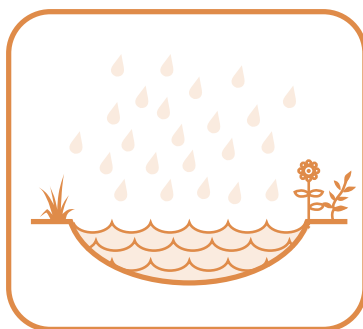




CLIMATE ADAPTATION IN DENSIFYING CITIES

Blue-green visions in Sofielund, Malmö, Sweden

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Climate adaptation in densifying cities. Blue-green visions in Sofielund, Malmö, Sweden
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CONTENT

1. INTRODUCTION
2. PRINCIPLES FOR BLUE-GREEN SOLUTIONS
3. EXAMPLES OF BLUE-GREEN SOLUTIONS
4. SOFIELUND
5. AREAS OF FOCUS
 - NORTHERN SOFIELUND
 - SOUTHERN SOFIELUND
6. FINAL WORDS
7. RECOMMENDATIONS



1

INTRODUCTION

In August 2014, a cloudburst rain affected the city of Malmö, Sweden and caused large floods; illustrating how vulnerable our cities are to heavy rainfall. Over 24 hours, 100 mm rain fell, which corresponds to a cloudburst that is expected to return every 100 years in Sweden.

With the global climate change, it is expected that the occurrence of similar cloudbursts will increase and it is therefore crucial that our cities have the capacity to handle large amounts of rain without people, buildings and infrastructure being severely affected. Measures taken to increase the capacity are usually called climate change adaptation.

Cities have previously relied on sub terrainian piped drainage and sewage systems for storm-water management. Large parts of these systems were constructed at a time when the cities were considerably smaller and more sparsely populated. Urbanization and an increasing amount of impermeable surfaces in our cities put higher demands on the sewage systems. Lack of capacity in these systems, in combination with climate change, increases the risk of flooding.

One way to reduce the risk of floods is to work with “blue-green solutions” on the surface. By using storm-water ponds, infiltration beds and by lowering grass fields, the local capacity to

accommodate water is increased, which reduce the pressure on the piped drainage system. Blue-green solutions do not just handle water but can also, if properly designed, make the city generally greener and increase the space for recreation and relaxation. Additionally, a greener environment has proved to have positive effects on the health of people living in the city. However, implementing blue-green solutions in an already developed area is a challenge. A challenge we need to take.

Implementing blue-green solutions in an already developed area is a challenge. A challenge we need to take.

Researchers from the Center for Environmental and Climate Research at Lund University interviewed small and large property owners in the district Sofielund in Malmö to capture their views on climate change adaptation and opportunities to create blue-green solutions. Based on the interviews, in cooperation with landscape architects, they identified ten principle blue-green solutions that could be used in a district like Sofielund. Together with the landscape architects, they also developed six visions, to illustrate how different places in Sofielund could look like with blue-green solutions.

2

PRINCIPLES FOR BLUE-GREEN SOLUTIONS

In a dense city, it is important to create structures, which have more than one function, i.e. multi-functional structures. Many blue-green solutions can have several functions, for example, an infiltration bed or a raingarden does not only take care of water, it can also be perceived as beautiful by people passing-by or function as a habitat for urban wildlife.

An advantage with blue-green solutions in relation to the traditional pipe-based wastewater and sewage system is that blue-green solutions are often more flexible. It is easier to build a blue-green solution in one place and later, if necessary, develop something else. Increasing the capacity of the existing sewage system is both complicated and costly. Blue-green solutions can therefore be a cost-effective and flexible alternative in already developed areas, as well as in new developments.

Which blue-green solutions that are possible to construct depends on the conditions of the specific urban context. Single-family house owners and owners of smaller properties usually lack the room for bigger solutions, such as a storm water pond.

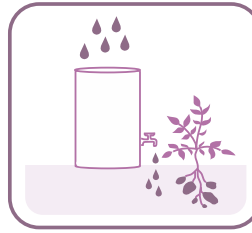
A single small blue-green solution may not contribute with a lot of water management, but many small contributions can amount to something big.

However, there may be room for infiltration beds, rain beds, green roofs or conversion of parking lots to permeable surfaces that could be used for urban gardening. A single small blue-green solution may not contribute with a lot of water management, but many small contributions can amount to something big.



RAIN BED

An infiltration bed or raingarden is a permeable plant bed where water is delayed, infiltrated and purified.



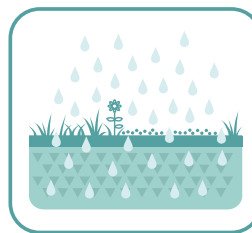
RAIN BARREL

A rain barrel collects water from the drainpipe, which can be used for irrigation of a house.



WATER PLAY

Areas which encourage play with water.



PERMEABLE SURFACES

Permeable surfaces allows water to infiltrate into the soil. For example, grass, gravel or hollow concrete bricks.



GREEN ROOF/WALL

A green roof or wall has some form of vegetation and can accommodate water.



TREE PLANTATIONS

Tree plantations with skeletal soil can delay and clean the water.



SWALLOW

A swallow is a grassy dike, which takes care of water from impermeable surfaces. The water is cleaned from particles as it passes through the grassy dike.



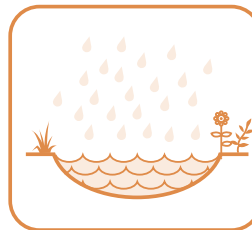
TRENCHES

A trench in the street for runoff on impermeable surfaces.



BICYCLE PARKING

A permeable bicycle parking lot enables water to be infiltrated into the ground. Water could also be delayed in the pipe design of the parking space.



STORM WATER POND

A pond can receive, delay and clean water. Some ponds have a permeable bottom where the water can infiltrate others have impermeable bottoms.

3

EXAMPLES OF BLUE-GREEN SOLUTIONS



STORM WATER POND
Brunnshög, Lund



SWALLOW
Brunnshög, Lund



GREEN ROOF/WALL
Hongkong



GREEN ROOF/WALL
Hongkong



RAIN BED
Monbijougatan, Malmö

4

SOFIELUND



Sofielund is situated a ten-minute bike ride from the heart of Malmö; the old stone city. The district is often divided into northern and southern Sofielund. The northern part has about 4000 inhabitants and the southern about 5000 inhabitants. The housing in the district is a mixture of single-family homes, multi-family housing in closed blocks, million program housing estates from the 70s and a relatively large industrial area in the northeastern part.

In total there are about 160 property owners in the area, some large and many small. Like many other parts of Malmö, Sofielund is a multicultural district. Approximately 40 percent of the residents are born abroad. The population is also young, with an average age of around 40. Educational and income levels are lower than the average in Malmö and the unemployment rate is higher. Parts of Sofielund are known for high crime incidents and some residents experience insecurity.

Malmö is often called the city of parks, even though the amount of public available green space per citizen is low seen from a Swedish perspective. Sofielund is a part of Malmö, that has the lowest amount of green space. The municipality has identified the district as a place where investments in green space is needed.

The location of Sofielund is of strategic importance for both the municipality and private property owners. In the neighbour districts, several urban development projects are ongoing such as 'Amiralstaden' and the new train station at Rosengård. These projects are expected to influence the development of Sofielund and make the area more attractive for both housing and business establishment.

In order to handle the multiple and complex challenges that exists in Sofielund, and to create dialogue about the development of the area, property owners in Sofielund have come together and started working in line with the so-called BID-concept (Business Improvement District). The BID-concept is used in several cities worldwide and is a method for how to collaborate cross actor groups in a district.

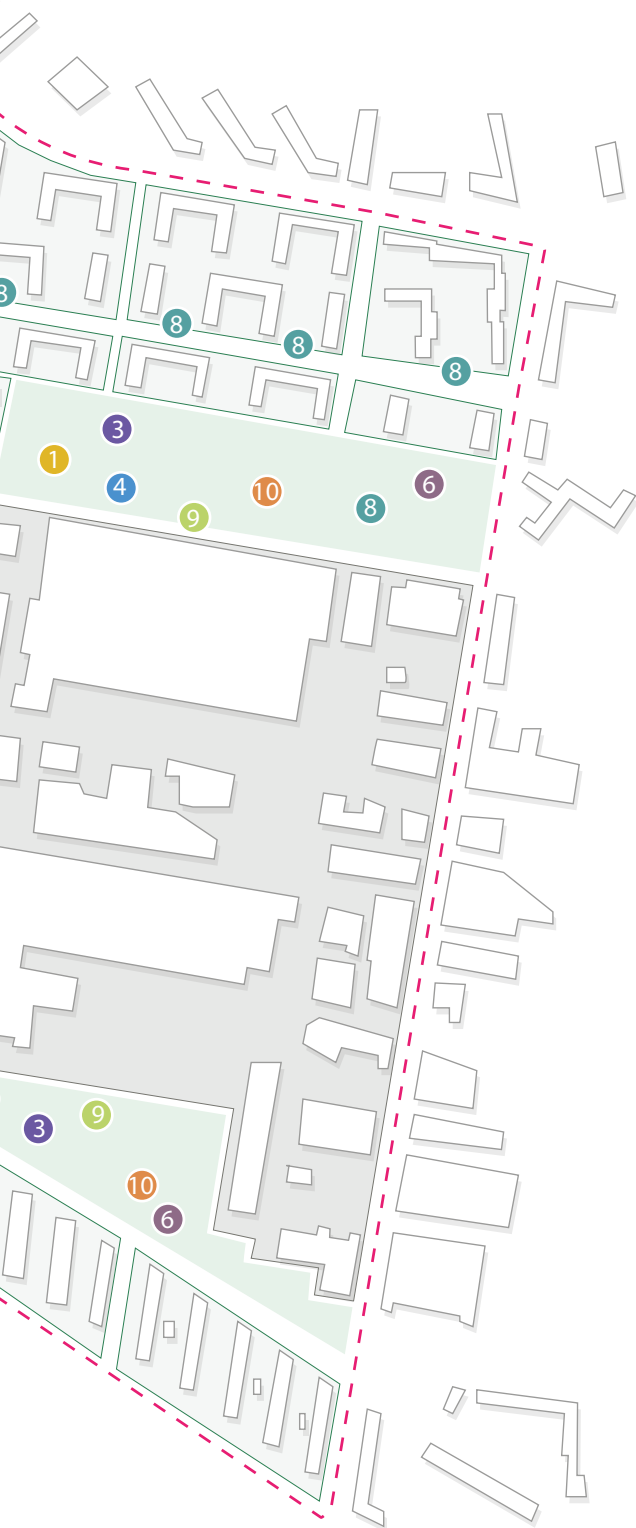
Parallel with hopes for a development of the area is a concern among residents about what will happen if Sofielund undergoes an urban regeneration. Increased living costs in newly built or renovated properties could lead to gentrification, meaning that a more socio-economic strong middle class replaces the current population.



Sofielund is a part of Malmö, that has the lowest amount of green space. The municipality has identified the district a place where investments in green space is needed.





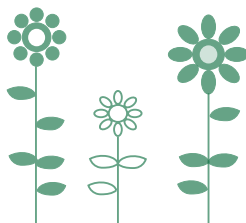


- 1 Rain bed
- 2 Trenches
- 3 Water play
- 4 Bicycle parking
- 5 Green roof/wall
- 6 Rain barrel
- 7 Tree plantation
- 8 Permeable surfaces
- 9 Swallow
- 10 Storm water pond

In order to put the solutions in a context we have placed them on a map of Sofielund. The solutions are placed based on the conditions of the different locations and the map illustrates opportunities rather than certain locations.

5

AREAS OF FOCUS

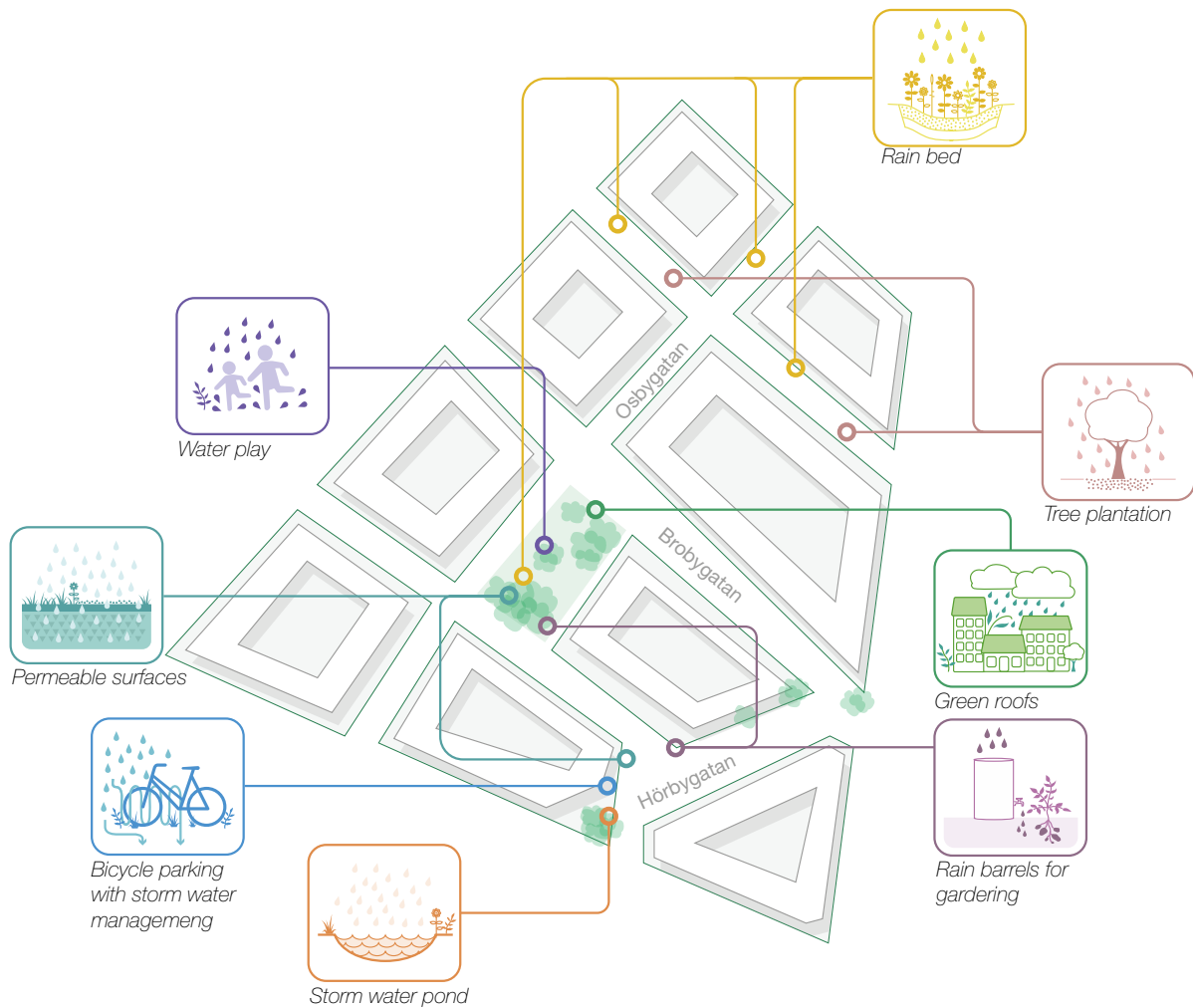


Walking through Sofielund, from Nobeltorget in the north to Sevedsplan in the south, you pass closed blocks with courtyards, street houses along Nobelvägen, larger single-family homes with gardens and multi-family housing built in the 50s along Rasmusgatan. All areas have their own characteristic and prerequisites for blue-green solutions.

The six visions represents different types of locations in Sofielund. The public parks, with space for playing, recreation and relaxation for the inhabitants. The closed courtyards of the multi-family housing, where bicycles and garbage facilities mix with trees, swings, barbecues and urban gardening. The private gardens of single-family homes, where time and interest govern the content and appearance.

The visions should be seen as an inspiration of how a place could be designed with blue-green solutions rather than a complete proposal. We focus mainly on two areas, the closed blocks in the northern Sofielund and the old Sofielund village in the southern Sofielund.





NORTHERN SOFIELUND

The closed blocks in northern Sofielund stretches between Regementsgatan in the north and Sofielundsvägen in the south. There are both tenant owner associations and tenant rentals in the area, divided into large and small property owners. Around 4000 inhabitants live in over 2000 homes. The area has a smaller park, Göingeplan, which consists of a playground, a lawn and some trees. Most of the courtyards are split between different property owners and the appearance of the different parts varies greatly. From green oases to asphalt deserts. In front of the properties there is commonly a strip of land, usually planted with bushes or grass.





Ideas of a courtyard design where plantations and permeable surface material makes the courtyard greener and enables storm water management.



Property owners indicate that order is important in the area, and that the surrounding environment should be appealing. Graffiti and tags is seen as a major problem in parts of the area and the interviewees returns several times to the topic and argues that large sums are spent on removing graffiti; money which instead could be spent on greening the courtyards.

An unexpected obstacle to greener courtyards turns out to be bicycles. Several property owners/mangers argue that the number of bikes have increased substantially in the courtyards and one owner mention that they have been forced to increase the cover of asphalt in the courtyard to create parking for the bikes. Developing alternative bike parking solutions is therefore necessary to create opportunities for greener courtyards. Options that could work in this limited area are installing green roofs on bicycle sheds, replacing asphalt with permeable ground material, for example hollow concrete blocks or moving the bikes to facilities outside the yards. In addition, more innovative solutions such as infiltration beds with an iron grid construction that allows for bicycle parking could be an interesting alternative.

One way to optimize the conditions for greener courtyards, and thus promote climate change adaptation could be to open up between the different parts of the courtyards. This would give better opportunities for trees to grow without taking over completely and make space for lowered grass areas in the middle of the courtyards, which could relieve water from the foundation and the cellars. However, property owners express hesitation to open up between the different parts of the courtyard. The main reason is the worry that the number of burglaries could increase if it becomes easier to move freely across the courtyard, but also practical reasons related to space for waste disposal facilities is mentioned.

Outside the courtyards, there is a potential to increase the quality of the green spaces by replacing parts of the lawns with infiltration beds or to increase the diversity of plants, in combination with parking for bicycles. This could possibly also act as a barrier to graffiti and tags.

Involving the residents is mentioned as an important aspect in the work to change the courtyards. As one property owner puts it: “They are the ones that use the courtyards“.





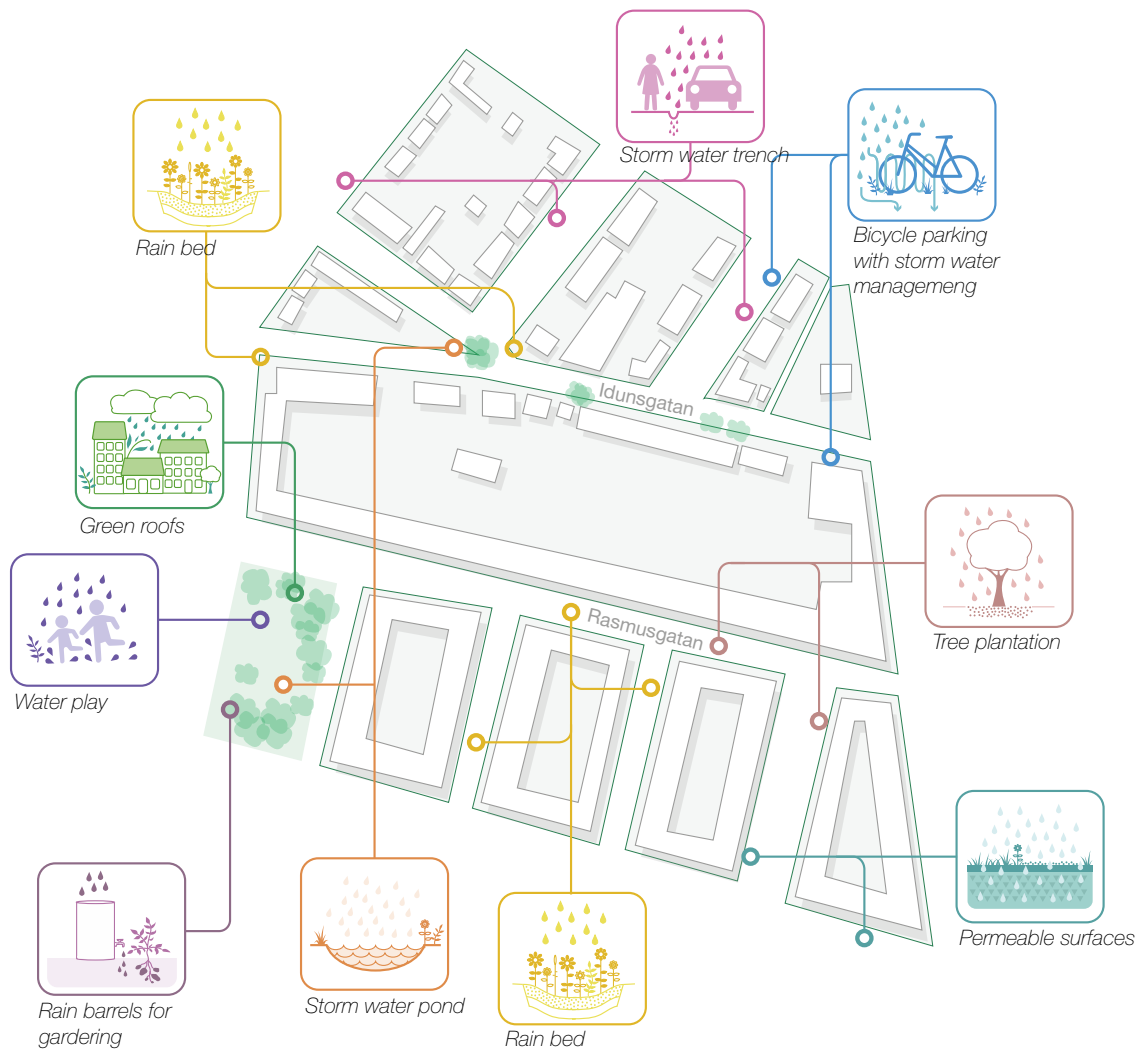
Proposal for a design of a courtyard in Sofielund, which enables storm water management and improve the outdoor environment for recreation and play.





By replacing the concrete squares with hollow blocks, the water infiltration capacity is increased in the bicycle parking spot. A slope towards the plantations removes further redundant water. The plantations are constructed with a small storm water pond and planted with plants that can handle both water and drought.





SOUTHERN SOFIELUND

Old Sofielund village is located south of Lönn-gatan between Nobelvägen and Lantmannagatan and is a part of Southern Sofielund. Bragegatan defines the southern border of the area. Here a resident association was formed in 1970 and has today over 100 members.

The area consists mainly of small-scale buildings from the beginning of 20th century. Most are single-family houses (around 120) of different character with associated gardens, but also some small rental properties and industries. Several of the single-family houses have gardens around the whole house.





Proposal design of a greener public environment in the old Sofielund.



Many property owners in the area were affected by floods in relation to the cloudburst in 2014 and express a great concern for future floods. One concern that is raised is the lack of opportunities to influence the situation themselves. The responsibilities for several of the measures that can be implemented are on public land or within the realm of responsibility of either the municipality or the sewage company.

Several property owners have begun to implement minor solutions, such as installation of check valves, which prevent back flush of wastewater at cloudburst situations and redirection of drainpipes from asphalt and other hard surfaces to lawns and plantations. Several of the interviewees also mention that, there should be requirements for property owners to install check valves.



Blue-green solutions such as green roofs, rainwater barrels and a small pond enables handling of rainwater in this private garden in southern Sofielund.





Some property owners have begun to consider other measures such as infiltration beds and smaller ponds, even though they are not sure of how much of the problem these measures could solve. However, the property owners express that it feels better to do something rather than just sit and wait for the house to be flooded again.

Even though many of the respondents highlight that private property owners can do several things, they conclude that the municipality has to implement larger measures both within and outside Sofielund to reduce flood risks in case of a cloudburst.

Something that was highlighted in interviews in both parts of Sofielund was the need for increased maintenance of the sewage systems and a better and faster communication between the residents and the municipality. This request links to the fact that several cesspits were full of debris during the cloudburst in 2014, which reduced the drainage efficiency.

Property owners also mention that the municipality should be more active, for example by buying strategically located land with the purpose to develop larger blue-green solutions.

Overall, the interviewed property owners are positive to increased cooperation with the municipality but lack a forum for this cooperation. The property owners also perceive the bureaucracy around how to design and implement blue-green solutions as unclear, which hinders implementation.

“If it’s raining and I’m at work I’m always thinking that I have to bike home and make sure everything is all right “.

Several of the respondents mentioned that blue-green solutions could make the streets in the neighbourhood more attractive and reduce the traffic load in the area. The area can thus be more appealing to the residents. The respondents also emphasize that investments in blue-green solutions can be a way to demonstrate neighbourhood attachment, which may have positive effects on a more general level. In order for blue-green solutions to be economical sound they need to be developed in connection to maintenance work, for example additional insulation, drainage work and facade painting.

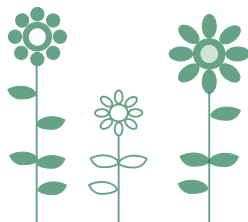


Idea for a courtyard where flowerbeds and a small pond enables water management while providing a nice environment for the residents.



6

FINAL WORDS



There is a strong desire to improve the area among the property owners in Sofielund. They want to get rid of the graffiti, increase the security, create an attractive outdoor environment and reduce the worry of future floods. Several respondents tell that blue-green solutions could be used to reach all these goals, which is an incentive to get started as soon as possible. At the same time, there is a lack of knowledge concerning the implementation and the effect of existing solutions, and how the solutions can be integrated with the traditional piped drainage system on both private and municipal land.

If we keep our focus on Malmö, there are examples of already established blue-green solutions in for example Augustenborg and the Western harbor. However, experiences from these areas have not yet been mainstreamed to any large extent in connection to urban-regeneration of the already established parts of the city. One reason may be that the “blue-green-thinking” is quite new. Another reason property owners in Sofielund mention, is the lack of communication and forum for discussion.

Not everyone in the municipality has the same view of the problem. The views differ in relation to where and how to start. Large-scale or small-scale solutions? Municipal or private initiated projects or projects where private and municipal actors collaborate. In addition, there is an issue of funding.

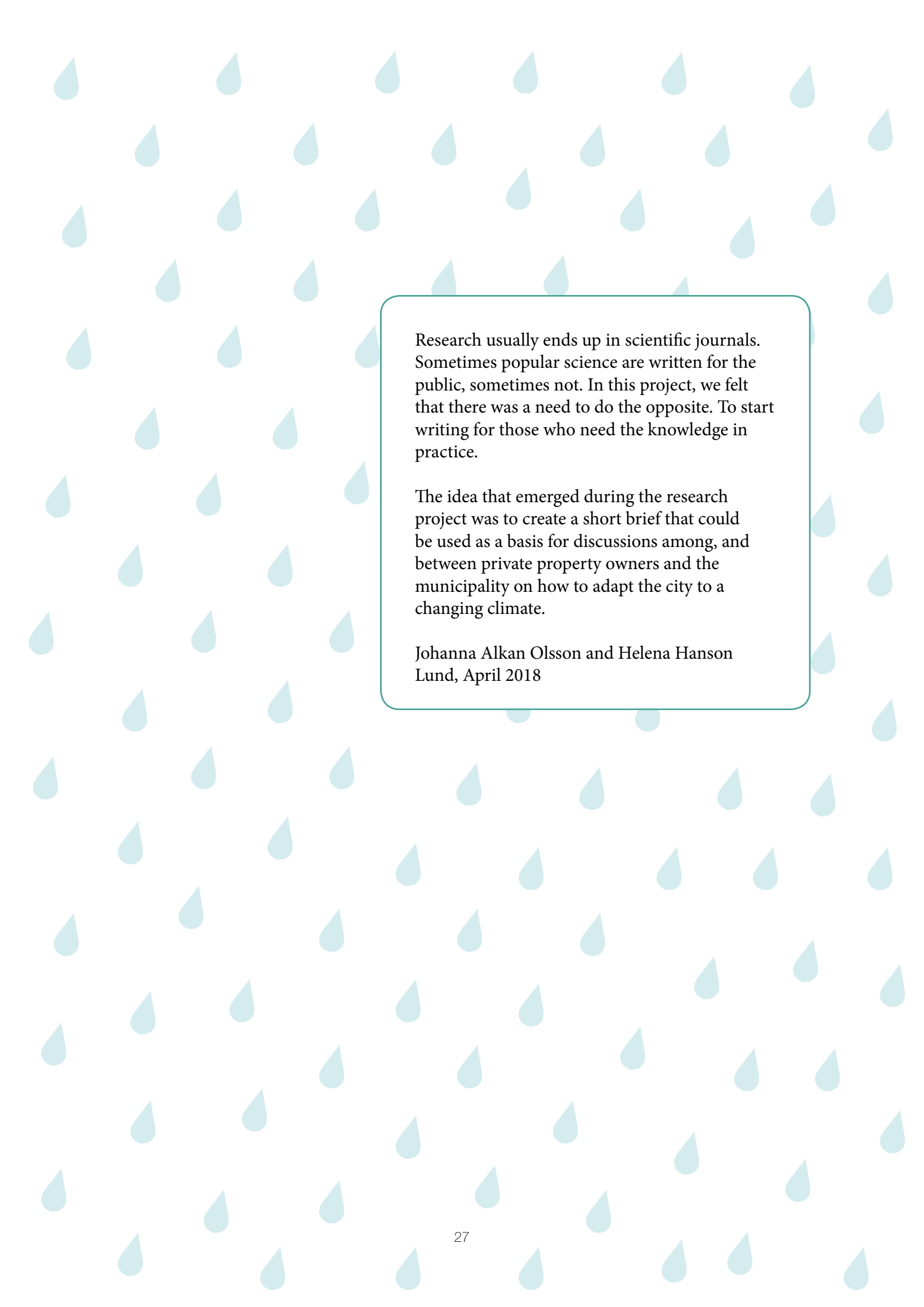
We highlight that the road to a climate adapted Malmö will most likely include both small-scale solutions on private land and large-scale strategically placed solutions on public land. The latter can prevent water from flowing from peripheral areas into the denser city center and low-lying neighbourhoods, such as Sofielund. Small-scale solutions cannot solve the entire problem with flooding but can strengthen the local attachment and the feeling of contributing to solving the problem. What is needed, desired and effective for climate change adaptation is probably not the same in rental properties, condominiums, privately owned single-family homes as on public land.

7

RECOMMENDATIONS

Based on the work in Sofielund we provide seven general recommendations on how to work with climate change adaptation in Sofielund and similar districts.

1. Take advantage of the commitment in the local attempt to improve and increase the well-being in the district.
2. Imagine a city where big and small-scale solutions work together to create a greener, nicer and safer city. A city without floods due to cloudbursts.
3. Focus on improvements that can be implemented without knowing the future development of the district. It is important to start the work.
4. Create financial incentives for developing blue-green solutions. These can, for example, support:
 - cooperation among property owners along a street.
 - cooperation between different neighbourhoods.
 - collaboration between private property owners and the municipality, including both private and public land.
5. Encourage cooperation between different stakeholder groups and municipal administrations to work with integration, well-being and security, green space quality and water management.
6. Create a forum in each neighbourhood to develop a local strategy for how the district can establish blue-green solutions, both individually and in cooperation with each other.
7. Create a knowledge bank in the municipality on how to design blue-green solutions in already built areas. The bank should consider legal, social and environmental aspects as well as economic aspects in relation to investment and maintenance.



Research usually ends up in scientific journals. Sometimes popular science are written for the public, sometimes not. In this project, we felt that there was a need to do the opposite. To start writing for those who need the knowledge in practice.

The idea that emerged during the research project was to create a short brief that could be used as a basis for discussions among, and between private property owners and the municipality on how to adapt the city to a changing climate.

Johanna Alkan Olsson and Helena Hanson
Lund, April 2018

Climate change is something that affects us all. For the city and its citizens, it means, among other things, more precipitation and consequently an increased risk of flooding. Therefore, it is important to work with climate change adaptation. The idea of this brief is to illustrate and discuss how blue-green solutions can contribute to adapting the city to a changing climate. It focuses on an already developed district: Sofielund in Malmö, Sweden.

The brief is based on interviews with private property owners and managers in the district and has been developed through collaboration between two researchers at the Centre for Environment and Climate Research, Lund University and landscape architects at COWI in Malmö.

