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ECOSYSTEM SERVICES IN THE URBAN SPACE: A CASE STUDY OF THE FOLKPARKEN & JULIVALLEN DENSIFICATION PROJECT IN HÖGANÄS MUNICIPALITY

EKOSYSTEMTJÄNSTER I DET URBANA RUMMET: EN FALLSTUDIE AV HÖGANÄS KOMMUNS FÖRTÄTNINGSPROJEKT FOLKPARKEN OCH JULIVALLEN

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Ecosystem services in the urban space:
A case study of the Folkparken & Julivallen densification project in Höganäs municipality.

Ekosystemtjänster i det urbana rummet:

En fallstudie av Höganäs kommuns förtätningsprojekt Folkparken och Julivallen.

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ABSTRACT

This thesis focuses on how a smaller Swedish municipality (Höganäs) works with ecosystem services. It is based on the Folkparken & Julivallen densification project and is divided into three parts. The first explains, from a theoretical perspective, how ecosystem services interact with community and national planning structures. The second focuses on the Folkparken & Julivallen project and explores, in depth, how ecosystem services were incorporated into planning from a retroactive perspective. The third is a comparative analysis of the Folkparken & Julivallen project and two similar projects in another Swedish municipality (Lomma). The findings highlight that the Höganäs densification project was particularly successful in ensuring that important values were protected and supported the development of regulatory ecosystem services. Areas for improvement included: the basis for meeting the challenges of ecosystem services, the municipality's attitude to solving problems, and the priority given to the order in which different solutions were proposed and implemented. The comparison with Lomma found that it was better than Höganäs with respect to using working methods based on green solutions, adapting projects to nature, and improving and protecting natural values and ecosystem services.

SAMMANFATTNING

Syftet har varit att fokusera på att undersöka hur en mindre skånsk kommun arbetar med ekosystemtjänster i en förtätningskontext och har utgått ifrån exemplet Folkparken och Julivallen i Höganäs kommun. För att kunna genomföra denna process har uppsatsen delats in i tre delar, en del som förklarar utifrån ett teoretiskt perspektiv hur ekosystemtjänster samverkar med samhällsplanering och den svenska planeringsstrukturen. Den andra delen fokuserar sig på fallstudien kring Folkparken och Julivallen, och gör en djupdykning i hur processen gått till att ta framplanhandlingarna i samband med ekosystemtjänster utifrån ett retroaktivt perspektiv. Den tredje delen handlar om en jämförelseanalys mellan Folkparken och Julivallen med två liknande projekt i en annan svensk kommun nämligen Lomma. I samband med en workshop av Mistra Urban Futures, diskuterade olika resonemang hur kommunerna arbetar med ekosystemtjänsterna och denna workshop ligger för grund till jämförelseanalysen. Det som Höganäs kommun gjorde bra i sitt förtätningsprojekt var att skydda viktiga värden och utveckla de reglerande ekosystemtjänsterna i området. Det som kunde förbättras var: grunden för att möta de utmaningar som ekosystemtjänster har, attityden att lösa problem med ekosystemtjänster och prioriteringar i vilka lösningar som föreslås och blir implementerade. Det som Lomma kommun gjorde bra jämfört med Höganäs kommun var att använda arbetsmetoder baserade på gröna lösningar, anpassa projekt efter naturen samt förbättra och skydda naturvärden och ekosystemtjänster.

Contents

1. INTRODUCTION AND PROBLEM DESCRIPTION

Researchers and practitioners promote ecosystem-based approaches to urban planning at international, national and local levels. However, at the local level, methods to support these approaches are scattered, and measures are neither systematic nor comprehensive (Beery et al. 2016). At the theoretical level, the concept of ecosystem services (ES) has been developed; however, research focuses on the relationship between human and nature, and not on practical matters such as societal structures. The latter include administrative and political structures, community institutions and the urban planning process (Nordin et al. 2017). Urban planning uses the ES concept to describe human-based relationships with nature; applications include biodiversity, climate change and human well-being (Grimm et al. 2008). Integration between urban planning and ES is a challenge, however, and it is not clear how the theoretical concept of ES can be applied in practice by city planners.

Zölch (2018) notes that the concept of ES emerged in the 1970s, when researchers sought to raise public awareness of biodiversity and nature conservation. She also describes how it is used in adaptation as a basis for understanding how humans can benefit from nature. The *Ecosystems and Human Well-being* report prepared by the Millennium Ecosystem Assessment Board (MA 2005) was the first global evaluation of ES aimed at the political arena. In the domain of urban planning, this international assessment has had a huge impact on how cities can reduce their ecological footprint and improve biodiversity.

ES can be defined in various ways. This thesis adopts the following description used by the Swedish Environmental Protection Agency (*Naturvårdsverket* in Swedish):

> "Ecosystem services are the benefits humans gain from nature's work. Plants clean the air, bushes dampen noise, bees pollinate crops and nature improves our health. The city's lawns clean heavy metals and harmful particles from rain and snow, and bacteria and worms make the earth fertile" (Naturvårdsverket, 2018, own translation).

The Agency's definition divides the overall concept into four categories: *supporting*, *provisioning*, *regulating* and *cultural*, as follows:

> "Supporting: Services necessary for the production of all other ecosystem services, for instance photosynthesis.

> Provisioning: Products obtained from ecosystems, for instance food.
>
> Regulating: Benefits obtained from the regulation of ecosystem processes, for instance climate regulation.
>
> Cultural: Nonmaterial benefits obtained from the ecosystem, for instance educational." (Naturvårdsverket, 2018, own translation).

In an urban planning context, Wamsler et al. (2016) argue that there must be more links between ES and political structures in order to support work in the domain of sustainability. Consequently, municipalities need to invest more in on-the-ground operations when working towards a sustainable city.

Against this background, this thesis also examines the linked terms *nature based solutions* (NBS) and *urban green infrastructure* (UGI). Nesshöver et al. (2017) note that the NBS concept was introduced specifically to promote nature and provide solutions to climate mitigation and adaptation challenges. Policymakers in Europe have adopted the term, and integrated it into various documents and policies, notably the Horizon 2020 Framework Programme for Research, which offers a new perspective on how ES and biodiversity can become goals for sustainable growth and job creation. In the urban planning context, NBS are a new opportunity to sustainably transform cities. Albert et al. (2019) provide an example of NBS implementation; in their case the problem relates to water management challenges associated with the Lahn river in Germany. They write:

> "We define NBS as actions that alleviate a well-defined societal challenge (challenge-orientation), employ ecosystem processes of spatial, blue and green infrastructure networks (ecosystem processes utilization), and are embedded within viable governance or business models for implementation (practical viability). Our conceptual framework illustrates the functions of NBS in social-ecological landscape systems, and highlights the complementary contributions of landscape planning and governance research in developing and implementing NBS".

In the context of UGI, Pauleit et al. (2011) argue that, "The concept is applied as a planning approach that aims to develop coherent networks of green spaces and contributes to the resilience of urban ecosystems; the goal is to provide services to maintain or restore ecological functions". Similarly, Zölch (2018) describes UGI as a popular urban planning tool designed

to combat, for example, heat stress and climate change impacts. Zölch notes that although the term is useful, there are problems. For example, which UGI are most effective in terms of climate change mitigation and improving ES? Urban planners must often decide what UGI will be the most useful in area *X*. However, she argues, planners' choices are limited by, for example, spatial, administrative and economic constraints. A consequence is that large-scale UGI solutions are not proposed.

This thesis will also address public participation in urban planning with respect to sustainability and ES. The issue is important given that residents can influence the design of building projects and other environmental work. Against this background, we draw upon a Swedish case study of *detailed planning*. The Swedish Planning and Building Act (SFS 2010: 900) stipulates that detailed planning must include consultations with inhabitants. Local municipalities must consult with affected residents and relevant authorities. On the other hand, the law does not describe what form this consultation must take and the lack of clarity has divided opinion between those who think public participation is helpful – and those who do not.

More specifically, this thesis investigates how ES can be applied to a densification project. It focuses on a case study in a small town located in the municipality of Höganäs, in the county of Skåne, in southern Sweden. Höganäs is situated close to the bigger city of Helsingborg and has approximately 26,000 inhabitants (Höganäs kommun 2018). The study also compares the project undertaken in Höganäs with two others undertaken in the municipality of Lomma, located in the same county. The aim is to demonstrate differences and similarities between the two municipalities regarding how they work with ES in urban planning.

1.1 PURPOSE, AIM AND RESEARCH QUESTIONS

The purpose of this thesis is to highlight opportunities and challenges regarding the integration of ES into everyday urban planning, taking the example of a densification project. It begins by discussing various theories that give an overview of the challenges related to the use of ES in urban planning. Secondly, it presents a case study of the municipality of Höganäs, in particular the Folkparken & Julivallen densification project. This study provides a concrete example of how a small municipality can use ES. The results illustrate the strengths and weaknesses of the work through a comparison with two similar projects in another municipality in the same county. The thesis seeks to answer the following three questions:

- From a theoretical perspective, how can urban planning and ES work together in densification projects to create sustainability?
- How have ES been applied in the context of urban planning in a smaller municipality in Sweden, taking the example of the Höganäs densification project?
- What are the similarities and differences between the implementation of the Folkparken & Julivallen project and similar projects in Lomma?

1.2 METHODOLOGY AND MATERIALS

The first part of this study explores the theoretical background to the use of ES in urban planning in the context of a densification project. The ES literature was reviewed, based on databases maintained by the Swedish University of Agricultural Sciences library. Keywords were "urban planning", "urban green infrastructure", "nature-based solution", "ecosystem services", "Höganäs municipality" and "sustainability". It goes on to present a brief overview of how the ES concept is used in urban planning in a densification project. The terms NBS and UGI are also described for completeness. Hart (2018) notes the importance of having a full overview of the literature, notably "the current knowledge, including material findings, as well as theoretical and methodical contributions to a particular topic".

The second part is a case study of Höganäs. This small municipality has limited resources compared to bigger neighbours such as Malmö. It therefore provides an interesting context for the analysis of ES practices in a densification project. Flyvbjerg (2011: 301) describes the case study method as follows, "An intensive analysis of an individual unit (as a person or community) stressing developmental factors in relation to environment". Furthermore, Denscombe (2000: 42) notes that case studies are based on the fact that "social relationships and processes tend to be linked to and mutually affect each other", arguing that "the case study can investigate the situation as a whole by identifying how different constituents are linked and effect each other" (*ibid*.). Bryman (2002) states that the case study method can be used to conduct a theoretical analysis.

Method triangulation is a term used by Denscombe (2000: 102) to describe a strategy that allows the researcher to use several methods to collect a wide range of material, arguing that this offers the researcher a clearer perspective on how the use of different sources can add value. Therefore, this thesis draws upon three data collection methods: the first is theoretical; the second is empirical; and the third is participant observation. These three methods are

expected to complement and strengthen each other.

In May 2018, Höganäs held a workshop (with the help of the Mistra Urban Futures project) to discuss the Folkparken & Julivallen project from the perspective of ES, NBS and UGI. The author of this thesis used the opportunity to carry out a participatory observation. Other participants included researchers from Lunds University and local planners from Lomma, Malmö City, Kristianstad and Eslöv municipalities. The aim was to create a model or develop a tool to compare how different municipalities work with ES in urban planning, and the analysis was used to answer the third question addressed by this thesis. Ørngreen & Levinsen (2017: 72) note that there are different types of workshops. Here, we adopt the "Workshops as research methodology" method, which they describe as follows:

> "Focus on the study of domain related cases using the workshop format as a research methodology. In these studies, the workshop is, on [the] one hand, authentic, as it aims to fulfil participants' expectations to achieve something related to their own interests. On the other hand, the workshop is specifically designed to fulfil a research purpose: to produce reliable and valid data about the domain in question".

1.3 SELECTION AND SHORT DESCRIPTION OF CASES

Cases were selected based on the author's knowledge of Höganäs municipality. I began working as a planning architect in Höganäs in November 2016 (and still do) and contributed to the detailed plan for Folkparken & Julivallen. I was offered an opportunity to prepare an article about the Folkparken & Julivallen project for the Mistra Urban Futures programme (details below) and Lunds University. I consequently came into contact with colleagues at Lomma municipality and saw an opportunity to present the case from an ES point of view, and compare Höganäs with Lomma.

Höganäs is a coastal municipality, located in the northwest part of the Swedish province of Skåne. It is bordered to the north by the Kattegatt sea and to the west by the Öresund strait. There is a land border with the municipality of Helsingborg to the south, and the municipality of Ängelholm lies to the east. The largest conurbation is Höganäs city (population around 15,500), which was created in 1971 following the amalgamation of Brunnby and Jonstorp. The municipality is situated on the Kullen peninsula and is home to various important natural and animal species, which are protected in national reserves. The area is dominated by farmland

and rural zones. There are six smaller towns: Viken (population around 4,500), Jonstorp (around 2,000), Arild (around 700), Mölle (around 600), Mjöhult (around 330) and Farhult (around 300). The total population is around 26,000 (Höganäs kommun 2018). The municipality's website presents this short history:

> "At the end of the 17th century, coal mining began in Höganäs, which at that time was a simple fishing community. In 1797 a mining industry started and a mining community grew. This was the origin of today's Höganäs AB, which now manufactures iron powder, among other things. In 1798, a railroad was constructed between the mines and the port of Höganäs. A few years later, the wooden rail was replaced by metal and Sweden got one of its first railways" (author's translation).

The Folkparken & Julivallen project is situated in the centre of the town of Höganäs (Figure 1A) and covers an area of just over 60,000 m^2. The *Folkparken* is one of the town's biggest parks and has a long history; the *Julivallen* was the town's sports stadium (Figure 1B).

The following ES were analysed and described: cultural (recreational, historical and cultural values); regulating (water management/ regulation, climate adaption/ regulation); and supporting (biodiversity). The Folkparken & Julivallen project was compared with two projects in Lomma, which is another smaller municipality in Skåne.

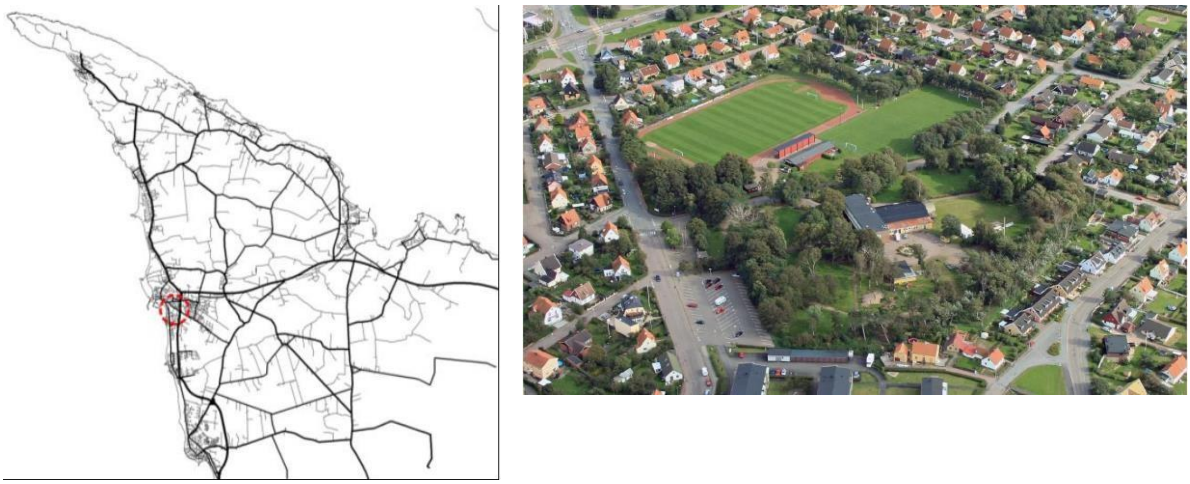


Figure 1 A and B. The location of the Folkparken and the Julivallens stadium. Copyright Höganäs Kommun 2015.

Lomma was created in the 1960s by the fusion of two smaller municipalities (Lomma and Flädie). It had 24,200 residents in early 2018. It is part of StorMalmö (Greater Malmö), which

is the largest city in the region. It borders the Öresund strait to the west, the municipality of Kävlinge to the north, Lund and Staffanstorp to the east and, finally, Burlöv to the south (Figure 2). Lomma and Bjärred are the largest cities, with approximately 12,600 and 9,900 inhabitants respectively (Lomma kommun 2018).

Figure 2 Location of Lomma in the county of Skåne. Copyright Lomma kommun 2018

1.4 SCOPE

Nahlik et al. (2012) argue that the consideration of ES in local planning needs to be more strategic. Furthermore, Nordin et al. (2017: 3) note:

> "Previous studies have also shown that small municipalities tend to have less developed environmental works than do large ones, e.g., in terms of having locally set up environmental targets, fulltime employed staff responsible for environmental issues, etc., which to a large extent is due to a lack of competencies and financial resources".

These considerations led to the focus on the densification project and the comparison with projects in Lomma. Another factor was that Lomma was part of the Mistra Urban Futures programme, and the observation that the research method had been tested on their projects. Moreover, Lomma has other features in common with Höganäs: the two municipalities have a similar number of inhabitants, demographics and economics, and Moderaterna (the Swedish conservative party) controls the council. In both cases, similar ES were implemented: water regulation, climate adaption and cultural. This thesis also briefly addresses public participation

in the Swedish planning process. In particular, it describes how, in the Folkparken & Julivallen project, green planning/ ES affected residents.

2. THEORETICAL BACKGROUND

This theoretical background is divided into six parts that provide an overview of ES in urban densification planning. First, it discusses ES in urban areas; second, it focuses on ES in Swedish municipalities, notably the challenges and problems they face; third, it looks at densification and ES, fourth, NBS; fifth, UGI and, finally, public participation in Swedish urban planning.

2.1 ESS IN THE URBAN SPACE

As noted in the introduction, ES are generally defined as the benefits humans obtain from ecosystems (MA, 2005). The Swedish Environmental Protection Agency (2018) has further divided the concept into four categories: *regulating*, *provisioning*, *cultural* and *habitat/ supporting*. Regulating ES are relevant, for instance, to climate adaption as they can directly moderate climate, while the other categories have either indirect or direct effects on human wellbeing. This thesis focuses on cultural, regulating and supporting services.

2.1.1 CULTURAL ES

Cultural ecosystem services (CES) are, according to the United Nations (2019):

> "The non-material benefits people obtain from ecosystems are called 'cultural services'. They include aesthetic inspiration, cultural identity, sense of home, and spiritual experience related to the natural environment. Typically, opportunities for tourism and for recreation are also considered within the group. Cultural services are deeply interconnected with each other and often connected to provisioning and regulating services: Small scale fishing is not only about food and income, but also about fishers' way of life. In many situations, cultural services are among the most important values people associate with Nature – it is therefore critical to understand them."

CES are important in developing sustainable cities, especially when residents have few opportunities to connect with nature. Urban green space and natural environments have a huge impact on human wellbeing, although Dickson and Hobbs (2017) note that little is known about the qualitative benefits. The latter authors describe CES as "less tangible benefits".

Furthermore, they state that, “CES have tended to be characterized by intangibility and incommensurability, when perhaps the most distinguishing features are the form and extent of human-environment co-production, and association between CES and held values”. CES challenges are ongoing as urbanization increases, and it is becoming even more important to include and understand non-economic CES and how they affect wellbeing.

Why, then, is it so hard to describe CES in urban areas? According to James (2015), evidence is lacking regarding the benefits that people derive from CES such as places, events or processes. Stålhammar and Pedersen (2017), like James (2015) argue that they “[are] often dependent on a particular place rather than a type of place and the service it gives rise to cannot be seen as a separate function”. MA (2005) describes CES as, “socio-cultural values [that] are assumed to be quantifiable and correlational to ecological functions and structures”. Stålhammar and Pedersen (2017) argue that this definition creates conflict due to the “conflation of ‘nonmaterial’ values with the calculable benefits of CES”. Examples of nonmaterial benefits are spiritual enrichment, cognitive development, reflection, recreation, and aesthetic experiences.

2.1.2 REGULATING ECOSYSTEM SERVICES

Regulating ecosystem services (RES) are, according to the United Nations (2019):

> “Maintaining the quality of air and soil, providing flood and disease control, or pollinating crops are some of the ‘regulating services' provided by ecosystems. They are often invisible and therefore mostly taken for granted. When they are damaged, the resulting losses can be substantial and difficult to restore.”

Although, as MA (2005) notes, RES usually benefit human well-being indirectly, many are also created or delivered by a range of co-production processes. Water management is one example. Carpenter et al. (2006) highlight the importance of including RES, which have generally been underappreciated due to a focus on ecological management or CES. Raudsepp-Hearne et al. (2009) echo this idea, and argue that the lack interest in RES has affected their development. For instance, sustainable ecological research usually gives pollination and carbon sequestration as examples, but there is no mention of RES. A consequence is that the systematic use of the term is neglected in research. From a more practical perspective, the consequence of this lack of research interest is that urban planners do not use RES in their work. Raudsepp-

Herane et al. (2009) illustrate this point with the example of provisioning and CES; increasing soil biodiversity to increase nutrient availability exploits the link between the two forms of ES with mutual benefits.

When ES are under pressure, resilience is crucial for survival. Under rapid climate change, it is even more important that the structure and function of the system are maintained (Foley 2005). Little is known about what confers resilience in an ES—on the other hand, it is well-established that dynamic, external forces are driving dramatic change. It is therefore important to include RES at an early stage in the planning process in order to discover what is necessary for survival and to support another ES (Raudsepp-Herane et al. 2009).

2.1.3 SUPPORTING ECOSYSTEM SERVICES

Supporting ecosystem services (SES) are, according to the United Nations (2019):

> "Providing living spaces for plants or animals and maintaining a diversity of plants and animals, are 'supporting services' and the basis of all ecosystems and their services."

The process and the concept of ES (especially SES) are closely linked to biodiversity in urban areas. Our understanding of nature depends on our knowledge of the relationship between ES and biodiversity, especially in the context of climate adaptation where the effect of, for instance, biodiversity loss has increased the value of ES (Diaz et al. 2006, Cardine et al. 2006). García-Mora and Montes (2011) and Schröter et al. (2014) argue that the integration of ES into urban planning policy has increased, leading to diverging opinions regarding whether they are relevant – or not.

Research into the link between biodiversity and ES has focused mostly on the contribution of habitats to different ES and individual species. More recent studies have extended this to genotypes, populations, functional groups and ecosystem trends (Diaz el al. 2006). Functional diversity is, according to de Bello et al. (2010), key to understanding the relationship between ES and biodiversity. Research has investigated everything from individual and group species, to a few species in multiple ecosystems (Conti and Diaz 2013). Lavorel (2013) took another approach. Her work highlights the value of identifying specific links between ES and biodiversity, such as between species, ecosystem processes and ES delivery. Her results illustrate the complexity of the relationship between the two concepts. Population is another

factor that plays a role in the relationship between biodiversity and ES. As the urban population increases, green spaces disappear (Harrison et al. 2014). Consequently, researchers such as Luck et al. (2003), Karmen (2005) and Bullock (2011) have created tools to help city planners protect green areas. Harrison et al. (2014) describes this in detail:

> "This was first highlighted by Luck et al. (2003), who proposed the concept of a Service Providing Unit (SPU) to describe the ecological unit which provides the ecosystem service. Subsequently, Kremen (2005) suggested identifying Ecosystem Service Providers (ESP) and the concepts were combined into the SPU–ESP continuum by Luck et al. (2009), showing how the ESP concept can be applied at various levels, for example population, functional group and community scales".

The importance of the link between the two terms is crucial in arguments about sustainable cities. It can, for instance, lead to efforts to restore and protect areas of ecological value (Bastian 2013). Success would be a huge boost for biodiversity conservation, and would automatically increase the delivery of ES (Palomo et al. 2014). Despite recent progress, Balvanera et al. (2014) argue that more research is needed due to uncertainty about the complex interlinkages between the two terms. Schröter et al. (2014) state that the consequence of this complexity is that current knowledge does not integrate both aspects. Finally, Harrison et al. (2014) note that our poor understanding of the two terms has made it difficult to establish a quantitative relationship, while only a few studies have used empirical evidence.

2.2 ES IN URBAN PLANNING – A SWEDISH PERSPECTIVE

To understand how Swedish municipalities, use ES in their urban planning, it is crucial to understand how urban planning is governed at a national level. Both spatial and urban planning are regulated by the Swedish *Planning and Building Act* (SFS 2010: 900). Under this Act, municipalities can decide their own spatial and urban planning policy (Boverket 2016). Two types of planning are provided for under Swedish law. The first concerns *comprehensive plans*, which operate at a strategic level and can be described as guidelines for the future. Their purpose is to set out the long-term agenda for the development of the municipality. Although they are not legally binding, Swedish law stipulates that all municipalities must have one, and it must meet criteria described in the Act. The second type of planning is local plans, also called *detailed plans*, which concern issue specific to the municipality. These plans regulate, for

instance, the use of water and land, and municipalities can decide rights and responsibilities within the planning area. Unlike the comprehensive plan, the detailed plan is legally binding (Boverket 2014).

Other documents that affect both urban planning and ES are policies that provide the background to comprehensive and detailed plans. Examples include the traffic plan, the cultural plan, the park plan and the energy plan (Boverket 2016). Nordin (2017) notes that, "to consider ES in planning […] at lower levels, e.g., local plans, it has been argued that the ES concept needs to be included in strategic, guiding documents such as the comprehensive plans". This point has been noted in interviews with municipal staff (land use planners) working on comprehensive plans (Delshammar 2015).

At national level, in 2012 the country had only set two objectives regarding ES. One was "a call for the identification of important ES" and the other pointed out that "the importance of biodiversity and the value of ecosystem services should be known and integrated in economic positions, political considerations and other planning decisions in society by 2018". In 2013, the Ministry of the Environment's report discussed how ES could be included and improved. In 2014, the Swedish Parliament adopted *A Swedish Strategy for Biodiversity and Ecosystem Services* (Prop. 2013/14: 141) that included, for example, guidelines for regional and local authorities regarding how they should work with ES to reach the United Nation's Aichi Biodiversity Targets (UN 1992) and the European Union's 2020 strategy for biodiversity (EC 2011). However, Delshammar (2015) highlights that two municipalities (Örebro in 2010 and Malmö in 2014) had already included ES in their comprehensive plan, but that

> "a government bill approved by the Swedish Parliament limits the scope of the municipalities' authority when it comes to setting environmental goals in the planning process. Thus, it is at the moment unclear how strong governmental or legal support the Swedish municipalities have to enforce the ecosystem service perspective in spatial planning."

Wamsler et al. (2016) make similar arguments. They write,

> "In accordance with Sweden being a declared forerunner and pioneer in both environmental and climate-change planning, ecosystem- based approaches are to some extent already integrated into strategic adaptation planning. However, because of the sporadic nature of the

> implementation of these plans, and the lack of clear responsibilities for adaptation, the implementation of planned measures is limited".

Furthermore Wamsler et al. (2016) argue that Sweden struggles at the operational level; they give the example of blue infrastructure, which has had little impact. The reasons for this, according to the authors, are project-based applications that have led to experimental approaches and a lack of established thinking. Howlett and Cashore (2009) note that policy documents that indicate the planning paradigm are not used systematically. The ES concept was adopted in 2005 by the Millennium Ecosystem Assessment Board. At municipal level, planners are guided by their own comprehensive plan, which can lead to confusion. Nordin et al. (2017) note that, "Previous studies have shown that the ecosystem services concept can occur in different ways in municipal planning documents: explicitly (concepts mentioned directly and given a name) or implicit (concepts described but not given a name)."

Nin et al. (2016) argue that making the development of ES an urban planning goal would increase the value given to nature in urban politics and support the adoption of green values. Delshammar's (2015) study of ES in Swedish municipalities showed that the term was well-known by urban planners, but its usage remained limited. This lack of support for ES has been ascribed to various factors, however Delshammar (2015) notes:

> "Very few seem to regard it as a political issue that has to do with values and beneficiaries. A dominant view among planners is that this is an issue to be solved by experts not politicians. None of the responding planners expressed the view that ecosystem services based on spatial planning is something that demands negotiations between different stakeholders and different societal needs".

The above quote highlights two interesting points: the fact that urban planners prefer a top-down perspective in the form of authoritarian government; and that the issue is technical and should be solved with planning tools. Another challenge, he notes, is the lack of practical experience. ES is a theoretical term that has not been tested in practice, and urban planners are hesitant to begin. Delshammar (2015) goes on to say,

> "the government as well as municipal planners are determined to start to use the perspective. The engagement is to some extent fuelled by governmental decisions, but likely also by a professional interest in planning as a (visionary) holistic project. The idea of taking a holistic

> view on planning, including the values of nature, is since long integrated in a Swedish planning tradition and legislation".

Hysing and Lidskog (2018) studied urban planning and ES in Sweden. Their findings show that the term has been accepted on an abstract level, but not in practice. The main point of difficulty is how to place a value on nature. Municipalities struggle to see how to use ES as a tool in the absence of clear legislation, and the decision to adopt it often comes down to a question of time and money. Hysing and Lidskog (2018) argue that the debate needs to move on to the broader question of the importance of nature for society. Questions such as biodiversity loss demand changes to traditional legislation and increased integration of ES into urban planning. If Sweden is to implement ES policy in practice, it must begin to transform sustainability goals into reality.

2.3 DENSIFICATION

The journal *Designing and Buildings* (2019) defines densification as:

> "Densification is a term used by planners, designers, developers and theorists to describe the increasing density of people living in urban areas. There are a number of methods by which urban density can be measured, including: Floor area ratio: Total building floor area divided by the area of the land buildings are built on. Residential density: Number of dwelling units in a given area. Population density: Number of people in a given area. Employment density: Number of jobs in a given area"

In this thesis, densification is based on residential density. If the number of people living in an area increases, the consequences are described in terms of population density. Densification has increased with the expansion and urbanization of cities. Today, almost 70% of the world's population lives in cities, which requires urban planners to decide how to distribute housing and public spaces. Some researchers claim that densification is more durable than its opposite – urban sprawl – as there is less need for transport and therefore fewer carbon dioxide emissions. Urban sprawl supporters, on the other hand, argue that quality of life is poorer as green spaces are lost, which impacts both well-being and the population's ability to cope with climate change risk (Haaland and Konijnendijk van den Bosch 2015).

To understand how Swedish municipalities, integrate ES into urban planning, it is crucial to understand how urban planning works at a national scale. Haaland and Konijnendijk van den

Bosch (2015) note that urban planners must trade off the need to protect green areas and accommodate residential areas and industries (notably through densification). However, the legislative context is confused. Swedish law prevents construction on farmland unless there is a specific benefit for society while, from an international perspective, the United Nations global climate goals state that urban planning should protect green areas. So, where should we build?

Haaland and Konijnendijk van den Bosch (2015) raise an interesting point about future urban expansion—will it be within the city or outside it? The notion of the *compact* city has been adopted globally as the way forward in developing sustainable urban areas. Densification and compact planning/ building are expected to optimize land use and help to overcome related environmental problems. However, there are also many drawbacks and challenges. Haaland and Konijnendijk van den Bosch (*op. cit.*) argue that densification problems are a threat to urban green space. It will be a major challenge for cities to protect and provide green spaces in compact urban environments. One solution, the authors argue, is that municipalities should provide compensation for the loss of public space due to densification; unfortunately, such action is rarely taken.

Khoshkar et al. (2018) studied Stockholm's growing population and the demands of new residents. The authors noted that "it is critical to adequately plan and address urban green spaces in future urban densification projects" and pointed out that other municipalities (both in Sweden and internationally) are tackling the problem in their detailed plans. It is clear that the exchange of knowledge is one way to increase dialogue about urban green space in densification projects. A second problem is that the actors involved in planning do not all have the same level of knowledge. Greater understanding of the benefits of ES and urban green space would sharpen the focus on how to increase efforts to protect it and improve its quality. The next step is, according to Khoshkar et al. (2018), to create a common vision of how green space can be provided and enhanced; they note, "the 50/50 collaborative approach implemented in Haninge can provide an example of how to involve and initiate dialogue between actors".

There is a need, in many cities, to stimulate debate, educate citizens, and involve residents in future green space and densification projects. Planning processes should include a structured plan to raise awareness of the benefits of sustainability in urban planning. Populations continue to grow, as do the challenges for urban planners. Pressure on the remaining natural, green spaces is increasing and soon none will be left if a solution is not found. Densification projects will not stop any time soon, and therefore sustainable urban planning and planning management

are crucial for the survival of ES in cities (Wells et al. 2017).

2.4 NATURE BASED SOLUTIONS (NBS)

NBS are important in the context of how ES are implemented. More specifically, the process can be used as a tool, an idea that is described in detail later. The NBS concept was introduced by the World Bank and the International Union for Conservation of Nature, with the aim of increasing the conservation of biodiversity in the context of climate change. In Europe, the Horizon 2020 Framework adopts the concept to refer to the use of nature to provide solutions regarding climate mitigation and adaptation challenges, for example water management (Pauleit et al. 2017). NBS are seen as a way for both nature-based planning and ES to provide (ecological, social and economic) sustainability. Compared to UGI, Pauleit et al. (2017) note that the two terms have many overlaps with respect to their scope and definition, but that:

> "the scope of the NBS concept is broader than Ecosystem based adaptation, more abstract (in terms of application to urban planning) than based on ecosystem services' approaches to the benefits of nature for human wellbeing. Thus, NBS could be said to be an umbrella term for other concepts that receive increased attention at the political and academic level".

Rauschmayer and Wittmer (2006) argue that NBS present both challenges and opportunities in future urban planning. They note that the term is used in the context of tackling complex social or environmental problems, and that transdisciplinary work often creates conflicts among different interest groups. In such cases, NBS can help to support out-of-the-box thinking.

The Horizon 2020 programme is a good example of policymakers' demands for a more transparent way of working. It requires different academic disciplines, public and private stakeholders, and residents to participate in an NBS project. This is consistent with Parkins and Mitchell's (2005) argument that,

> "Ideally, a diversity of actors should be involved in the deliberative processes […] that could take place in relation to the role, scope and appropriateness of interventions premised in relation to NBS. This will also need a careful reflection on institutional arrangements can enable NBS with such inclusive, long-term and balanced perspectives".

Curran and Hamiliton (2012) state that the *eco-gentrification* of cities can be part of an NBS

process, while McIntyre, (2009) uses the term “a new green revolution” to stimulate debate. Brand (2012) takes the discussion further and addresses the structural level. NBS are seen as a complement to the concept of the “green economy” in efforts to create more sustainable societies and cities. Rodriguez-Labajos and Martinez-Alier (2013) discuss the disadvantages and challenges of NBS. They argue that the term has huge potential to stimulate environmental thinking in spatial planning and many other sectors, notably businesses, which are unfamiliar with the idea of including sustainability in their decision-making. On the other hand, the terms strength could also be its weakness. The latter authors highlight the “risk of overselling nature or of encouraging a perception of ecosystems as entirely-substitutable by other assets used by humans”. So, how can NBS be used?

Nesshöver et al. (2017) state that, “To have the best chance of success, NBS projects should be based on well-balanced, clear, widely accepted and implementable set of key principles”. Furthermore, they note,

> “The new NBS concept should be perceived as an opportunity, but also as a challenge since a good understanding of ecosystem processes is needed, a diversity of actors must be engaged, and a broad set of societal facts/issues needs to be included and integrated. It is a chance for sustainability science to achieve more recognition in policy, projects and practice, and to bring together ideas from all relevant actors”.

There is clearly an opportunity for sustainability science to raise its profile in policy, projects and practice, and to bring together ideas from all relevant actors. Some key questions about how to implement NBS will remain open, as is currently the case for similar concepts such as *adaptive management* and the Ecosystem Approach. Whether NBS can go beyond being just another communication tool’ that is used to promote a positive view of nature-based and sustainable management measures, and which avoids using old tools with diverse conceptual foundations, will depend on whether these conceptual and practical challenges can be addressed when developing projects and linking them across scales, contexts and people. Bringing together diverse contexts, societal backdrops and scales will be essential if funding agencies are to deliver frameworks within which researchers and other actors can implement genuine, sustainable, nature-based solutions.

Albert et al. (2019) address the complex relationship between NBS and ES. They make a

distinction between the *Social system* and the *Ecosystem* (Figure 3). The Social system refers to institutions, actors and human well-being. It interacts with the work of municipalities and researchers. Research forms the backdrop for detailed plans, comprehensive plans and other spatial concepts. NBS emerge when natural solutions are implemented as ES. Once implemented, the focus of the process shifts to the Ecosystem. For example, there is an analysis of the impacts of the implementation of the detailed plan on local biodiversity, and its advantages and disadvantages. These ES processes and functions, which create biodiversity, feed back into the Social system. Finally, input from ES affects future landscape planning and creates new societal challenges.

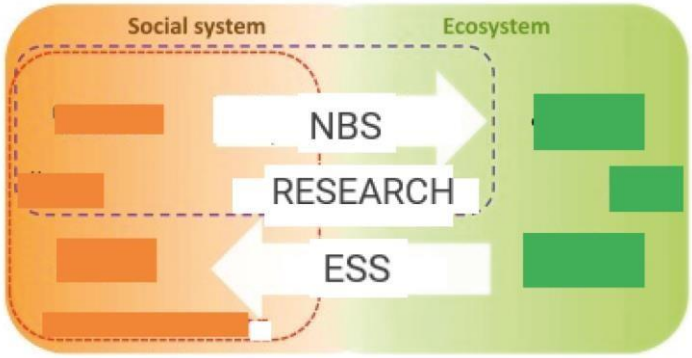


Figure 3 NBS schema adapted from Albert et al. (2019).

2.5 URBAN GREEN INFRASTRUCTURE (UGI)

UGI is relevant to this thesis because the term describes "an interconnected network of green space that conserves natural ecosystem values and functions and provides associated benefits to human populations" (Benedict and McMahon 2002). This, in turn, embraces the ES approach.

The UGI concept emerged from urban planning in the United States, where it was intended to improve sustainable planning and the protection of green areas. In Europe, the concept has been used, for instance, in the 2010 Biodiversity Strategy that integrates the term into both rural and urban planning. Zölch (2018) states that "urban green infrastructure (UGI) refers to vegetated areas within a city that are planned and maintained for the purpose of delivering a large amount of ecosystem services". The aim is to restore, recreate and develop green sustainability and ecological dimensions in cities. It is used in urban planning as a tool to develop a network of coherent green spaces. Zölch (2018) goes on to describe different uses of the term, and its application at various scales, for example "parks are found at city scale, while

trees are found at local scale".

The link between ES and UGI can be complex, especially the mechanism that lies behind the development of urban ES. Andersson et al. (2014) note that most links are found between urban green space and human well-being. In the urban planning context, UGI is commonly used as a CES to improve, for instance, health and recreation. Another connection is found in services such as urban farming, which can be described as a form of food production.

Social-ecological resilience is another illustration of the connection between UGI and ES. Here, the link is between human well-being and RES such as pollination. ES cannot provide all the answers and UGI reflects the fact that "human activities may both promote service providers and make services available to the beneficiaries" (Andersson et al. 2007).

Noble et al. (2014) describe some practical issues with implementing UGI at a municipal level. They discuss the problem of whether urban planners should choose grey or green infrastructure solutions to various forms of climate adaptation. Hard approaches (grey infrastructure) take the form of engineering solutions such as irrigation systems. These solutions can temporarily resolve a climate challenge/ problem but, in the long term, the mechanical system will probably have to be replaced. Green approaches, on the other hand, have the benefit of not only solving the problem, but also giving back to nature and causing less damage in the future. This allows ES to grow and UGI to create more green and blue urban spaces. Although Zölch (2018) agrees with Noble et al. (2014) that green infrastructure is better than grey, at the same time she recognizes the difficulty of integrating such ideas into planning theory. Furthermore, she notes, "comparable information concerning the performance of different UGI types to moderate such impacts is mostly lacking". Even if UGI can be promoted as a tool to combat, for example, heat stress and climate impacts, it also has its downsides. Zölch (2018) underlines that urban planners "need to decide on the most effective measures while considering spatial and administrative constraints".

2.6 PUBLIC PARTICIPATION

As noted in the introduction, the discussion of public participation is limited to a presentation of the advantages and disadvantages of the provisions in the *Planning and Building Act* (SFS 2010: 900) regarding consultation with residents. The discussion is incidental to the main purpose of the thesis and is limited to a comparison of two research studies: one pro-public

participation (Qi 2012) and the other against (Wamsler et al. 2019). These papers were selected to illustrate different opinions about public participation and ES, and for their focus on the Swedish perspective. The Swedish National Board of Housing, Building and Planning (Boverket 2015) describes consultation in the context of detailed planning as follows:

> "The consultation aims to gather information, wishes and views that concern the plan proposal and consider these at an early stage of the detailed planning work. The municipality will consult on a detailed plan with other county administrative boards, the land survey authority, known property owners and residents concerned".

The Board underlines the importance of beginning consultations before the detailed plan is completed, as this can reduce the risk of an appeal further on in the process. The main aims of consultation are to provide stakeholders with information, thereby ensuring transparency, and to improve "the basis for decision-making by gathering knowledge about the current planning area".

The two contrasting views of participation presented here illustrate differences between those who think that it is a civil right and those who think that participants use the process simply to promote their own economic interests. Qi (2012) studied two urban projects, one in China and one in Sweden, and concluded that in both cases, "The lack of public participation in the city planning and building processes actually reflects an asymmetry of information and power, and will lead to more conflicts in the future". The study notes that human ecology is crucial for urban sustainability and is manifested in interactions between power, culture and ES. The balance of power is reflected in urban planning, especially if the problem is seen from a historical and cultural perspective. There are winners and losers and the right to live in a city begins with public involvement. Furthermore, Qi argues,

> "Especially for eco-cities, it is not only about urban planning, but also an environmental movement to achieve the balance between human and ecology, between 'good intentions and sentiments' to protect environment and 'protection of their economic interests'".

She also quotes Harvey (2003), who says,

> "The right to the city is far more than the individual liberty to access urban resources: it is a right to change ourselves by changing the city.

> It is, moreover, a common rather than an individual right since this transformation inevitably depends upon the exercise of a collective power to reshape the processes of urbanization. The freedom to make and remake our cities and ourselves is, I want to argue, one of the most precious yet most neglected of our human rights."

These arguments equate sustainable urban planning with a human right. Another argument relates to societal injustice. Qi (2012) describes examples from both China and Sweden (Malmö), where a lack of planning and societal involvement has resulted in a poorer environment (from a sustainability perspective) for inhabitants.

On the other hand, Wamsler et al. (2019) do not agree, and instead see public participation as a threat to sustainable cities. They describe several projects in southern Sweden where inhabitants used their power to stop a project because it threatened their financial interests. They see consultation as a threat to building sustainable cities. Their article describes examples of both small- and large-scale citizen engagement that blocked the consideration of NBS in the planning process.

Residents' concerns about the detailed plan are often based on their own personal interests and a lack of information and awareness of environmental problems. The consequences can, however, be enormous for municipalities. Wamsler et al. (2019) note the "considerable impacts on the planning process in the form of lengthy, resource consuming delays for, and the reduction of, NBS considerations". The study goes on to argue that the pursuit of personal interests is a theme that has emerged in many different municipal projects. Providing a car-friendly environment, free parking spaces and good access based on hard infrastructure are some examples of residents' priorities that hamper sustainability work. The democratic process is costly to the municipality both in terms of time (other projects have to be put aside), and the inability to implement green actions. The study's findings highlight that a number of sustainable projects in different parts of southern Sweden have either been stopped or been subject to a court appeal as a result of individual economic interests.

3. CASE STUDY

This chapter begins with a short description of the Folkparken & Julivallens area and its history. ES were identified in both the detailed plan and a pre-planning report, which contained an inventory of the Folkparken's cultural value. The chapter ends with a short description of public

participation efforts. This information is revisited later in the context of a comparison with two projects in Lomma.

3.1 THE FOLKPARKEN & JULIVALLEN SITE

The Folkparken & Julivallen site is in the centre of Höganäs and covers around 10,000 m² (Figure 4A). Initially, the area was divided into four zones: the old sports arena, also called Julivallen (a new arena has been built outside the town and the old arena is not in use); houses built by the people's movement (known as the *Peoples' houses*), located to the west of the street Norra Månstorpsvägen; the Folkparken, an urban park that includes a playground; and infrastructure such as roads and parking. Figure 4 (B–F) shows the area in 2011.

Figure 4A Map of the Folkparken & Julivallen zone. Copyright Höganäs kommun 2011.

Figure 4B and 4C The Julivallen sports arena. Copyright Höganäs kommun 2011.

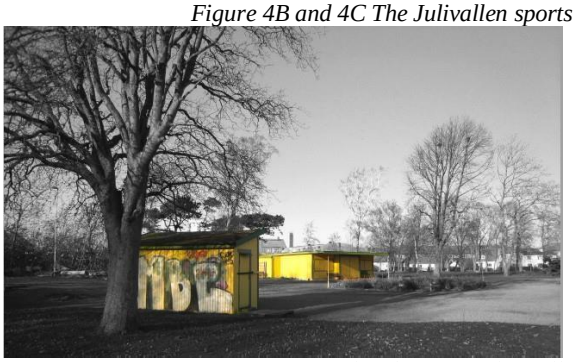


Figure 4D Peoples' houses in the Folkparken. Copyright Höganäs kommun 2011.

Figure 4E Inside the Folkparken. Copyright Höganäs kommun 2011

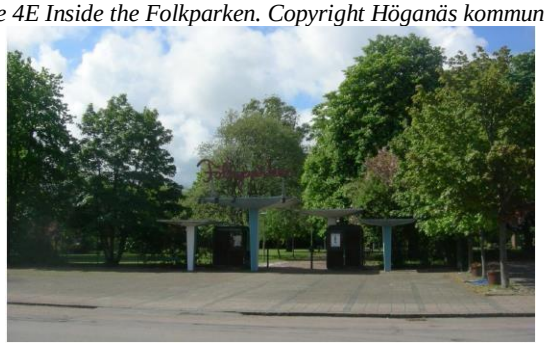


Figure 4F External view of the Folkparken Copyright Höganäs kommun 2011.

The Folkparken has played an important role in Höganäs's history, notably in connection to the people's rights movement and the foundation of the country's social democratic party. In 1908, the Månstoprsgården, as it was known at the time, was bought by the labour movement.

Workers at the local company Åke Nordenfelt were barred from engaging in political activity on the premises. Against this background, the labour union needed a place to hold meetings. The labour movement was formed in 1906 and gathered momentum. In 1908, a large party was held to celebrate the opening of the workers' movement headquarters for Höganäs. In 1923, the social democrats dominated the town's politics and, to save the Folkparken, they sold part of the land to the sports' association. On 8 July 1928, the opening ceremony was held for the new facility, which was named Julivallen (in English, the July Arena) (Höganäs kommun 2011).

In modern times, Höganäs, like many other cities in Europe, faced challenges as industry moved to Asia. The transformation to a creative, knowledge city created new demand, and Höganäs began to attract the middle classes (Florida 2002). In 1998, the influx of a new population led to the end of social democratic political domination, and a coalition of conservative parties took over. Their strategy was to build luxury homes to attract wealthy new residents to strengthen the weak economy (Silverstrand 2010). A consequence of the new political environment was that the 2002 comprehensive plan designated the Folkparken & Julivallen zone as an area for potential residential densification (Höganäs kommun 2002). Compared to the municipality's other villages and towns, the city lacks green space, due to both the climate and a lack of investment (Höganäs kommun 2017) – and building residential houses in the city's biggest park would only make the situation worse. This makes Höganäs an interesting subject for an analysis of the incorporation of ES into a densification project.

The 2035 comprehensive plan states that the municipality must include ES in its detailed plan (Höganäs kommun 2019). An interesting question is, therefore, how did the municipality use ES before the publication of this plan and, in particular, in the Folkparken & Julivallen densification project?

Figure 5A The Folkparken & Julivallen arena in 1940. Copyright Lunds University

Figure 5B The Folkenparken Peoples' house 1928.

Figure 5C The Folkparken in 1960

Figure 5D A party in a Peoples' house 1929. Copyright Höganäs kommun 2011.

3.2 THE DETAILED PLAN

On 24 November 2011, the municipality of Höganäs decided to adopt an agreement with Höganäs Folkets Hus och Parkförening to explore the development of the area. The first step was for the municipality's social housing department to launch a parallel development programme. This was completed in February 2012, and work began with three construction companies. On 5 March 2013, the City Council decided that work would continue, and the planning department was commissioned to prepare a detailed plan for the area (Höganäs kommun 2015a). The purpose of the detailed plan was to develop the area via densification in the form of residential and commercial premises, while, at the same time, protecting and preserving the area's recreational value. It was consistent with the 2002 comprehensive plan and the 2011 in-depth comprehensive plan for Höganäs and neighbouring Väsby (Höganäs kommun 2015a).

The detailed plan includes green areas, in the form of a large urban neighbourhood to the west and smaller park areas to the east (Figure 6A–C). Residential development is concentrated in the east and along Långarödsvägen and Norra Månstorpsvägen streets, where the main part of the sports arena is situated. Where Långarödsvägen and Norra Månstorpsvägen streets meet (known as Olof Palme plats) there is a mixed residential and commercial zone. This area is integrated into the rest of the city by both road and green connections. The street network is linked to the city's main streets, and cul-de-sacs are avoided. The urban area, which can be entered from all directions, forms a green link between the coast and the city. Olof Palme plats is a hub for flows to and from points of interest (Höganäs kommun 2015a). A key development

strategy in the in-depth comprehensive plan is that at least half of all new construction should be in the existing urban area—the aim is to save space for farmland and natural resources while making the city alive and energy-efficient. The plan is a typical example of densification. Development strategies include a tighter mesh for the street network, integrated, mixed-use areas, and the need for attractive streets (Höganäs kommun 2002).

Figure 6A Map of the new Folkparken & Julivallen zone

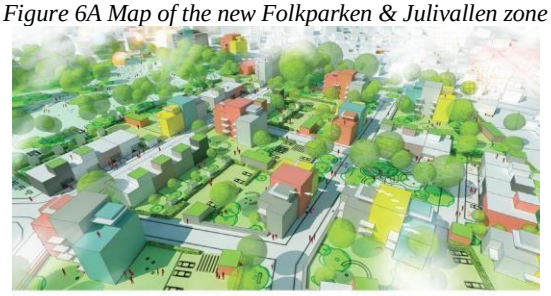


Figure 6B Overview of the new Folkparken & Julivallen development. Copyright Höganäs kommun 2015a

Figure 6C Detailed illustration of the new Folkparken & Julivallen development. Copyright Höganäs kommun 2015a

3.3 ES PRECONDITIONS

The detailed plan does not explicitly use the term 'ecosystem services' and, therefore, the following is an interpretation of the functions investigated.

3.3.1 THE PRE-PLANNING REPORT

The Civic Planning Officer ordered a background report to be prepared on the cultural and park values in the planning area. The City Attorney and Park Engineer led the project, and drew up an inventory of buildings, trees and other greenery. This document formed the basis for the following work. A professional arborist prepared the tree inventory and an assessment of the park's value. A landscape architect examined the report's conclusions, and the municipality's Environmental Director and Cultural Coordinator evaluated the Julivallen area. The aim of the report was to provide an official evaluation and inventory of existing value. It should be noted that the issue of new housing was included in the public version of the 2011 in-depth comprehensive plan for Höganäs and Väsby. The resources that were dedicated to the pre-planning project show the importance of preserving the area's value and concerns about over-exploitation (Höganäs kommun 2011).

The pre-planning report notes that the Folkparken cannot be linked to any modern park style. Its original, romantic style has gradually become distorted. Modern trees have appeared spontaneously, and the original stock resembles a forest more than a park. There is little of value, although a few trees are botanically interesting. ES include lawns (for children to play on), birds and a shady, green environment. Despite its lack of structure, it is a pleasant place to visit. Its value, the report states, lies mainly in the provision of greenery, its social significance

(it is a relatively large recreational area in central Höganäs) and its ecological significance (for insect and bird life). A secondary value concerns user of Norra Månstorpsvägen street. Finally, the report notes that it differs from neighbouring green areas, such as the Sjöcrona or Lerbergsskogen parks, and that its future value lies in a growing human need to spend time in natural places (Höganäs kommun 2011).

Several studies published by the Swedish University of Agricultural Sciences show that proximity is a determinant factor in whether people spend time in nature. Specifically, they are more likely to visit a park if it is 300 meters or less from their home. A large body of evidence has highlighted the importance of nature for human health. Stress, fatigue and irritation are lower in people who can spend time in a natural environment. Hence, it is crucial for urban residents to have access to green space (Grahn 2003, Stigsdotter 2009). However, the report notes that the Folkparken does not provide a high-quality urban green area. Among many other problems, most larger trees have been damaged by wind, root swelling is pronounced due to the sandy soil, many elms have been killed by Dutch elm disease. (Höganäs kommun 2011).

With respect to cultural value, the park's cultural heritage consists of its connection to the labour movement and as a place of entertainment. The report notes that buildings to be conserved are usually specified in the detailed plan. However, this does not extend to cultural heritage related to the labour movement or sporting activities. It highlights that sports centres have rarely been interpreted in cultural–historical terms, and do not feature in policy documents. It states that the Julivallen arena has obvious cultural and historical value, as very few venues from the 1920s still exist. Moreover, both the Folkparken and the Julivallen arena have close connections to the popular movement. In particular, the Folkparken has a strong link to the struggle for freedom of assembly and universal suffrage. Furthermore, both locations have a very strong connection to the Höganäs exhibition in 1928, and were a venue for leisure and entertainment in the 1900s. It concludes by arguing that it would be unfortunate to eradicate this cultural heritage. Instead, it asks, how can preservation can be combined with new development, without damaging the city's cultural heritage (Höganäs kommun 2011)?

3.3.2 ES IDENTIFIED IN THE PRE-PLANNING REPORT

As the feasibility study did not explicitly use the term ecosystem services, this section presents an interpretation of the functions investigated. ES categories used in this thesis are taken from *The Economics of Ecosystems and Biodiversity* report (TEEB, 2019).

Regulating services: air quality, carbon sequestration and storage, and pollination

The report describes local air quality in the Folkparken as an important part of the area's ecosystem. Trees provide shade and capture rain while, overall, the park regulates air quality by removing pollutants. Carbon sequestration and storage are hard to measure at the local level. However, we know that trees and plants play an important role in removing carbon dioxide from the atmosphere and locking it away, and the report notes that the park's trees help to cool the city. Pollination is crucial for the park's survival and biodiversity. The wind, insects and birds pollinate plants and trees, creating fruit, vegetables and seeds. The park's huge variety of plants and trees supports biodiversity and pollination (UN 2019, Höganäs kommun 2011).

Supporting services: providing a habitat for species

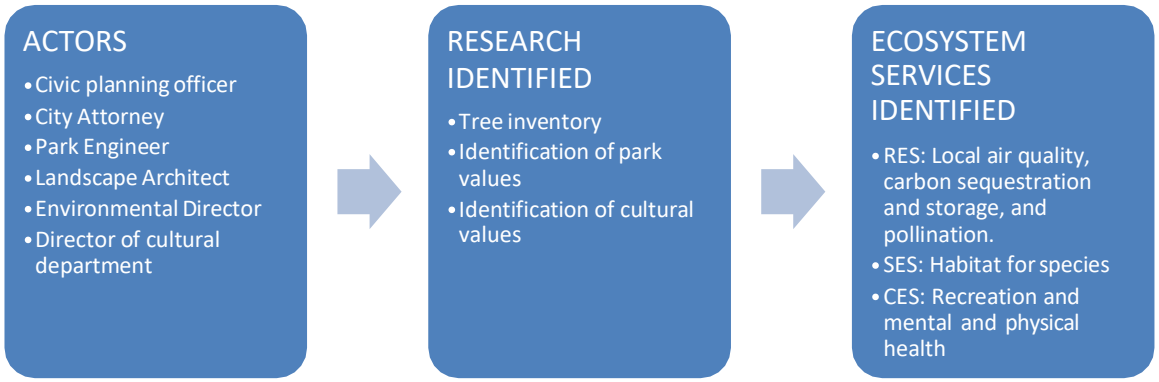
The term, biodiversity *hotspots* refers to habitats with an exceptionally high number of species that are more genetically diverse than other places. The report highlights the park's diversity of plants and trees, which support other ES (UN 2019, Höganäs kommun 2011).

Cultural services: recreation, and mental and physical health

Mental and physical health are important for humans. The report notes that the park provides a variety of cultural services, such as a playground, birdsong, etc. (UN 2019, Höganäs kommun 2011).

The identification of ES is based on the schema shown in Figure 7, which is adapted from Albert et al. (2019). The focus is on the relationship between the social system and ES from the actor's perspective. Water and storm water management were not addressed in the pre-planning report, but do appear in the subsequent detailed plan. Following Albert et al. (2019), we identified the institutions and actors in the social system. In this case, actors consisted of the Civic Planning Officer, the City Attorney, the Park Engineer, an arborist, a landscape architect and the municipality's Environmental Director. The next step was to identify relevant research, in this case, the tree inventory and the report on the park and its cultural value. The third step was to identify ES: birdsong, a playground, a green environment, shade, biodiversity, animal and insect life, a social platform, health, human well-being, climate adaptation, cultural heritage, esthetical and historical values. The Albert et al. (2019) study sees this approach as the start of the NBS process that begins with the social system and ends with the ecosystem.

Figure 7 NBS, adapted from Albert et al. (2019).



3.4 CHALLENGES IDENTIFIED IN THE PLANNING PROCESS

This section examines the detailed plan. It highlights how the results of the pre-planning report fed into the detailed plan, and describes some new ES that were added (water management/ risk of flooding). We present an overview of environmental impacts in order to understand the municipality's priorities regarding improvements to ES. We also examine how solutions were found to the different ES challenges. This is the next step in the analyses presented in Albert et al. (2019).

3.4.1 WATER MANAGEMENT

Capacity: Wastewater is run west, towards the sea, in underground pipelines. However, the area naturally slopes to the northeast. The existing system is at full capacity and mechanical solutions were needed. A failure to solve this problem would mean that, for example, in the event of 10-year rainfall, most of the area would be flooded. This, in turn, risked damaging property and, in the worst case, human health and well-being (Höganäs kommun 2015a).

Drainage: A drainage study was prepared by the municipality, which was the starting point for designing a levelling and storage area. The detailed plan noted that particular attention needed to be paid to the area around trees for aesthetic reasons, and that the city centre was another opportunity to manage water; notably through contrasting or soft natural transitions in the park environment (Höganäs kommun 2015a).

3.4.2 GEOLOGY

Historically, Höganäs is a mining town, which limits conditions for both densification and water management (in particular, the problem of developing a new pipeline system and soil absorption). During the summer of 2013, a geotechnical survey of the area was carried out,

which found that several different foundation techniques could be used (Höganäs kommun 2015a).

3.4.3 ENVIRONMENTAL IMPACTS

When a detailed plan or planning programme is established or changed, the municipality must assess the impacts. This assessment needs to be carried out in consultation with the county administrative board and relevant neighbouring municipalities. If the implementation of the plan is likely to have a significant environmental impact, the Swedish Environmental Code requires an environmental impact assessment to be prepared. This information is also included in the detailed plan. The impact assessment evaluates whether the measures that need to be taken impact green issues such as climate, nature and ES. The results are divided into three categories: 1) Improves green sustainability; 2) Does not affect green sustainability/ irrelevant; and 3) Negative effect on green sustainability. In fact, the updated detailed plan was not expected to have a significant environmental impact and an environmental impact assessment was not deemed necessary (Höganäs kommun 2013). The reason given was that the new plan provided for housing densification and development in central Höganäs, while enhancing and securing the area's green and recreational values.

Appendix 1 provides more detail regarding the municipality's thinking about environmental questions such as ES.

3.4.4 SUMMARY OF HOW ES WERE USED IN THE DETAILED PLAN

Once all of the required documents and policies had been prepared, the process moved to the implementation stage. The first step was an inspection of policies and documents to ensure that all problems and challenges had been addressed (Albert et al. 2019). This found that further investigations were needed regarding water management, due to the lack of information in the pre-planning report. Consequently, new ideas were put forward about how to use ES to address the project's problem of an increase in impermeable surfaces and a reduction in green space. These, together with the nature of the soil, the area's geology and its drainage capacity led to several changes, described in the following paragraph.

The planning architect asked the water and sewage department to investigate whether it was possible to construct underground reservoirs in the area. The municipality was open to

alternative solutions. A completely new system was proposed that required further investigation. The final solution comprised a comprehensive underground management system, and a combination of open and underground waterways. The investigators estimated that an underground reservoir of approximately 1,000 m^2 would be needed to supply the area, located at its lowest point.

As in the last section, the process of evaluating the impact of the detailed plan on ES was developed (Figure 8), adapted from Albert et al. (2019). Once the detailed plan had been prepared, authorities and residents were able to comment on it. As Figure 8 shows, the consultation led to changes to, and the improvement of spatial concepts and plans. It also opened up new opportunities to use ES.

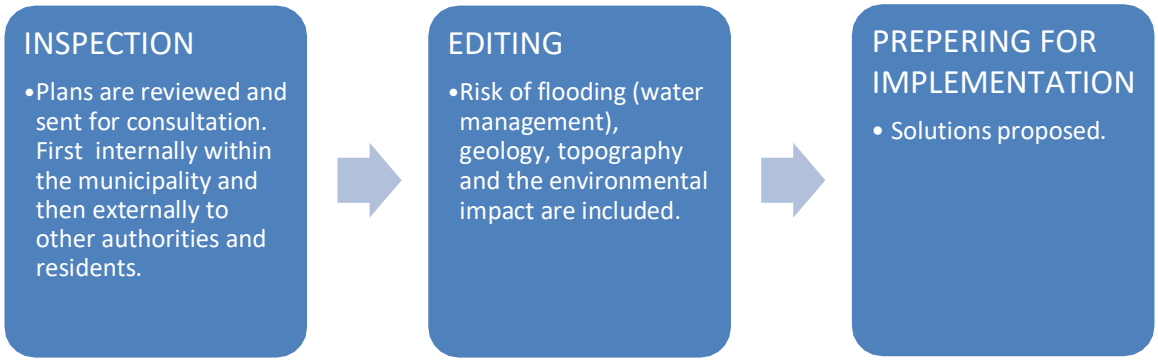


Figure 8 NBS, adapted from Albert el al. (2019)

3.5 SUGGESTED IMPLEMENTATION IN THE PLANNING PROCESS

This section examines how conditions that were identified in the detailed plan were implemented. Specifically, this is known as the *plan proposal* and it is intended to provide solutions to challenges identified in the detailed plan.

In 2011, the Swedish Civil Protection Agency launched a climate PM for Höganäs, in order to get an idea of the consequences of climate change. The municipality has a long coast, and this document presents the risks, vulnerabilities and consequences of rising sea levels. A terrain model estimated the effects of a +1, +2.5 and +3.5 metre rise in water levels, based on forecasts for 2100. In the worst-case scenario (a +3.5-metre rise) wind and waves would have an extensive impact. However, the report noted, the Folkparken & Julivallen area is relatively high in relation to the rest of Höganäs, and flooding would be limited to its north-eastern part. Moreover, there were no plans to build in this zone (Höganäs kommun 2015a).

3.5.1 GUIDELINES FOR THE DESIGN OF THE URBAN ENVIRONMENT

Within the Folkparken & Julivallen zone, careful thought was given to the design of water bodies, while other areas were the target of political ambitions. In general, there was a desire to preserve existing vegetation as far as possible especially, as noted in the pre-planning report, mature trees. With respect to conserving vegetation, the aim was to preserve clusters of trees rather than individual species. This was because a lack of density led to individual trees being weakened. In particular, trees at the junction of Långarödsvägen and Norra Månstorpsvägen streets were identified for preservation, as were several oak trees close to the Julivallen stadium. Extra protection was provided in the form of legislation. Vegetation situated along Littorinavallen to the west was to be conserved. The new district park was largely based on the illustration developed during the planning process. Finally, the wall along Långarödsvägen street and the entrance to the Julivallen stadium were marked for conservation (Höganäs kommun 2015a).

3.5.2 WATER MANAGEMENT

The water management proposals stated that water in the area had to be captured before being directed to pipelines in the Långarödsvägen area. In the area to the west of Norra Månstorpsvägen, the idea was to capture it in open dikes to the north and east of the park. Water in the eastern part of Norra Månstorpsvägen was to be stored in an open basin. About 450 m^2 was set aside (Höganäs kommun 2015a).

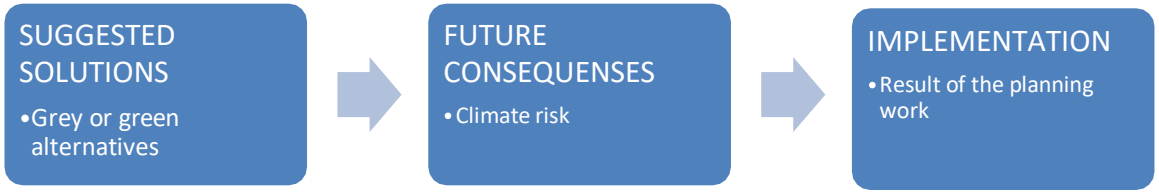
Two water management design principles (Figure 9A–B) were proposed. To the west, open dikes with shallow slopes were suggested, offering a transition in the form of broad bridges and narrow waterways. The detailed plan notes that these dikes should be attractive to look at, even when not filled with water. In the north-east, day-to-day water management was proposed in the form of one or more reservoirs. The plan stipulates that these basins should have an urban character, and should be integrated, in an aesthetically-pleasing way, into the park environment. The use of vertical edges, for example, means that a smaller area is necessary, and one side could be provided with a sunroof However, vertical sides require appropriate safety devices and here, emphasis was placed on the choice and design of materials. Finally, the plan noted that the design and construction of dikes and reservoirs should give careful consideration to existing trees, where there was a risk of waterborne disease (Höganäs kommun 2015a).

Figure 9A–B Suggested water management solutions. Copyright Höganäs kommun 2015a.

3.5.3 SUMMARY OF THE IMPLEMENTATION OF ES

Like the previous section, here we summarise the links between the detailed plan and ES, based on Albert et al. (2019). Implementation focuses on the future sustainable use of the area. Albert et al. (2019) argue that ecosystem elements and structures are the first way to understand whether the implementation is sustainable over a longer period of time. At the same time, the process moves from a social system perspective to an ES perspective as ideas start to reach the implementation stage. Biodiversity is another factor that is important at this stage. Significant amounts of time and money were dedicated to finding green solutions for the urban area. For instance, most trees were preserved in order to maintain as much of the park as possible and maintain its ecosystem. In the end, the municipality chose to use both green and grey infrastructure to address climate adaptation and improve ES. Open dikes and reservoirs are two examples of the different solutions that were found to environmental problems (Figure 9 A–B).

Figure 10 NBS, adapted from Albert el al. (2019).



3.5.4 PUBLIC PARTICIPATION

On 3 April 2014, the public were invited to visit the area and attend a consultation meeting in Höganäs City Hall. Around 50 residents visited the site, and the consultation meeting attracted about 35 visitors. The meeting was organised by the municipality's planning department, and the project's architects also attended. The aim was to present the draft plan and outline the planning process. The questions, comments and responses recorded during the day are listed below.

During the consultation meeting only one comment was documented regarding ecological sustainability and climate change: "In a new area of this extent one ought to think a lot about ecological sustainability. Creating unique values and, for example, using solar cells on the settlement also means that people from outside are interested in the area". The municipality answered: "There are several sustainability aspects included in the project. Among those things are the fact the expansion itself means a densification and efficient use of the land. There is also a stated ambition to establish a car pool, both for residents in the area and for residents as part of reducing car use. With regard to energy supply, there is the possibility of introducing urban wind farms on the roofs. However, nothing is regulated in the detailed plan" (Höganäs kommun 2015b, own translation).

During the consultation period, 16 statements were received, but only one concerned nature: "Furthermore, property owners oppose the conservation of the trees along the wall because there attract many birds that nest; they make a lot of noise and there are droppings everywhere". During the review period, 10 statements were received but, here again, only one concerned nature: "Regarding flood risk, property owners suggest that adjacent land is within the risk area, which at high water levels may affect accessibility to the planned area".

Public participation was included on the agenda of the 2018 Mistra Urban Futures workshop. Different types of citizen involvement were examined and, therefore, different indicators were used regarding methods and how citizens responded. The aim of the workshop was to categorise citizen involvement in different municipalities, and outcomes. The results from the Folkparken & Julivallen case study found that the municipality used a formal planning participation process, citizen planning walks, citizen planning games and digital civil dialogues in an effort to involve the community. However, outcomes included a formal appeal, protests from neighbours and individual disputes (Wamsler et al. 2019).

This result shows that citizen engagement can be a barrier to sustainability outcomes. In fact, it became apparent that it was better to avoid it and provide NBS/ UGI/ ES both explicitly and implicitly. Wamsler et al. (2019) describe it as follows:

> "For instance, there were examples of citizens' contestation against NBS considerations, including small-scale (e.g. individual statements or disputes during hearings) and large-scale engagements (e.g. organised appeals against municipal plans). They are often based on citizens' personal interests and a lack of environmental awareness, which can lead to considerable impacts on the planning process in the form of lengthy, resource consuming delays for, and the reduction of, NBS considerations".

4. COMPARING HÖGANÄS WITH LOMMA

To get a broader perspective, this thesis compared the Höganäs Folkparken & Julivallen project with two projects in Lomma municipality. This was made possible during the 2018 Mistra Urban Futures workshop. This chapter begins by describing the background to the Urban Futures project, then it presents the background to the Lomma projects, next it briefly describes public participation in the two projects and, finally, compares Lomma and Höganäs regarding ES, UGI and NBS.

4.1 THE MISTRA URBAN FUTURES PROJECT

The Mistra Urban Futures project supports systematic city-to-city learning to foster ecosystem-based planning and associated governance. More specifically, the aim was to create a city-to-city learning lab that allowed participating municipalities to work in close cooperation with researchers from Lund University in order to:

> "1) systematically analyse, compare and learn from the integration of ecosystem- or nature-based approaches in their daily planning practice, and 2) assess associated stakeholder involvement and governance mechanisms. In each municipality, one development project relevant for climate adaptation will be step-by-step analysed – from the beginning (project idea) throughout detailed planning, procurement, implementation, maintenance and follow-up (monitoring and evaluation)".

This thesis is the outcome of a joint workshop organized by Mistra Urban Futures Skåne and the Skåne Association of Local Authorities, at Malmö University on 27 April 2018. The workshop was based on the identified local needs of municipalities and a desire for increased knowledge exchange. Representatives from five municipalities in Skåne (Eslöv, Lomma, Malmö Town, Höganäs and Kristianstad) participated, and researchers from two research centres at Lund University presented the project (Wamsler et al. 2019).

4.2 PROJECT DESCRIPTIONS

This section briefly describes the two projects implemented in Lomma.

The first concerned a school located close to the beach (the Beach school). Lomma lacks places for preschool and school-age children, and demand is increasing due to the municipality's popularity among families. Moreover, the old school, Pilängskolan, had closed, increasing pressure to build new facilities. The Beach school is one of many new schools in the municipality and pupils range from kindergarten to junior level. It covers a total area of 2,350 m^2, with eight classrooms, group rooms and play areas. Furthermore, an activity house of about 300 m^2, an activity hall of 144 m^2 with changing rooms are also included. Building has taken into account the Lomma harbour construction project, as future residents' children are expected to go to the Beach school. The school is not yet at full capacity, as more residential buildings are still being built nearby. An important aspect of the project was the involvement of children and their feedback, resulting in, for example, the addition of two obstacle courses in the schoolyard. There are many similarities with the Höganäs project. For example, both are densification projects, located by the sea and built in existing green space. These factors made the Beach school a good candidate for a comparison, as it highlights the working methods of different municipalities (Lommabladet 2017, Skånska Dagbladet 2016).

The second relates to the reconstruction of the wall protecting the coastline in Lomma. In 2011 and 2013, Lomma's coastline, especially the southern part, was hit hard by high winds and storms. The disaster increased the vulnerability of the area to climate change and sea level rise. Climate experts and scientists have warned the municipality that it must take action before even more damage is caused by extreme weather and climate change. During the 2011 storm, the sea level rose by about 1.5 meters. The beach road became more beach than road, as the sea surrounded coastal villas. Against this background, the municipality has been forced to act before the next storms arrive.

The response was to plan a larger wall, near the beach, to protect the harbour and local villas. The purpose is to provide protection from shoreline erosion. Following investigations to identify the best solution, and meetings with residents and local authorities, consultants were hired to complement the municipality's own work. The outcomes was a plan for a 1,000 metre-long barrier that could also function as a recreational area for cyclists and pedestrians, and support biodiversity. A variety of materials, including concrete, soil and plants were envisaged. The aim was to strengthen the existing embankment and raise it to between 2.7–3.4 meters above sea level. Despite the clear benefits in terms of protection against climate change, some residents living nearby were against its construction. The local newspaper reported that residents were worried about losing their sea view. A group took matters into their own hands and appealed against the municipality's decision, which delayed implementation of the project. The project's focus on climate change, public participation, NBS and UGI offers another perspective on key horizontal issues, and is a useful comparison with the Folkparken & Julivallen project. It also provides an opportunity to compare results regarding proposed NBS solutions, and how UGI was affected (Lommabladet 2015, Sydsvenskan 2016).

4.3 THE TWO LOMMA CASE STUDIES

The two Lomma projects were presented at the 2018 workshop by the municipality's Environmental Director. I attended in my capacity as the representative for the municipality of Höganäs – and as a student. As Ørngreen and Levinsen (2017: 72) note, "the workshop is specifically designed to fulfil a research purpose: to produce reliable and valid data about the domain in question".

Part of the workshop was based on a question and answer model, and the following five questions were discussed: (Q1) Tell us about your NBS project. (Q2) How have you integrated NBS to support urban sustainability and climate adaptation? (Q3) What are the main drivers that support this integration? (Q4) What are the main barriers for further integration? And, finally, (Q5) What is the value of working with other stakeholders to foster NBS? The answers were summarized in a short video (except for question 1) and are presented below. Questions 2–5 are quotes from the Environmental Director of Lomma municipality.

Q1: The first case is the detailed planning process for a new school next to the sea that considered a range of green measures for flood prevention and multiple other purposes, such as recreation and the creation of a healthy environment for children, and biodiversity. The

project started in 2015, was finalized in 2018, and included some involvement in the form of discussion groups with teachers and parents about how to improve children's outside environment. The second case is the development of a long green embankment along the coast (coastal protection/ sea wall). The embankment was built with the aim to protect the municipality and the school; it also protects a number of private homeowners. The planning phase started in 2007 with the redevelopment of the city's comprehensive plan, construction was finished in 2017, and the process included a range of consultation meetings with environmental associations and opposing citizen groups (Wamsler et al. 2019).

Q2: "When we designed the coastal protection project, it was not only designed as a way to reduce flood risk, but we also wanted it to be a recreational space for our citizens and, on top of that, we wanted to make room for biodiversity. In order to do so, we built natural beach meadows sown with natural dune species, but in the areas with more structured lawns we also made patches of natural dune meadows. The goal was to create an area that was both high in biodiversity while at the same time having high accessibility. When we built the school, climate change adaptation was addressed by a range of different, multipurpose measures. We tried to minimise the impact on existing trees and green spaces, and the school is basically built in-between existing trees with green roofs on all the buildings. We also kept a part of the school yard as a sort of wilderness to increase biodiversity and environmental education, and to promote nature-based solutions and climate adaptation" (Wamsler et al. 2019).

Q3: "The main driver has been a change in how we think about these issues. We have, for example, improved our internal working structures and we have developed a method for ecological compensation. This has meant that different professions collaborated more than they usually do, and in the end a lot more greenery was saved and a lot of more natural species were introduced to urban areas. Biodiversity is often overlooked as a relevant factor in urban developments, but working with this can really increase quality of life in cities" (Wamsler et al. 2019).

Q4: "I strongly believe that regulations on a national level have to change to better support nature-based solutions and climate change adaptation in both urban and rural areas. Currently, the state gives municipalities a monopoly on planning, but at the same time it restricts and regulates the possibilities to fulfil national and local goals at the local level. This is a problem, and in the long term this situation will lead to deterioration regarding land use, biodiversity and possibilities to protect the wellbeing of our citizens. If we can solve this problem it will help

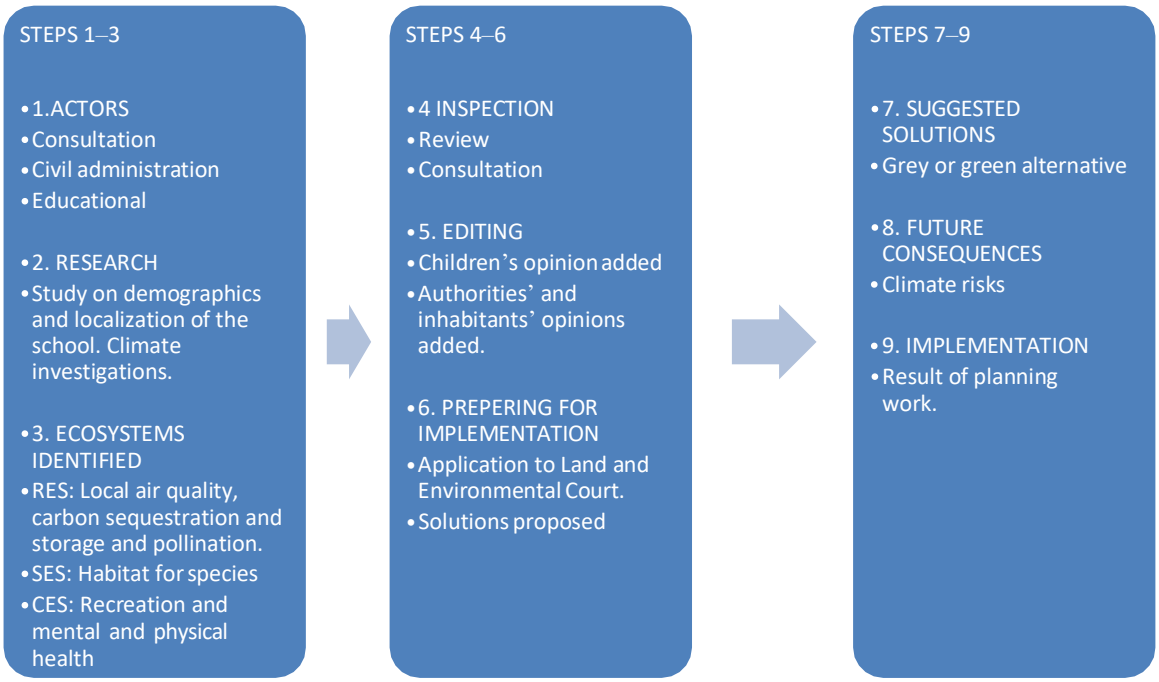
us support nature-based solutions to address climate change" (Wamsler et al. 2019).

Q5: "Since both this approach for knowledge co-creation, and planning for nature-based solutions and climate adaptation are fairly new, we must learn together. Every place is different and has different problems that need solving. So, the creation of processes for interacting with other cities and stakeholders is very valuable and inspiring. This is important for supporting nature-based solutions in our cities and to help us better-address climate change" (Wamsler et al. 2019).

4.4 SUMMARY BASED ON THE PROJECTS IN LOMMA

Figure 12 summarises the process adopted by Lomma. As before, this figure is adapted from Albert et al. (2019). It is interesting to note that one difference compared to the Höganäs project is the involvement of children in the process. Asking participants to design and provide input to the final product is an interesting way to exchange knowledge between authorities and users. Another difference is in the final solutions – Lomma decided to use green, alternative solutions to climate change adaptation, while Höganäs used both grey and green methods. Finally, the two projects have many other similarities, for instance, objections from residents, climate risk and biodiversity.

Figure 11 NBS adapted from Albert et al. (2019).



4.5 PUBLIC PARTICIPATION IN LOMMA

Public participation was high on the agenda of the Mistra workshop. Cases were presented that illustrated different types of citizen involvement, with different indicators regarding methods, how citizens responded, and the process was adopted. Participants tried to categorise the different types of citizen involvement in each municipality, and its outcomes.

The results from Lomma showed that working methods included a formal participation process and workshops with local residents and teachers, and that outcome/ reactions included disputes between neighbours and a lack of active engagement by others (Wamsler et al. 2019). These results highlight that citizen engagement can be a barrier to sustainability outcomes. In fact, citizen engagement was an important factor in not providing NBS/ UGI/ ES either explicitly or implicitly as Wamsler et al. (2019) notes before in the thesis.

In the case of the sea wall construction, similar opinions were expressed by residents, as the municipality's Environmental Director noted:

> "[E]external stakeholder involvement was huge. It is a very interesting example. There is a whole row of exclusive villas along that wall, and half of them wanted the wall because they got flooded during the event, and half of the row did not want to have the wall because their (sea) view would be destroyed. So, they wouldn't have a sea view any more. And it was basically uproar. People came to our meetings. We had many meetings with the people living there. They were so upset, basically throwing things at us. There were a lot of discussions and meetings" (Wamsler et al. 2019).

The Director goes on to describe citizens' ignorance of legislation regarding NBS considerations. For instance, construction of the coastal protection project became problematic because:

> "several people had built on municipal land, they did not own the land, they had taken it and built on it, for example for garden sheds, fences, even quite expensive winter gardens with a view to the sea. All of that had to be turned down. First, they opposed the wall, and then we said 'you have appropriated our land and you have to push back your borders'. In some cases, they had built more than 50 meters into municipal land. They had also sold houses saying that the garden went

> all the way to…. So, some people did not know about this… That was very dramatic for some people" (Wamsler et al. 2019).

Wamsler et al. (2019) summarize the outcome of the public participation process as follows:

> "Due to the described situation, municipalities' citizen involvement is today mainly driven by strategic reasons aimed at: i) dealing with existing or preventing future conflicts that hinder efficient implementation and sustainability outcomes, and ii) increasing validity for democratic planning purposes. A lot of time and resources thus go into arguing against citizens' types of engagement to ensure sustainability outcomes."

4.6 COMPARING ES, UGI AND NBS IN LOMMA AND HÖGANÄS

This section discusses and compares the use of ES in Lomma and Höganäs. Water regulation in Lomma is compared with water management in Höganäs (regulating ecosystem services), along with supporting and cultural services. Finally, public participation is discussed.

4.6.1 OVERALL PERSPECTIVE ON ES

Both municipalities struggle with their respective coastlines due to sea level rise. Solutions to water management and water regulation problems are important for their survival. In Lomma, various solutions have been proposed regarding coastal protection. Adding value to nature by providing more recreational space for both nature and citizens has created a multifunctional area that has benefits for both humans and nature. In Höganäs, and the Folkparken & Julivallen project in particular, the struggle was not so much about sea level rise and more about stormwater management, which can also affect the coastline.

Scientist have found that 100-year rain is becoming more common due to climate change. Therefore, it was important for Höganäs to increase drainage capacity or create other solutions. The new solutions that were presented can be divided into grey and green infrastructure. The giant, open reservoirs are a typical grey solution that addresses climate challenges with engineering knowledge but, on the other hand, does not improve nature/ climate or UGI in the area. Other solutions, such as green dikes, are more similar to solutions adopted in Lomma. When full, the dike can be used as a recreational facility, and as a place to spend leisure time when it is dry. Like Lomma, there are benefits for nature in the form of increasing the park's

green value and adding more natural space.

The second case from Lomma, the Beach school project, is interesting because the whole building project was adapted to existing vegetation and nature. In Höganäs, on the other hand, nature was forced to adapt to human planning and only afterwards was there an effort to compensate with more natural space and high-quality green areas. Nature or green space is not something you can create in a day; it takes time to restore the damage, for example, from cutting down a tree. An interesting innovation in Lomma is that green roofs were used to improve the area. Höganäs did not do this and, instead, the municipality was satisfied with the most necessary, limited actions. Approaches to green issues such as ES, UGI and NBS are created on a political level and manifest in different working approaches. The outcomes of the Lomma projects indicate that new collaborations were created and, consequently, new green areas and natural species were introduced into urban spaces. In Höganäs, on the other hand, the results were very different.

In Höganäs, the Julivallen stadium was closed, and a new stadium was built outside the city to provide better facilities. The municipality also demolished the Peoples' houses in the Folkparken, while plans are being developed to rebuild them elsewhere. The space that was cleared created new opportunities – for instance, a new playground was built. Most structures with historical significance, such as the entrance to the stadium, and the most valuable trees were preserved and protected. Water management problems were addressed, and new facilities were built that improved accessibility to water bodies for people living in the area. Although some actions were unplanned and motivated by unexpected side effects, the overall outcome was mostly beneficial. On the other hand, in Lomma, actions were focused more on increasing cultural ecosystem services such as providing a green area for children to learn by spending time in nature. The green area also functions as a playground. Similarly, the coastal protection project improved accessibility to the coastline. It provided facilities for runners to train and, at the same time, benefit from nature.

4.6.2 A DETAILED COMPARISON

This section compares the ES that have been discussed and offers some conclusions. Figure 13 (A–C) presents a list of ES, divided into regulating, supporting and cultural. It shows which ES were analysed, and briefly describes how different municipalities worked with them.

REGULATING SERVICES

- Local air quality, carbon sequestration and storage , pollination, water management

- HÖGANÄS
- Protect valuable nature by incorporating protection provisions into the detailed plan, compensate for any losses and create both grey and green solutions for water management.

- LOMMA
- Improve the area's regulatory services by implementing, for example, green roofs, protect nature by planning the school around the natural area and create conditions for coping with climate change by building a protection wall while increasing green values.

SUPPORTING SERVICES

- Habitat for species

- HÖGANÄS

Compensating for biological losses included re-planting new species in the Folkparken, which has led to the park becoming more biodiverse. This has helped to maintain other species and ESS.

LOMMA

Adding green roofs to the area has increased biodiversity in the school project. Regarding the coastal protection project, a green loop was introduced along the walkway. This has strengthened existing ecosystem services and has improved the green environment for ecosystem services.

CULTURAL SERVICES

- Recreation and mental and physical health

- HÖGANÄS
- The Folkparken in Höganäs is an important cultural ecosystem service, as it provides opportunities for recreation, sport, games and a peaceful environment for the entire city. The redevelopment of the playground also makes it more accessible and attractive for children in the area.

- LOMMA
- The school project in Lomma provided opportunities for children, teachers and parents to be educated and improve their knowledge of ecosystem services, which resulted in them being able to influence the design of the school according to their needs. Furthermore, the coastal protection project was an opportunity to provide a walkway for exercise, walking and proximity to the water.

Figure 12A–C, Comparison of ES used in Höganäs and Lomma.

4.6.3 PUBLIC PARTICIPATION

Wamsler et al. (2019) summed up the drivers and barriers observed in Lomma and Höganäs regarding public participation as follows:

> "Municipalities' capacities for more positive citizen involvement able to support democratic approaches and sustainability outcomes are low.
>
> This relates to a lack of an adequate support structure for systematic mainstreaming of NBS and CCA and associated citizen involvement (apparent in a lack of policies and regulations, working conditions and structures, planning tools, finances and human resources – linked to political and practical spheres of transformation).
>
> Identified drivers and barriers at personal level relate to people's environmental awareness and beliefs, 'non-rational' behaviour, the way people understand their relationship to others and the environment, embedded social power structures (linked to education, income, experience/ newcomers, political orientation and groupings) and associated perceptions of one's own influence and responsibilities.
>
> A systematic inclusion of people's knowledge and capacities requires the consideration of the identified drivers and barriers at personal level to tap into the personal spheres of transformation (e.g., people's emotions, values and belief systems)."

Further obstacles to the implementation of ES, UGI and NBS in municipal planning are found when citizens oppose sustainable cities. For example, in both Lomma and Höganäs personal interests resulted in conflict. Citizens in Höganäs opposed plans to protect trees in the Folkparken, and in Lomma citizens protested against plans to protect the coastline. One argument that is often used is 'not in my backyard' thinking. This was especially the case in Lomma, where an opposition movement protested against the coastal protection project motivated by concerns that the new environment would decrease the value of their houses.

4.6.4 OUTCOME OF THE COMPARISON BETWEEN HÖGANÄS AND LOMMA

This study highlights the main differences between the two municipalities regarding regulating ES. Höganäs chose both grey and green solutions to the water management problem in the Folkparken & Julivallen project, while Lomma chose green solutions to solve the problem of

the coastal protection wall. In terms of supporting ES, the main difference was the attitude to using ES to address challenges. Lomma's Beach school project respects ES principles – the school has been adapted to the existing environment and the schoolyard has been used as an opportunity to create more biodiversity (which will, in turn, increase supporting services). However, in Höganäs, priority was given to exploitation, rather than protecting nature or increasing ES.

The main difference between the municipalities regarding cultural ES concerns priorities. In Lomma, children participated in the spatial planning process, which led to improvements to the schoolyard and the preservation of the surrounding nature. Furthermore, the coastal protection project improved recreation facilities for the public by providing better paths for cyclists and pedestrians. On the other hand, in Höganäs, priority was given to how the municipality could compensate for, and preserve, cultural value and green areas. In Lomma, priority was given to avoiding damage to ES, while Höganäs accepted that some ES would be damaged and sought to find ways to compensate for this. This is seen in the demolition of the Peoples' houses, which was a cultural monument, and many trees.

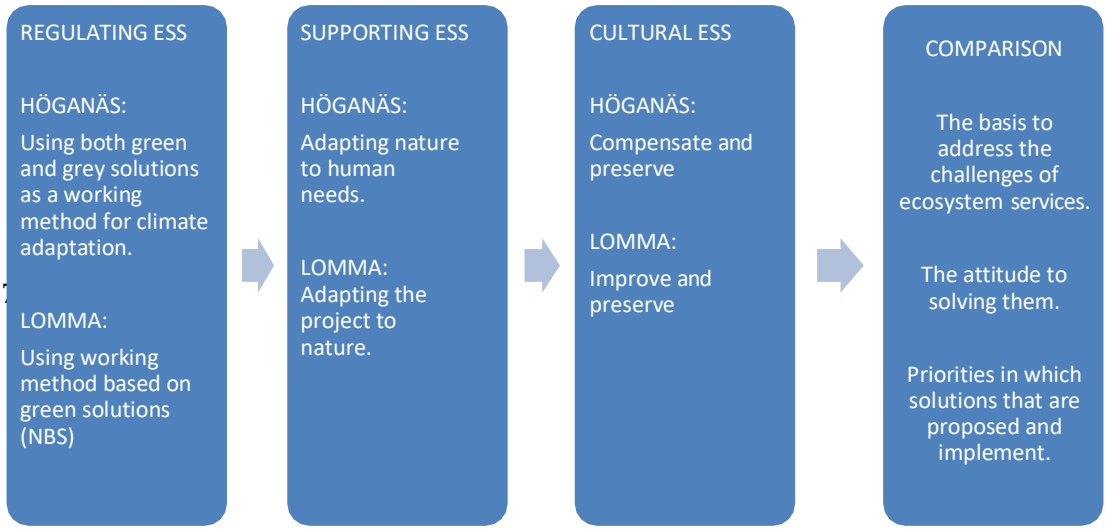


Figure 13 Comparison of ES in Höganäs and Lomma.

5. DISCUSSION

This thesis has analysed the Folkparken & Julivallen project in the Swedish municipality of Höganäs from the perspective of ES. Furthermore, it compared the Höganäs initiative with similar projects in Lomma municipality. The results highlight differences in how the two municipalities worked with ES and the impacts of the three projects on ES. First, we discuss question one, namely:

From a theoretical perspective, how can urban planning and ES work together in densification projects to create sustainability?

Wamsler et al. (2016) note that it is important to include UGI and NBS when analysing ES. This is because the two concepts support ES by proposing solutions to complex problems related to the social and ecological values of a city. These ideas were taken up in Albert et al. (2019), while Zölch (2018) argues that UGI is important as green areas in a city provide the largest number of ES. Haaland and Konijnendijk van den Bosch (2015) address densification in urban planning, and try to analyse the question of "where should we build?" in a context of conflicting national and international legislation that sets the protection of farmland against the protection of urban green areas. I would argue that solutions can be found for the difficult issues that Haaland and Konijnendijk van den Bosch (2015) discuss – and that NBS/ UGI can be part of those solutions. In both Lomma and Höganäs, examples can be found of green alternatives based on NBS: green roofs in Lomma and water management solutions in Höganäs. These two examples show how densification and ES can coexist. In turn, UGI is preserved and cities become more resilient to, for example, climate change.

However, much of the literature presented in this paper has addressed a broader, strategic problem. Many examples can be found where efforts to use UGI and NBS in densification projects have proved difficult. In this context, Wamsler et al. (2016) point out that, among other things, Sweden's project-based working practices make it difficult to establish the use of ES in community planning. In a similar vein, Nordin et al. (2017) argue that the strategic overview is the most important document for municipalities seeking to work with ES. As Delshammar (2015) notes, there is no legislation that requires a municipality to include ES in their overall plans, which makes implementation difficult. The lack of Swedish legislation regarding ES is also addressed by Delshammar (2015), who sees it as an obstacle to including them on the urban planning agenda. Finally, Hysing and Lindskog (2018) argue that there is a need to start

a new debate, and shift the focus from time and money, to the value of nature and sustainable urban development. These issues are clearly seen in Höganäs and Lomma, where the two municipalities have used ES in various ways in their densification projects. This, of course, may be due to many factors, but one of them may be the lack of clarity from the Swedish parliament, and the lack of legislation at national level.

Question two is:

How have ES been applied in the context of urban planning in a smaller Swedish municipality, taking the example of the Folkparken & Julivallen densification project in Höganäs?

The Ecosystem Knowledge network (2019) describes various methods regarding how ES are described and used in case studies. They have developed the *Models for mainstreaming the Ecosystem services framework and ecosystem services approach* to clarify differences between how the term is used in different case study contexts. Their description is based on four categories of approaches that are used in projects, called: retrofit, incremental, ecosystem services-led and ecosystem approach-led. The different approaches are described as follows (see also Figure 15):

> **RETROFIT:** ES have been bolted on, retrospectively, to the output of an existing plan and therefore have not explicitly influenced its direction and scope.
>
> **INCREMENTAL:** ES have been integrated into the process, but as a separate part, limiting their overall application.
>
> **ECOSYSTEM SERVICES-LED:** ES have been embedded in the process from the start and, thus, are able to inform subsequent assessment, planning and deliverystages.
>
> **ECOSYSTEM APPROACH-LED:** the 12 principles of the Ecosystem Approach have been embedded in the process from the start.

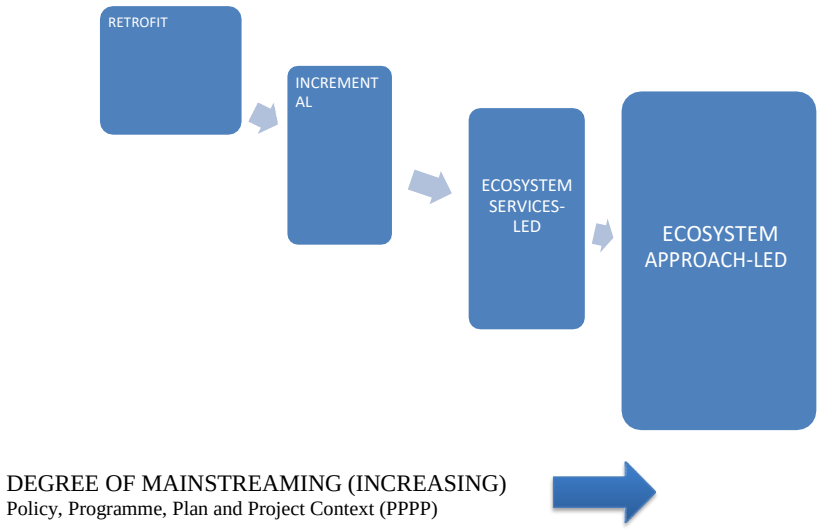


Figure 14 ES based on the Ecosystem Knowledge (2019) approach.

This model clarifies, and provides a better understanding of the differences that arose between Lomma and Höganäs. In Höganäs, the project corresponds to the concept of the retrofit. This explains, for example, why the municipality worked with both grey and green solutions, as ES were not the focus of planning. In contrast, Lomma adopted an ES perspective from the beginning and the municipality was thus able to adapt the two projects to ES needs. This enabled the municipality to preserve and contribute to the improvement of ES in the areas affected by the projects. This is an example of a step 3 process, namely ecosystem services-led projects (Figure 15).

Nordin et al. (2017) present similar arguments, but use the terms *explicit* and *implicit*. In the case of Höganäs, the municipality worked implicitly, as they did not actively use the term *ecosystem services* either in detailed planning or in feasibility studies (e.g. the pre-planning report). This shows the municipality's lack of knowledge regarding ES, while Lomma worked explicitly and actively used the ES concept in their planning.

Question three:

How does the Folkparken & Julivallen densification project relate to similar projects in Lomma municipality?

Raudsepp-Hearne et al. (2009) argue that RES usually stands alongside other ecosystem services. Carpenter et al. (2006) present similar arguments, stating that the importance of RES

has been underestimated, and the concept is a lower priority compared to other forms of ES. Foley (2015) agrees, and notes that if humans do not make changes, RES will be unable to help in addressing climate change. Therefore, RES structures and functions are an important tool in facing future challenges. Further evidence is seen in the fact that Höganäs chose both green and grey solutions, suggesting that RES were a low priority, while Lomma used only green solutions and gave higher priority to RES. With reference to Figure 15, this can be explained by the fact that Höganäs had a problem with stormwater management; however, because the focus was not on ES, the only solution was grey infrastructure. This concrete structure solved the water problem, but added no biological or ES value. On the other hand, in Lomma, the two projects were led from an ES perspective and, therefore, were oriented towards sustainable solutions to challenges; consequently, green alternatives were preferred.

Harrison et al. (2014) addressed the problem of urbanization and the threat it poses to supportive urban ES. Other research, for example Luck (2003), has created tools to enable the protection and preservation of urban green spaces. Bastian (2013) argues that it is important to identify the link between biodiversity and all ES, but especially supporting services in order to better-understand the relatively unknown link between them. Palomo et al. (2014) state that if we succeed in recreating and protecting biological value in cities, this could be the key to securing the future of supportive ecosystems that could generate even more services.

In Höganäs, such solutions were not adopted, and the municipality instead considered that human values took priority. From this perspective, it is more natural to begin by thinking about compensation mechanisms for SES and other green factors. The starting point is the human perspective, and nature is expected to adapt to the client/ architect and the vision of politicians. Lomma adopted a very different attitude. In the Beach school project, for example, opportunities were adapted to the needs of nature that, at the same time, made it possible to increase the green value of the area. The approach and working methods were completely different: Lomma was far more oriented to solutions that helped SES compared to Höganäs.

Dickson and Hobbs (2017) argue that CES are becoming more and more important as urbanization increases and green spaces disappear. Reduced access to green space affects people's well-being. The non-economic benefits of CES appear to have been forgotten by researchers; CES risks not being taken seriously if they cannot be quantified. James (2015) and Stålhammar and Pedersen (2017) described some of the difficulties with the CES concept and its definition. They argue that individual subjective experience of a place can make it important

in a larger context of, for example, interventions that are carried out in a CES-sensitive area.

In Höganäs, the park provided a variety of CES, such as opportunities for play, sport, recreation, etc. and did not face the challenges described in the research, instead the problem concerned preserving CES. Although not initially planned, the park was improved through the introduction of water management solutions, which contributed to CES as water provides cooling in summer and opportunities for relaxation. However, there is no evidence of other improvements in the area, which raises questions aboutdecision-makers' priorities. The focus on protecting (for example, cultural monuments) shows that Höganäs understands the value of access to CES, but there are no signs of improving existing services or investing in new ones.

In Lomma, on the other hand, both projects show an understanding of being able to find solutions that both meet the project's goals, and are green and sustainable. Although the coastal protection project could have easily used grey solutions (i.e. asphalt and concrete), the municipality instead invested in green paths. Similarly, in the school project, the municipality chose to include children, teachers and parents in decisions, which led to knowledge exchange and an understanding of sustainable development. Although both municipalities are dominated by the same political party (the Moderaterna), it is interesting to see how two completely different solutions were implemented with respect to CES.

To summarize, Höganäs and Lomma differ in how they worked with ES, as Figure 15 shows. Other differences are seen in the attitude of politicians and organizations to solving problems and challenges that require ES. Finally, a comparison of the work of the two municipalities highlights differences in long- and short-term perspectives when contributing to sustainable urban development.

Finally, a brief reflection on public participation is merited. As described in the introduction, the public participated in the detailed planning process, and here we explore the influence of residents and authorities on spatial and detailed planning. As noted earlier, there are two main theses regarding the role of public participation in urban planning: those that are for more dialogue and those that are against. Qi (2012) argues that it is a human right, while Wamsler et al. (2019) argue that it can hamper projects, contribute to delays and incur extra costs for the municipality.

In both Lomma and Höganäs, public participation appeared to be an obstacle rather than an

asset. In the case of the coastal protection project, local residents protested. The same was seen in Höganäs, where residents opposed planting trees in the Folkparken because of bird noise and droppings. At the same time, Lomma invited children, parents and teachers to participate in the school project, which resulted in a successful solution for the use of the schoolyard, improved understanding and supported the exchange of knowledge. One approach could be to integrate residents in the early stages of, for example, the planning process in order to be able to create sustainable solutions and educate participants. In these cases, it could lead to a more positive attitude to changes in the urban space.

What I find interesting is that similar political contexts in the two municipalities produced different results. It is reasonable to expect that similar policies would have similar goals, political will and attitudes to ES in urban planning. What, then, can be the difference? I argue that the answer to this question is based on Theodore Roosevelt's quote, "I believe that the more you know about the past, the better you are prepared for the future" (Pinkley 2019). In fact, the history and background of Höganäs and Lomma are very different. It was noted earlier that the Folkparken played an important role in the city's popular, socialist movement (Höganäs kommun 2011). Furthermore, both the municipality and the city underwent major spatial changes when the coal industry closed down. This economic crisis led people to ask what they should do next. The population lost confidence in the Social Democrats, seen in the fact that, in 1998, the Moderaterna, a right-wing party, took over the municipality (Silverstrand 2010). The shift is described on the municipality's website as a journey from coal to diamonds, and today the municipality enjoys a dynamic economy (Höganäs kommun 2018).

Another factor that emerges from this thesis is based on Albert et al. (2018). Notably, actors in the social system play a huge role in developing NBS in urban planning. Legislation ensures that, to some extent, municipal processes are similar. However, working practices, routines, solutions and results are completely different, which all have an impact on how much ES can affect a project. For example, Lomma may have more resources, greater expertise and more time than Höganäs. Such prerequisites are, of course, decisive in whether ES are included, or not, in the project. How does this affect ES? I think it has a significant impact.

Political influence should not be underestimated in community-building projects. This is a factor that may have caused decision-makers in Höganäs to focus more on the historical perspective than green values. This perspective, in turn, influences the choice of NBS and UGI, and the priority given to ES. Time, money and expertise, in combination with political will,

greatly influence a municipality's predisposition to work with ES. As Nordin et al. (2017) note, smaller municipalities have generally allocated fewer resources to ES. This could also be the reason why both green and grey solutions were adopted in Höganäs. Solutions were adopted from a human perspective, without considering future, sustainable options. Interests are always set against each other in community-building projects, but as long as politicians take decisions about urban development, the public will probably never know what the real motives are for a project in their city. Hopefully, Höganäs will learn from Lomma and seek to become more sustainable and work more with ES.

6. CONCLUSION

This thesis highlights the opportunities and challenges of integrating ES into everyday urban planning in densification projects. The results show how Höganäs used ES in the Folkparken & Julivallen densification project. A comparison of the Folkparken & Julivallen project with two similar projects in Lomma clearly highlights differences between the two municipalities, and the shortcomings of Höganäs. Lomma, unlike Höganäs, has adopted an ES perspective, which means that solutions were, first and foremost, based on green and sustainable alternatives. A second issue is public participation. This thesis examined two contradictory opinions in Swedish planning; one perspective argues that more dialogue is needed, while the other considers that it is counterproductive. The results of this study are mixed.

The Folkparken & Julivallen project is not yet completed, and it will be interesting to see the final product. At least with respect to landscape planning, there are still opportunities to make improvements and compensate for the losses that have been incurred so far. The question is, will politicians allocate a budget to support the municipality's decision to incorporate ES into urban planning? It remains to be seen. However, I am optimistic about the future development of the municipality. More investment is being directed towards the environment, which can only improve ES in Höganäs.

The Folkparken & Julivallen project has been a learning process. It is the municipality's biggest densification initiative, and many new solutions and working methods were tested for the first time. It remains unclear why Lomma does work with ES, but Höganäs does not. Is it due to political will, (lack of) interest or attitudes to green sustainability? At the same time, Höganäs planners have worked unconsciously with ES, UGI and NBS, although retroactively.

The comparison of Höganäs and Lomma is interesting. In particular, how two municipalities, with so many similarities, have such different views of the use of ES and green sustainability in urban planning. At the same time, research, for example, Nordin (2017) and Delshammar (2015) has begun to bring attention to the challenges that Sweden faces in how to unite municipalities so that they work in similar ways towards a more sustainable future. Legislation and regulations, goals and visions, are clear manifestations of how interpretations differ regarding how municipalities are expected to work with ES.

Through this thesis, I have learned a lot. One of the many lessons I take with me is that, despite all that has been learned about environmental issues, ES and green sustainability, there has been little progress towards sustainable cities. With ongoing climate change, progress needs to be made now, and not tomorrow. Is it still too difficult to understand its role, and implement it in a densification project in a small town in a small country? If time had allowed, it would have been interesting to compare Höganäs and Lomma when the Folkpark & Julivallen project had been completed. This would have provided more concrete evidence of what ES were taken into account, what was compensated for, and what other measures the municipality had taken. It would also have been interesting to make a comparison with similar cases in other counties in Sweden, and internationally. Another approach would be to observe differences between municipalities that work actively and passively with ES. I think future research could also contribute to the clarification of goals and visions; each year the Swedish government publishes new legislation and directives on green sustainability, why not, eventually, ES? What would be the effect of such a change on urban planning? One final question, that rounds off this paper, is how Höganäs will work with ES in the future?

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APPENDIX

The environmental impact

How does the plan's implementation affect the following areas? Note positive or negative impact with + and −, respectively, and no change with an x. Use parentheses () to indicate that the influence will be determined by ongoing planning work or building permits and cannot be assessed at present (Höganäs kommun 2013 and own translation).

NATIONAL ENVIRONMENTAL OBJECTIVES	**None**	**Moderate**	**Great**	**Comment/Action**
1. Limited climate impact			+	Housing densification in central Höganäs with extremely good possibilities for district heating, service, and public transport.
2. Fresh air	x			See point 1
3. Just natural acidification	x			See point 1
4. Toxic environment	x			Not applicable
5. Protective ozone	x			Not applicable
6. Safe radiation environment	x			Not applicable
7. No eutrophication		-		Depending on how park and green area is installed and maintained. Fertilization of green areas with water drainage should be avoided.
8. Living lakes and streams	x			Not applicable
9. Good quality groundwater		-		Reduced infiltration and, consequently, groundwater reclamation by surface hardening for road, parking, and buildings.
10. The sea in balance as well as living coast and archipelago		-		Risk of mainly oil and fuel influences on daylight from parking, loading zones, etc., must be managed environmentally correct, how is it monitored in the implementation?
11. Mild wetlands		(-/+)		New water retreatment magazine is planned but in an urban design that does not add any biological values. Design and management absolutely crucial.
12. Living forests		(+)		Litorinavallen should be secured so that it remains wooded.
13. A rich farming landscape	x			Not applicable
14. Well-built environment			(+)	The design and protection of the area's green areas are important for how housing densification should be experienced. So also the connection to streets, service etc.
15. A rich plant and wildlife		+		They are new values today. The ones available are linked to older trees and vegetation at Litorinavallen, this is where you can develop these.

Environmental Quality	None	Moderate	Great	Comment/Actions
Outdoor air	x			The measurement of NOx and PM10 is closest to Höganäs. Environmental quality standards are met in Höganäs. Plan change is not expected to change the emission picture.
Surface and groundwater	x			Not applicable
Fish and mussel water	x			Not applicable
Social Functions	**None**	**Moderate**	**Great**	**Comment/Actions**
Transportation (goods, persons, etc.)			+	The area's access to public transport is good. District heating, service and public transport are central and close to housing sealing.
Other communication (telly, IT etc.)	x			Available, is not expected to change.
Service (business, post office, etc.)			+	Available and benefited, thus increasing the opportunity for new business in a weak market (Storgatan).
Jobs		+		Available and benefited, so also the possibility of new business in a weak market (Storgatan)
Territories (as production)	x			Not applicable
Care (sickness and aging care)		+		Located close to the development area.
School, preschool		+		Located close to the development area.
Meeting places			+	Available in connection with Library, Central, and Storgatan, the harbour.
Any barrier effects in the availability		+		No, the plan is considered to counteract any barrier effect.
Tourism	x			The change of plan is judged to primarily serve the residents of the resort and public and commercial services.
Waste management		-		More housing and more companies provide a certain waste disposal.
The neighbouring municipalities (traffic, air, exploitation, planning, community functions as above)	x			Not considered to be affected.

People's Health	None	Moderate	Great	Comment/Action
National interest in outdoor recreation	x			Not applicable
Access to recreation areas		+		Weak, closest to Lerbergsskogen and Kvickbadet
Access to other recreational activities			+	Good with sports centre, Lerbergets golf, airport and football facilities.
Other green surroundings than recreation		(-/+)		Weak - important that the green areas created in the area of the plan are large enough and attractive.
Feeling safe		+		Estimated increase with more accommodation, greater flow of visitors in the area that can easily be enhanced by light, public space and meeting places.
Equality	x			It is not clear from the plan how it can be strengthened.
Adaptation to disability	x			Handled in construction law. It is not apparent from the plan how it can be strengthened
Traffic safety		-		The traffic flow on Långarödsvägen is estimated to increase, partly as a link between the city's southeastern parts and the centre, but is also an entrance to the south from the south sidewalks and the cycling network shows some shortcomings in and around the area. The sidewalks along Långarödsvägen are narrow and some marked cycle tracks are not available. Straight through the plan area runs the Norra Måntorpsvägen, which links the residential areas south of the Folkparken with the city's central parts. The perception is that the traffic issue must be investigated better.
Noise		(-)		The noise is expected to increase slightly with more residents. Does it not matter how much?
Vibration		(-)		See Noise
Radiation, radon	x			Not applicable
Light disturbances	x			Not expected to change
Odour	x			Not applicable
Hazardous substances	x			Not applicable, 150 m to road 111 and dangerous goods.
Accident Risks	x			See" traffic safety"

Landscape, Nature, Animal and Plant life	**None**	**Moderate**	**Great**	**Comment/Action**
National interest nature conservation	x			Missing
National interest for coastal zone	x			Yes, but is not expected to be adversely affected.
The landscape	x			Missing
Wildlife, green structures	x			Missing
Fishing loch hunting area	x			Missing
Wetland, marsh forest		(+)		Missing today, possibly wetland with a new water reservoir. The question is its design, urban gives few biological values.
Red-listed species	x			Missing
Other rare or threatened plants and animals or its communities.		(-/+)		Unknown, possibly in vegetation on Litorinavallen. Important that this green area is not converted to parkland should be treated as a light open natural beach forest.
Risk of disturbance on nesting birds and other young animals.	x			Missing
Animal welfare areas, directly or indirectly	x			Missing
Shoreland	x			Missing
Nature management areas of the County Administrative Board	x			Missing
Nature conservation Plan, County Administrative Board or Municipal	x			Not included in today's nature conservation plan, but Litorinavallen has qualities to be included in the forthcoming new municipal nature conservation plan.
Natura 2000, directly or indirectly	x			Missing

Soil	**None**	**Moderate**	**Great**	**Comment/Action**
soil contamination		-		Available, but moderate, and estimated to be handled during exploitation.
Risk of erosion	x			No, the area is over +3.5 meters above sea level.
Valuable geology			+	Yes, Litorinavallen
Valuable farmland, is class known?	x			Missing
Changes in sedimentation conditions in waterways, lake or sea areas	x			None
Water	**None**	**Moderate**	**Great**	**KOMMENTAR/ATGARD**
Risk of contamination of surface water		-		Yes, Öresund through water, an environmental technology issue to consider.
Risk of contamination of groundwater	x			No, is not considered relevant.
Water availability, water quality in surface or groundwater or possible	x			No, is not considered relevant
Change in infiltration, drainage		-		Yes, reduced infiltration
Change in flow, direction or amount of water	x			Yes, through the tidal magazine but not considered negative
Change in flow, direction or current in groundwater or other surface water		-		Yes, reduced infiltration and increased direct dewatering
Risk of dehydration or flooding		-		The area is flat, heavily drained. More hard surfaces and ceilings increase the risk of flooding in the event of any drainage.
Water protection area	x			Missing
Air - Emissions	**None**	**Moderate**	**Great**	**Comment/Actions**
Transports	x			No, not as a whole
Production	x			No production
Heating for accommodation, rooms, etc.		-		Some increase, absolutely crucial is the energy battle
Climate factors	**None**	**Moderate**	**Great**	**Comment/Actions**
Wind conditions				Can change, hard to predict (see high house project)
Humidity	x			No, enough green area left to weight any heating
Air, water and ground temperatures	x			No, enough green area left to weight any heating
Buildings	**None**	**Moderate**	**Great**	**Comment/Actions**
Cityscape, term lines		+		Estimated favourable