Wight et al. (2016, 533) and Fischer (2013) found that science-specific language is more common in nature or in environments inspired by nature. The preschools that do have diverse nature preschool yards have better learning opportunities, whilst those with no elements of nature may find it harder to reach the goals of the curriculum. In the latter case, implementing sustainability and environmental education may be held separate from nature activities. To what extent the preschool offers opportunities to reach these goals therefore will be unevenly distributed, depending on where the child is enlisted: *“respect for all forms of life, as well as care for their immediate environment”* (Skolverket 2010, 8), ensure that each child develop *“their understanding of natural science and relationship in nature, as well as knowledge of plants, animals, and also simple chemical processes and physical phenomena”*, develop their interest and understanding *“of the different cycles in nature, and how people, nature and society influence each other”* and *“develop their ability to distinguish document, put question to and talk about natural science”* (Skolverket 2010, 10). Since, children’s access to nature may be a necessity in order to reach the overarching guidelines (Chapter 3.2).

7.2 Diversity matters

The larger more diverse elements such as shrubs, groves, natural slopes, and hills as well as water and varied terrain, contribute to children’s physical and psychological development. In Wight et al. (2016) and Fjørtoft and Sageie’s (2000) comparative studies, they explain how children having these elements during their time in preschool developed better motoric skills and show better abilities to concentrate than children on a traditional playground. The diversity of a forest or a playscape catches children’s interest in exploring, learning and having a greater level of inquiry (Wight et al. 2016, 523) and makes room for non-gendered games (Änggård 2011). The preschool yard, therefore, could be analysed in terms of to what extent it offers a wild environment rather than the number of nature elements it has. Since preschools tend to have structured vegetation such as isolated bushes and trees, these nature elements do not offer enough benefits to children’s play.

Trees and bushes were popular settings for many different types of play in Wight et al. (2016) and Fjørtoft and Sageie's (2000) studies, such as symbolic and constructive play. Therefore, when isolating trees and bushes or replacing nature covers the positive effects that diversity of nature has on children and their play goes to waste. The reason for not having mainly natural ground cover such as grass was in the preschools in the NC of Gothenburg, according to preschool directors, is because nature covers and vegetation quickly get torn when many children are playing on a small area. The director stated that this was a reason why all preschools isolate vegetation. Grass in most cases is therefore replaced by an artificial ground cover of rubber, artificial grass or asphalt. Artificial ground covers were present on all preschools in the NC of Gothenburg which indicates that most preschools have taken the same precautions concerning the wear and tear of the ground covers, or perhaps did not have natural ground cover to start with (the latter might, for example, be the case for those preschools situated within an inner courtyard). If the preschool yard were 30 m²/child suggested by Boverket (Jensfelt 2017), then the preschools may be able to have grass as cover. It seems like almost all preschools in the NC could not meet up to this advice requested by Boverket in their 'complementary guideline to the planning and building act' (Chapter 3.4) saying that: *"the free surface should be so spacious that it without difficulty or risk of extensive wear and tear, can arrange for varied terrain and vegetation conditions"*.

Boverket (2017) also gives out state funds for green initiatives on the preschool yard, but only one preschool in the NC had applied for this support. Still, a wild preschool yard was something that the preschool directors wish for based on the results of the interviews and questionnaire. A gardener was suggested by one preschool director, whom would be hired for the purpose of taking care of the preschool yard. However, currently, 40 % of the preschools in the NC of Gothenburg hardly have any nature elements on their preschool yard which indicate that what they want is not implemented in reality. It may therefore be something else hindering preschool directors to apply for funds supporting green initiatives. But there was one preschool that was an exception, offering a wild-like nature environment.

What can be analysed in the surrounding area is the different size of the forest/groves (Figure 4 in Chapter 6.2) since it may indicate that those preschools that have access to the larger forest have access to greater biodiversity, and therefore give their experience a greater value. Russel et al.'s (2013, 482) study on nature's benefits to human well-being (Chapter 4.3) explains that when viewing a nature area it has an effect on mental health. The nature areas were both structured parks and more diverse nature areas. Therefore, both parks and a forest that is hard to enter, still generate benefits to the children merely by perceiving the nature area. This means that those that

have both the ability to access a forest from their preschool yard and viewing nature from within the preschool reap considerable benefits compared to those that have neither.

7.3 Access to nature

Another challenge to reach nature is also the lower number of accessible parks due to the focus from centrally located preschools of Gothenburg city to create fewer bigger parks, which are used by many people daily. If following the targets in Gothenburg's green strategy (Chapter 3.5) then parks and nature areas should be within a 300 metres reach and ability to access without crossing any motorways, rivers etc. Illustrated in Figure 4 (Chapter 6.2). The area in the north-west part is characterized by hard ground covers, heavy traffic, rivers and lots of people in movement. The area in the middle (slightly east) is characterized by heavy traffic, hard ground cover, river, and by being an area for large events, with stadiums and a cinema. Finally, the area in the south is characterized by varied terrain and residential buildings. Gothenburg, therefore, has great challenges in order to reach their environmental targets.

Nevertheless, the overarching message from contemporary research agrees upon that nature benefit's people in different ways. Therefore, if the urban children do not have close access to nature from their homes such as grassy areas or forest/grove, they then grow up with a distance from nature. Distancing from nature may risk children to spending more time indoors than outdoors and consequently may result in lower possibilities to think creatively or challenge their imagination (Kim 2011). It further creates alienation toward nature, for example, may mud be associated with dirt rather than an element of life. According to the results from the GIS-analysis, five preschools located in the northern part of the NC have no forest/grove within 300 m where two of them have no nature areas within this zone. If the children going to one of these preschools have their homes in a similar setting, then these will have no associates to nature in their daily life. Preschool yards offering a nature, wild environment, in these areas play perhaps an even more important role in terms of providing children their right to experience nature.

Further, the location of the preschools has an impact on children health in terms of daily exposure to bad air quality, noise, UV exposure, and warm temperatures. This suggests that there need to be regulations of for example heavy traffic by preschools or better restrictions on the location of the preschools so that children reap no risk for bad health. The preschools that do not have access to nature during preschool activities in the NC of Gothenburg, therefore, may have risk getting health-related problems, compared to those that have medium or many nature elements and access to a more diverse nature environment. However these findings need to be analysed together with, for example, factors such as distance to heavy roads.

7.4 Group size

Nature areas are not far away from the preschools in the NC of Gothenburg in terms of distance but the result of this study does, however, not encounter other barriers between preschools and nature areas such as large children groups.

The preschool directors explained that one main reason for not being able to go on an excursion to more diverse nature areas or public parks is because the groups of children are too big.

Gothenburg did not manage to lower the preschool groups described in [Chapter 3.5](#), which therefore indirectly affect children's access to nature in the city. The preschool excursion bus suggested by Gothenburg (explained in [Chapter 3.4](#)) may be one way to tackle the barriers that exist today.

The larger question concerns the underlying factors that make the children groups too big for the number of preschool teachers and for the preschool yards. This has to do with the ongoing expansion of cities, namely urbanization and densification of cities which was brought up in the introduction of this study. Urbanisation leads to high pressure on preschools in the city (Nyström 2018). As explained by the chief of education in Gothenburg, the lack of free space and high rents is a big problem for preschools situated in urban areas. It is simply too hard to find space and finance to pay for the space that is available ([Chapter 3.5](#)) (Nyström 2018). Therefore, the situation forces directors to increase the number of children whilst staying in the same facilities. When the state provided the municipalities with financial support to lower the number of groups, it may not be Gothenburg city's own fault that they could not reach this goal, but rather a larger societal issue of fast urbanisation and an expensive housing market. It seems to be a question of a bad history of rural policy in Sweden which has now backlashed onto the children in the cities.

Impediments that were repeated many times throughout the study are: how can the preschool yard enable a diverse nature environment allowing the children to play and explore the environment? How big does a playground need to be in order to resist extensive wear and tear so that artificial ground covers and playground equipment's replace nature on the preschool yard? How many preschool teachers are needed for the number of children to allow for excursions to diverse nature areas?

Based on the results, this study argues that present scientific knowledge is not well implemented in contemporary city planning due to a science-policy gap in the NC of Gothenburg.

7.5 Forest preschools

As the studies on the benefits of outdoor nature education increases, concepts of outdoor nature-based education increased. These are for example called forest kindergartens (Roberts and de Jong 2016), forest-immersion programmes (Fischer 2013) or forest school (O'Brien 2009, 54), I Ur & Skur (Friluftsfremjandet n.d.), among others.

Over 10 % of the Danish preschools are nestled in a forest or other types of natural settings. It started in 1950 where a daily hike in the forest was part of the curriculum for preschools (Stasiuk n.d.). They also notice the importance for children to see the animals and understand where the food they see in the supermarket actually comes from (Stasiuk n.d.). In this nature-based education, they raise awareness and learn about interconnectedness, understanding their place on earth, and in what ways they affect nature.

From the results of this study, it seems that the preschools in the NC of Gothenburg do not consider other factors than safety and security. Teaching children about dangerous conifer or to be careful when climbing on the stone, for example, can instead be part of a child's development. This differs to urban areas, as explained by a preschool director in the NC of Gothenburg, security is of highest value. Removing all things that could result in an accident prevents children from learning and taking precautions. The fear of something bad to happen is valued higher than teaching and trusting. The forest kindergartens in Denmark, therefore, shows the opposite example, the children are free to run in a forest without any fence or harness controlling them and learn to use a knife (Stasiuk n.d.; Roberts and de Jong 2016). Cities, therefore, may trigger a society to be more afraid, this was something that a preschool director also noticed. People tend to be afraid of what they do not know, and humans distancing from nature might result in a growing fear of nature as the unknown. Are we happier and healthier if we are secured inside a fence on a flat asphalt surface or if we have the possibility to go exploring a forest or by digging in the mud or climbing on a stone?

The curriculum for preschools does include an extensive amount of goals on environmental education. However, small children need a better real case demonstration and do not learn by purely listening to a person talk. Children between 3-5 need to feel, see, sense, explore, in order to understand nature's processes. Therefore, O'Brien (2009, 55) suggests that preschools should be organised in a more practical way, and that "children's senses are stimulated by nature and that the experiences form children's relationship with natural areas in a way that is often remembered into adult life", which also was acknowledged by the preschool directors O'Brien (2009, 54).

There are about 200 Ur & Skur schools and preschools in Sweden and this concept have education outdoors and indoors (Friluftsrämjandet n.d.). A study made by Sandell and Öhman (2010, 121-122) explains that there were several positive outcomes from the Ur & Skur preschools, such as ecological interdependence and moral habits. In both the forest school and preschool approach and in Ur & Skur, is the long-term relationship with nature the essential part, which is supported by Lloyd and Gray (2014), Berg (2015), Chawla (2007) and Malone's (2012). Having a better relationship with nature enables a better understanding of how humans affect the environment and the climate, and to begin and focusing on how to adapt to the changes that follow. This is important since we need not only understand our impact on climate but also start focusing on climate change adaptation practices. Children will better understand these types of changes if educated in a more diverse nature environment where they can learn and use their knowledge and competence while building a relationship with nature (Fuller and Irvine 2010, 135; Berg 2015 and Lloyd and Gray 2014).

8 FUTURE RESEARCH

There are an extensive amount of studies on nature's benefits to children, and this is something that the preschool directors are well aware of. According to (Berg 2015, 25) is the most important factors to enable a positive human-nature development are nature's quality and accessibility to it as a child, the adult's engagement in promoting activities in nature, as well as the cultural and societal view of nature. It seems that there is a knowledge-policy gap hindering presence of nature in urban areas. It is thereby a clash between on the one side urbanisation, densification of cities and on the other side nature and children's place in the city. For future research, it would be interesting to interview political leaders on their view on children's place and access to nature areas in cities. Further, what are the obstacles that prevent nature contact in contemporary urban city planning?

Since the study on access to nature areas in the GIS-analyses, it would be interesting to do a similar research but including obstacles such as roads, rivers, and varied topography. The results from this study could, therefore, have become differently if including these other aspects of access to nature.

Another topic that I will suggest is continuing on the focus of air-quality, UV exposure and noise in relation to features of vegetation in the preschool yard and in the nearby environment as well bigger roads.

The final topic focuses on preschool and elderly's facilities and their position in relation to heat waves, for the reason that children and elderly are more vulnerable to warm temperatures which will increase in urban areas due to climate change and heat island effect.

9 CONCLUSION

The nature elements on preschool yards in Gothenburg differs a lot between preschools, some have a wide variety of nature elements whilst some have few or none nature elements. If the surrounding environment offers nature, it is most likely that the preschool yard will also have elements of nature on it. In most cases, the reason for the low number of elements is that there have not been any green initiatives on the preschool yard or that the increasing number of children on too small preschool yards leads to the replacement of nature elements with artificial ones. Large children groups and few ordinary preschool teachers hamper visits to nature areas. Since the small parks are replaced by bigger well-visited ones in Gothenburg it lowers preschools willingness to visit these parks.

The preschool directors indicate strong consciousness of the present scientific knowledge on nature's benefits to children, especially in urban areas. Security reasons and too many children in small preschool yards hinder preschool directors to apply their knowledge in practice.

Based on the results from this study, I argue that there is a science-policy gap that hinders implementation of scientific knowledge in contemporary city planning, thereby hinders children's access to nature in the city.

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APPENDICES

[Appendix 1](#) contains pictures on different types of nature elements, [Appendix 2](#) contains the pictures from the preschools in the NC of Gothenburg, the questions on the interviews and questionnaire is found in [Appendix 3](#) (the interview questions was built up in the same way but was more of a floating discussion), and finally [Appendix 4](#) presents a result table on air, noise and UV exposure on preschool yards, by Västra Götalands Miljömedicinska Centrum.

Appendix 1



Figure 8: The image illustrates an example of the elements shrubs/forest and grove (to the right), varied topography and natural slopes/hills (Lennart Torstensongatan 11). Photo: Viktoria Janovskis.



Figure 9: Huts (image to the left: Baldersplatsen 2 and image to the right: Valhallagatan 4). Photo: Viktoria Janovskis.



Figure 10: The images illustrate a singular and isolated tree (Levgrensvägen 3).
Photo: Viktoria Janovskis.



Figure 11: The images illustrate singular and isolated trees (the two images to the left: Levgrensvägen 3, to the right: Molinsgatan 23). Photo: Viktoria Janovskis.



Figure 12: The image illustrates an example of the elements singular and isolated bush (Hallandsgatan 7).
Photo: Viktoria Janovskis.



Figure 13: The image illustrates an example of the elements singular and isolated bush (Folke Bernadottes Gata 4). Photo: Viktoria Janovskis.



Figure 14: The image illustrates the element rock (Levgrensvägen 3). Photo: Viktoria Janovskis.



Figure 16: The image illustrates an example of the elements natural stuck/heavy and loose materials (Vasa Kyrkogata 7). Photo: Viktoria Janovskis.



Figure 15: The image illustrates natural stuck/heavy materials (Levgrensvägen 4). Photo: Viktoria Janovskis.



Figure 17: The image illustrates cultivation boxes (Folke Bernadottes Gata 4). Photo: Viktoria Janovskis.



Figure 18: The image illustrates an example of the elements natural loose materials and grass (Valhallagatan 4). Photo: Viktoria Janovskis.



Figure 19: The image illustrates an example of the elements varied topography, natural slopes/hills and grass (Vasa Kyrkogata 7). Photo: Viktoria Janovskis.



Figure 20: The image illustrates an example of the elements natural slopes/hills, varied topography and grass (Skånegatan 18). Photo: Viktoria Janovskis.



Figure 21: The image illustrates an example of the element artificial hard ground cover: a wooden deck and a sandpit (Hallandsgatan 7). Photo: Viktoria Janovskis.



Figure 22: The image illustrates an example of the element artificial ground cover of rubber and artificial hard ground cover (asphalt) (Levgrensvägen 3). Photo: Viktoria Janovskis.

Appendix 2



Figure 23: Lilla Samskolan. Photo: Viktoria Janovskis.



Figure 24: Molinsgatan 23. Photo: Viktoria Janovskis.



Figure 25: Vasa Kyrkogata 7. Photo: Viktoria Janovskis.



Figure 26: Folke Bernadottes Gata 4. Photo: Viktoria Janovskis.



Figure 27: Lasarettgatan 7A. Photo: Viktoria Janovskis.



Figure 28: Nedre Kvarnbergsgatan 17. Photo: Viktoria Janovskis.



Figure 29: Färgaregatan 7. Photo: Viktoria Janovskis.



Figure 30: Friggagatan 3B. Photo: Viktoria Janovskis.



Figure 31: Baldersplatsen 2. Photo: Viktoria Janovskis.



Figure 32: Levgrensvägen 3. Photo: Viktoria Janovskis.



Figure 33: Skånegatan 18 (one out of two preschool yards). Photo: Viktoria Janovskis.

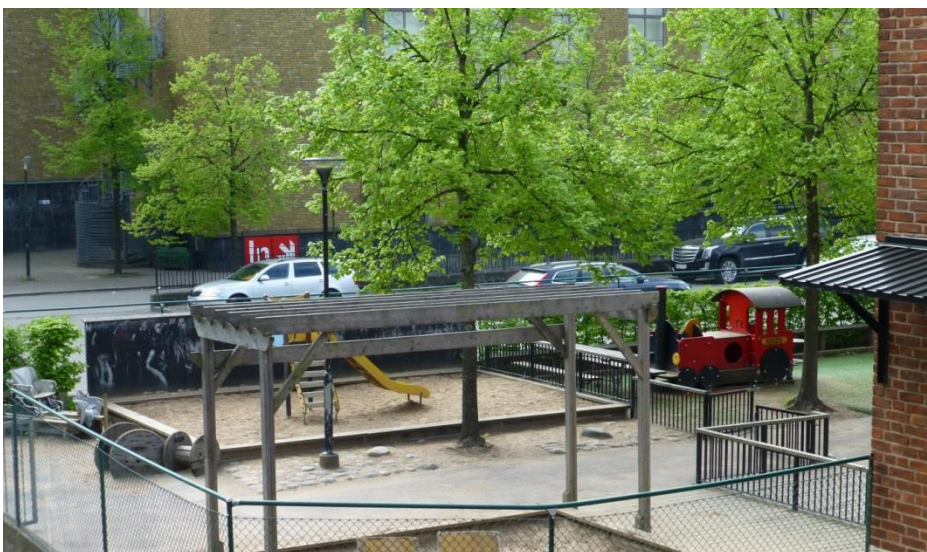


Figure 34: Skånegatan 18 (one out of two preschool yards). Photo: Viktoria Janovskis.



Figure 35: Hallandsgatan 7. Photo: Viktoria Janovskis.



Figure 36: Valhallagatan 4. Photo: Viktoria Janovskis.



Figure 37: Engelbrektskatan 34E. Photo: Viktoria Janovskis.



Figure 38: Lennart Torstenssonsgatan 11. Photo: Viktoria Janovskis.

Appendix 3

Natur i Förskolan (see further down for English version)

Förskolechefers attityder till natur i förskolan

1. I hur många år har du arbetat som förskolechef?
2. I hur många år har du arbetat inom förskolan och/eller skolan?
3. Har du några personliga intressen, i så fall vad då?
4. Har du tidigare stött på konceptet "gröna skolgårdar"?

Markera endast en.

Ja Nej Kanske

5. Om ja, i vilket sammanhang och vad tänkte du om konceptet? Om nej, vad tror du konceptet innebär?

Del 1

Barns relation till naturen

6. Berätta om hur du ser på barns relation till naturen:
7. Är barns relation till naturen något du tycker är viktigt?

Markera endast en.

Ja Nej Ganska

8. Varför är barns relation till naturen viktigt/inte viktigt?

9. Tror du barns relation till naturen har ändrats över tid? Exempelvis från 50-20 år sedan till idag. I så fall på vilket sätt och varför?

Del 2

Förskolegården

10. Hur kan förskolans utomhusmiljö påverka barns relation till naturen?

11. Vilken effekt tror ni naturliga element så som träd, buskage, vatten och jord har på barns rörlighet och lek?

12. Vilken effekt tror ni att naturliga element har på barns kreativitet och fantasilek?

13. Vad finns det för andra faktorer (utanför förskolan) som kan påverka barns kontakt med naturen?

Del 3

Grön undervisning

14. Vad för typ av platser besöker ni om ni går på utflykt med förskolegruppen?

15. Anser ni att naturen (så som skogen) är lätt att nå från er förskola?

Markera endast en.

Ja Nej Ganska

16. Finns det något som hindrar er att gå ut i naturen? I så fall vad?

17. Har ni odlat med barnen?

18. Till vilken grad anser ni att ni uppfyller följande delmål i läroplanen: "...utveckla barnets intresse och förståelse för naturens olika kretslopp och för hur människor, natur och samhälle påverkar varandra"?

Markera endast en.

Inte alls 1 2 3 4 5 Fullt ut

19. Vilka hinder finns för att uppnå delmålet? Vad bidrar till att uppnå delmålet?

20. Till vilken grad anser ni att ni uppfyller följande delmål i läroplanen: "...utveckla barnets förståelse för naturvetenskap och samband i naturen, liksom sitt kunnande om växter, djur samt enkla kemiska processer och fysikaliska fenomen"?

Markera endast en.

Inte alls 1 2 3 4 5 Fullt ut

21. Vilka hinder finns för att uppnå delmålet? Vad bidrar till att uppnå delmålet?

22. Till vilken grad anser ni att ni uppfyller följande delmål i läroplanen: "...utveckla barnets förmåga att urskilja, utforska, dokumentera, ställa frågor om och samtala om naturvetenskap"?

Markera endast en.

Inte alls 1 2 3 4 5 Fullt ut

23. Vilka hinder finns för att uppnå delmålet? Vad bidrar till att uppnå delmålet?

24. Bidrar er skolgård till att uppnå dessa mål? I så fall hur?

25. Bidrar er närmiljö till att uppnå dessa mål? På vilket sätt?

Avslutning

26. Finns det diskussioner om att göra skolgårdar i centrum grönnare?

27. Finns det bidrag till gröna initiativ på skolgårdar?

28. Om ni fick välja helt fritt, hur skulle er optimala utomhusmiljö för barn se ut?

29. Finns något mer ni skulle vilja tillägga:

Nature in Preschools

Attitudes among the preschool directors toward nature in the preschool

1. In how many years have you been working as a preschool director?

2. During how many years have you worked education, preschool, school?

3. Do you have any interests or hobbies? If so, which?

4. Have you previously heard the concept "green schoolyards"?

Only mark one.

Yes No Maybe

5. If yes, in which context and what did you think of the concept? If no, what do you think the concept means?

Part 1

Children's relationship to nature

6. Explain your view on children's relationship with nature:

7. Is children's relationship with nature something you find important?

Only mark one.

Yes No Maybe

8. Why is children's relationship with nature important/not important?

9. Do you believe children's relationship with nature have changed over time? Say 50-20 years from now. If so, in what way and why has it changed?

Part 2

The preschool yard

10. How can the preschool outdoor environment affect children's relationship with nature?

11. What effect do you think nature elements such as trees, bushes, water and mud have on children's movement and play?

12. What effect do you think nature elements have on children's creativity and fantasy play?

13. Are there any other factors (outside the preschool) that can influence children's contact with nature?

Part 3

Environmental education

14. What type of setting do you visit when going on excursions with the preschool group?

15. Do you believe that nature (such as a forest) is easy to reach from your preschool?

Only mark one.

Yes No Maybe

16. Are there any obstacles that prevent excursions to nature areas? If so, which?

17. Have you been growing any vegetables or plants with the children?

18. To what extent do you believe you meet up to the following goals in the curriculum for preschools: ... “Develop their interest and understanding of the different cycles in nature, and how people, nature and society influence each other”?

Mark only one.

Not at all 1 2 3 4 5 Fully

19. What are the obstacles preventing you to reach this goal? What contributes to reaching this goal?

20. To what extent do you believe you meet up to the following goals in the curriculum for preschools: ... “Develop “their understanding of natural science and relationship in nature, as well as knowledge of plants, animals, and also simple chemical processes and physical phenomena”?

Mark only one.

Not at all 1 2 3 4 5 Fully

21. What are the obstacles preventing you to reach this goal? What contributes to reaching this goal?

22. To what extent do you believe you meet up to the following goals in the curriculum for preschools: ... “Develop their ability to distinguish document, put question to and talk about natural science”?

Mark only one.

Not at all 1 2 3 4 5 Fully

23. What are the obstacles preventing you to reach this goal? What contributes to reaching this goal?

24. Does your preschool yard enable you to reach the goals in the curriculum for preschools, if so, in what way?

25. Does your nearby environment enable you to reach the goals in the curriculum for preschools, if so, in what way?

End

26. Are there any discussions concerning making the preschool yards having more nature elements in the NC of Gothenburg?
27. Is there any financial support aimed for green initiatives on preschool yards?
28. If you are free to choose, how would your optimal schoolyard be designed? What elements should it contain?
29. Is there anything you would like to add?

Appendix 4

Table 5: Results on the area Centre on UV exposure, noise and air on the preschools in Gothenburg performed by VMC (Hulth et al. 2016, 40-41). The colours indicate if the preschools have good (green), acceptable (yellow) or adequate (red) sun, noise and air quality. The study does not have results on Lilla Samskolan. Montessoriförskolan Centrum does not have a preschool yard.

	Total		NC	
	202		14	
UV EXPOSURE				
	Number	%	Number	%
Good	77	38 %	10	71 %
Acceptable	76	38 %	1	7 %
Inadequate	49	24 %	3	21 %
NOISE				
	Number	%	Number	%
Good	101	50 %	5	36 %
Acceptable	78	39 %	9	64 %
Inadequate	23	11 %	0	0 %
AIR				
	Number	%	Number	%
Good	180	89 %	1	7 %
Acceptable	22	11 %	13	93 %
Inadequate	0	0 %	0	0 %