Stormwater Governance

Commoning in Rostorp, Malmö: Practicing shared responsibility in stormwater governance

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Acknowledgments

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1. Introduction

Managing water from heavy rains is both a private and a collective issue, where these two perspectives can be expressed as a conflict of interest or an opportunity for collaboration. While traditional grey infrastructures have been assumed to manage most heavy rains, upgrading these to manage the future flows predicted due to climate changes and urban growth would require heavy financial and material investments as well as maintenance costs. This thesis takes its departure from Malmö, a medium-sized city in Southern Sweden with a population of around 300,000 (Malmö Stad, 2018a). In Malmö, some of the stormwater continues to be mixed with wastewater in older combined sewer systems, leading to the risk of back-flow during extreme precipitation, or cloudbursts, which can be defined as rainfall of at least 50 mm per hour or 1 mm per minute (SOU 2017:42). The city has experienced several cloudbursts in recent years, resulting in the flooding of a number of buildings and other infrastructure, and climate change predictions indicate a risk for more severe and more frequent cloudbursts in the coming decades.

To address these challenges the municipality has been directing resources to prepare for climate change predictions and what is perceived as more sustainable urban stormwater solutions. These include strategies to address both quantitative and qualitative aspects of stormwater by expanding penetrable areas as well as green and blue infrastructures such as lawns and trees, detention ponds, swales or root zone systems which can play a significant role in both detaining and purifying the water (Stahre, 2008). These low-impact developments are a complement to existing grey infrastructure, but they take up a significant amount of urban space. A growing urban population, combined with densification and expansion of the urban area, can lead to even less space and increased pressure on already strained sewage and stormwater systems. According to Statistics Sweden (Statistiska centralbyrå, SCB) Malmö has the least amount of green surfaces compared to other cities in Sweden (Malmö Stad, 2015). Hard or non-porous surfaces result in a higher load on the stormwater systems because the water cannot infiltrate or be detained and is therefore transported to the systems at a high rate. One way of encouraging infiltration and detention is to expand green and blue areas on private land that can serve as a buffer zone to retain and delay water runoff during cloudbursts.
A significant percentage of land where green and blue areas could be developed is in the hands of homeowners, either housing associations or private homes, but current legislation requires limited participation of these actors to engage in sustainable stormwater solutions. A long-term solution will require the collaboration from multiple stakeholders, including homeowners. In such areas of Malmö, groups of homeowners or homeowner associations have experienced extensive basement flooding leading to significant losses. Water from cloudbursts can be seen as a collective action problem since stormwater is not only a private concern but connected to surrounding homes and areas through various systems where action is required from a critical number of stakeholders in order for positive effects to be achieved. While it may be in everyone’s interest, the costs and benefits of improved stormwater management are unequally distributed, making coordination important from an equity perspective and challenging in organizational terms.

The responsibility of the government versus the individual in contributing towards environmental goals or standards is heavily discussed. Many studies focus on strategies for policymakers and other actors to create a desired change in behaviour to address these common pool resource problems connected with environmental goals (Carlson, 2001; Sunstein, 1996; Lockton et al., 2008). Such strategies use various mechanisms to bring about change, and there are opportunities for learning from other policy areas and contexts. In the case of stormwater, the question of legal responsibility is a highly important but difficult issue, as has been expressed in a recent governmental investigation on climate change adaptation in Sweden (SOU 2017:42).

Our study is part of a greater field of trying to understand what motivates people and communities to invest in the greater good (Rydin & Pennington, 2000; Foster, 2012; Parker & Schmidt, 2017; Harvey, 2012; Iaione, 2016; Powell, 2015). This is of particular interest in an urban environment where utilities and services such as electricity, water and waste management have traditionally been seen as an area for which the municipality is responsible, and which are primarily perceived as necessary but preferably invisible aspects of urban life. With the shift of trying to perceive nature-based solutions such as green and blue infrastructures in stormwater management as ecosystem services, there is an increased need to include a broader reach in society, including homeowners with access to and control over precious urban space.
In this research project, we wish to explore some of the factors that may contribute to introducing more sustainable stormwater measures at the community level. Our research focuses on Rostorp, an area in Kirseberg, Malmö in southern Sweden, which has been involved in an outreach initiative run by the city’s wastewater company, VA SYD. The area has an enclosed grey infrastructure system so there is limited impact from upstream water events. Homeowners in Rostorp have had several experiences with basement flooding in previous years including in 2009, 2010, 2011 and 2014. Most of the area’s residents are part of a homeowner’s association, and the area is characterized as being relatively homogenous, socially active, and having some professional resources. It could be expected, based on collective action assumptions, that these factors would enable for the development of forms to tackle a collective action problem (Poteete & Ostrom, 2004).

1.1 Aim of study and research questions
This study looks at homeowner collaboration in stormwater governance to find out how legal, economic, normative aspects enable or undermine collaboration as an aspect of addressing the wider issue of stormwater governance. We seek to contribute towards understanding what enables and hinders people in an urban environment to address collective action problems. The research focuses on the following questions:

- What legal, institutional, economic, and customary responsibilities do homeowners have towards collective action solutions to reduce flooding?

- What encourages or discourages homeowners to adapt stormwater solutions that can benefit the greater community?

- What aspects should be considered in order to encourage successful governance in an urban common of stormwater management?
2. Stormwater Management in Malmö and climate change

2.1 Climate change

According to UN Framework Convention on Climate Change (UNFCCC) in 1992, the climate is now rapidly changing because of human actions (UNFCCC, 1992; Hulme, 2017). The convention was created to address the threats of climate change and has since then become an important political issue. Several climate change conferences have been held since 1992, and the most recent one took place in Bonn, Germany in 2017. Many countries and cities around the world have been taking action to mitigate climate change as well as prepare for predicted change. In Sweden there has been a lot of focus on the increase of precipitation in terms of frequency and severity (SOU 2007:60). During the winter, spring and autumn seasons heavier precipitation is predicted to fall in most parts of the country. This may have major effects on society and the environment, and it is therefore important to prepare for a different climate in the built urban environment.

![Picture 1](image.jpg)

**Picture 1.** The left picture illustrates the days with heavy precipitation will increase with 8-10 days per year in Malmö. The right picture shows that the heavy rains in Malmö can be up to 20-30% heavier. (Malmö Stad, 2018)

The Swedish Meteorological and Hydrological Institute (SMHI) has created an analysis of precipitation scenarios for Scania based on the climate scenarios of RCP 2.6 (low) and RCP 8.5 (high). Based on these predictions, Scania is likely to experience an increase in both frequency and severity of cloudbursts in the coming years. In picture 1 the scenario for Scania based on the scenario of RCP 8.5 is presented. The number of days with heavy rainfall is expected to increase with 8-10 days, and precipitation is expected to increase by 20-30% (SMHI, 2018a). These scenarios are based on the understanding of complex processes and there are many uncertainties (SMHI, 2018b). The city of Malmö has an obligation to prepare
the city for more precipitation, though to what degree is unclear. The city of Malmö has a higher ambition than the laws currently require and recently published a cloudburst plan (Malmö Stad, 2018). The vision of this plan is that no damage or severe inconvenience will occur in any part of the city due to cloudbursts. One specific goal in the plan is that Malmo, by 2045, should be able to manage a 100-year rain with minimal material and personal damages, and minimal disturbances as a consequence.

2.2 Legal and formal aspects of water governance

There are various laws that are relevant in regulating water governance. While homeowners are responsible for protecting their own property, the government has a role in ensuring that risks are minimized. Considering recent severe weather events and climate change predictions, one of the main questions is who is responsible for managing and financing both preventative measures as well as costs related to damages caused by severe weather events. Relevant laws include the Planning and Building Act¹, the Environmental Code², as well as the Law on Public Water services³ (SOU 2017:42). Other laws are indirectly relevant such as the Act on the protection against accidents⁴ and Act on municipal and county council measures in advance extraordinary events in peacetime⁵.

In 2015, the government opened an official inquiry on adapting national laws in regard to climate change adaptation and accompanying areas of responsibility and financing. One of the main purposes was to clarify the relationship between the state, municipality, county and other actors, including homeowners, regarding climate change effects. According to the Environmental Code, it is the County (Länsstyrelsen) that bears the responsibility to coordinate climate change adaptation at the regional level. But at the local municipal level, it is the homeowner who is responsible for, yet not legally required to, protect herself from climate change events. Still, a homeowner bears the costs of climate change adaptation as well as climate change costs from damages. Many homeowners may be able to cover the costs of damages using their homeowners’ insurance because the event can still be classified as sudden and unforeseen.

¹Plan och bygglagen (PBL)
²Miljöbalken
³Vattentjänstlagen
⁴Lag (2003:778) om skydd mot olyckor
⁵Lag (2002:833) om extraordinära händelser i fredstid hos kommuner och landsting
But once these events become more frequent and predictable, they will likely no longer be covered. It is likely that the cost for protecting themselves will be high at an individual level, requiring both time and effort to gather knowledge and to collaborate with necessary experts and contractors. It is considered unrealistic to place this level of responsibility and cost on homeowners (SOU 2017:42). The investigation has resulted in some proposed legal changes requiring homeowners to retain a certain amount of stormwater on their property, but it remains unclear how this will be translated into practice, be measured and enforced.

2.3 Malmö and stormwater management

The existing water management infrastructure in Malmö was constructed based around a smaller population, certain climate conditions, and planned with a modernist approach that was typical of post-World War II in Sweden. This approach assumed that water management for stormwater as well as sewage and wastewater should be collected underground and transported in pipes to treatment plants (Malmö Stad, 2018). After 1960 the city started to build separated sewage systems, but Malmö’s systems are still based on 30% combined pipes, where sewage and stormwater are collected in combined pipes (Malmö Stad, 2015; VA SYD, 2016). The water management infrastructure in the city is constructed to transport the rainwater as fast as possible, and not to retain the water. When heavy rain occurs, the wastewater treatment plants are overloaded, resulting in some of the unprocessed sewage and rainwater flowing directly to the nearest recipient, for instance in Öresund (VA SYD, 2016).

Malmö receives on average around 600 mm rainfall per year, but due to climate change this is expected to rise (Malmö Stad, 2017). This means there will likely be increased pressure on the water management infrastructure. A general practice throughout Sweden has been for municipalities to dimension their systems to be able to cope with a 10-year rain. A 10-year rain is a cloudburst which is expected to occur once every 10 years (SMHI, 2017), though there is no consensus on the definition. According to SOU 2017:42, a 10 year rain in Malmö can be defined as a 30 millimetre rainfall over the course of 120 minutes, which can be compared with a 100 year rain that can be defined as a 30 millimetre rainfall over the course of 10 minutes (SOU 2017:42). Climate change predictions reveal that 100-year rains are likely to occur more frequently in Malmö, which can lead to significant, dangerous and costly floodings. There have already been several heavy cloudbursts in recent years: In 2007 there was a 100 mm rain event in the span of 24 hours; in 2010 a 60 mm rain event happened in the western and central parts of Malmö in the span of six hours; and the most recent one in 2014,
storm Arvid, where some parts of Malmö received 120 mm of rain over the span of six hours, which was designated as a 180 year rain (Malmö Stad, 2015; Malmö Stad 2018, see picture 2). The terms 10 year and 100 year rains are already losing their meaning in light of these recent events and predictions.

In these rain events, stormwater pipes were overburdened with the surge of water, leading to serious floodings in streets and underpasses, as well as in basements and other low-lying structures. The estimated financial damage of storm Arvid was placed at 600 million SEK (about 57 million euros), while there were other damages including indirect costs such as disruption of traffic and other services (Malmö Stad, 2017). Other costs that are difficult to quantify, such as the loss of personal belongings, an increase of fear related to rainfall, and the destruction of biotopes is also important to include in assessing the damage from these events. Around two-thirds of all reported flooded basements were from building in areas with combined sewage and rainwater systems. Many of these buildings were in low lying areas (SOU 2017:42).

Picture 2. Map of Malmö, precipitation of the cloudburst 2014. Source: SOU 2017:42. This map shows the amount of rain that fell in terms of year rains. Söderkulla school experienced the heaviest rainfall, estimated to be the equivalent of a 360-year rain, and the school is located in an area with combined sewer/stormwater systems and lies at a low elevation, which exacerbated the amount of stormwater they received. The black dot is approximately where Rostorp is located.
After the storm of 2014 there were numerous complaints filed against Malmö’s water company VA SYD for not being able to cope with the amount of precipitation. In some cases, it was determined that the system was not even able to cope with a 10 year rain, resulting in a payout of around 20% of the 600 million SEK of quantifiable damage (SOU 2017:42). It is thus clearly in the interest of VA SYD to invest in tackling these issues before the next cloudburst. The number of flooded basements that were reported has increased in Malmö the last decade. Table 1 provides an overview of the reported basements that were floodings in some of Scania’s cities between 2012-2017. Picture 3 shows in what places the reported floodings in Malmö were.

Table 1. Reported basement floodings between 2012-2017. Source: VA SYD (2017)

<table>
<thead>
<tr>
<th></th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>Jan-Okt 2017</th>
<th>Summa</th>
</tr>
</thead>
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<tr>
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<td>10</td>
<td>118</td>
<td>4</td>
<td>2</td>
<td>3</td>
<td>140</td>
</tr>
<tr>
<td>Eslöv</td>
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<td>9</td>
<td>26</td>
<td>16</td>
<td>6</td>
<td>107</td>
<td>168</td>
</tr>
<tr>
<td>Lund</td>
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<td>16</td>
<td>52</td>
<td>6</td>
<td>22</td>
<td>8</td>
<td>111</td>
</tr>
<tr>
<td>Malmö</td>
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<td>41</td>
<td>2481</td>
<td>130</td>
<td>66</td>
<td>33</td>
<td>2778</td>
</tr>
<tr>
<td>Summa</td>
<td>41</td>
<td>76</td>
<td>2677</td>
<td>156</td>
<td>96</td>
<td>151</td>
<td>3197</td>
</tr>
</tbody>
</table>

Picture 3. Map of Malmö indicating areas with combined sewer/stormwater systems (pink) and reported basements that were flooded (black) in Malmö 2014. Source: SOU 2017:42
Since storm Arvid, the municipality of Malmö has prioritized cloudbursts through developing and updating strategic documents and action plans, as well as creating a cloudburst coordination group composed of various departments (Malmö Stad, 2015). In these strategic documents, green and penetrable surfaces are important aspects of retaining and absorbing rainfall (Malmö stad, 2017). An expansion of the existing pipe system is not deemed a realistic option in all areas due to the huge technological and economical investments it would require (Malmö Stad, 2015). Even if all pipes were replaced and expanded, a water volume similar to the one in 2014 could not have been managed as it would have taken 2000 km additional pipes, and this is not possible in Malmö (Malmö Stad, 2015).

2.4 Sustainable urban stormwater management

Today there is an understanding that stormwater can be looked upon as a positive resource in the landscape (Strahe, 2004; Malmö Stad, 2017). By using open stormwater systems, stormwater can be understood as contributing to supporting and regulating ecosystem services. A challenge with adopting green and blue infrastructures is that there is still a tendency to prefer technological solutions (grey infrastructures) in part due to the lack of quantitative knowledge regarding the effectiveness of green and blue infrastructures’ capacity to detain water (Hall et al., 2015). Another challenge is that many of the potential green surfaces are bound up by legal frameworks regarding ownership and management. According to Malmö (2017), 70% of the city’s surface area designated development area with existing buildings or planned for development. This means that a collaboration between different actors, including homeowners, is needed to cope with stormwater infrastructure.

With a focus on more sustainable stormwater practices, Stahre (2008) has defined four different kinds of open stormwater solutions. While these four categories define simplified models, they illustrate the interdependence of the various steps in the process and the connection between private and public land managers. The first step is source control, where water is often managed on private land. Source control can be accomplished through the help of green roofs, infiltration on lawns and flowerbeds, and permeable surfaces. The second step, onsite control, differs from source control since onsite facilities are the responsibility of the municipality. This step can include permeable surfaces, green filter strips, rain gardens and ponds on public land. The third category slow transport refers to how stormwater can be transported sustainably through the city (Strahe, 2004). This includes open drainage systems like swales, ditches/creeks and vegetated canals. The last category is downstream control.
This is where a temporary detention of stormwater in the downstream parts of the drainage system occur by large ponds, wetlands or lakes. As these categories in picture 4 show, both private and public actors have significant and interlinked roles in alleviating risks of flooding due to cloudbursts.

![Picture 4. Four different kinds of sustainable stormwater solutions (Stahre, 2004)](image)

3. Theoretical Approach

3.1 Governance and urban stormwater management

In seeking to explore factors contributing to stormwater governance, it can be useful to define governance at a more general level, understood here as the coordination between state and society towards collective interests (Pierre and Peters, 2000). The increase of unpredictable, hazardous natural events in response to human interferences has led to a greater interest in resource management during the past decade (Huitema et al., 2009). Since urban stormwater is not only a nuisance and a hazard, but also a commodity and a resource, and involves both private and public stakeholders (Cousins, 2017), coordination between the various actors is likely to become increasingly important.

Urban stormwater governance is defined by various formal and informal rules and is characterized by complex interrelations between actors and scales, and is driven by international, national, local as well as neighbourhood governing bodies. The governing of shared resources and risks is inherently connected to regulations (Iaione, 2016). How these laws are interpreted and translated is an important and much needed point of entry but does
not necessarily explain practice at the local level. In order to understand these practices, we need to examine the role that norms, knowledge, incentives and material aspects play in shaping these practices.

3.2 Urban commons and commoning

Systems of stormwater management are shared resources which can be understood as a commons and face some of the same risks as other natural resources such as management of air, land or a body of water. The tragedy of the commons, as developed by Hardin, has traditionally been seen as the consequence of free-riders and rent-seekers who overexploit a resource, leading to an unequal distribution and degradation of the resource. By perceiving individuals as being rational, this tragedy has traditionally been addressed either through asserting private property rights or strengthening governmental regulation (Carlsson, 2001; Foster 2011). Many policymakers base their strategies for involving citizens on what Ostrom (2000) terms a zero-sum thesis, which is based on assumptions of rational choice. Under these assumptions, citizens are rational and self-interested unless there is coercion or other incentives to make them act in the interest of the common good. At the same time, empirical evidence has shown that individuals can also express intrinsic motivations that are not enforced on them externally. Empirical examples revealed another form of governance over resources which can be understood as a form of collective resource management.

Ostrom’s (2000) evidence of collective resource management as an alternative to privatization and regulation in rural areas is hard to translate and scale to the urban environment. Not only are urban environments more complex, but there are numerous resources and spaces that compete and overlap with each other. Understanding how this concept can be adapted into an urban context is a relatively new field and is part of a movement of finding alternative approaches to urban governance where public spaces and resources are often at risk of being neglected due to spending cuts or privatization (Foster, 2013; Foster & Iaione, 2017; Parker & Schmidt, 2017). Applying the concept of commons in an urban setting could be useful in helping citizens and administrators alter the way they conceive of, design and use urban spaces and resources (Powell, 2015).

Collectively shared urban resources, both tangible and intangible, can be referred to as an urban commons (Foster, 2012). While there are similarities between public goods and urban commons in that they both are non-rivalrous and nonexcludable, the difference emerges when
governmental regulation declines, referred to as “regulatory slippage”, which can lead to rivalrous or degrading conditions for users (Foster, 2012). The urban resource is then characterized by being non-excludable and rivalrous, which is more similar to a traditional common, and at risk for being exploited, as described by Hardin. Harvey (2012) proposes that an urban commons is not a thing or a specific social process, but rather an “unstable and malleable social relation between a particular self-defined social group and those aspects of its actually existing or yet-to-be-created social and/or physical environment deemed crucial to its life and livelihood” (Harvey, 2012, p. 73). From this perspective, an urban commons can be understood as a social practice that has the potential of being created, preserved and used. Thus, the term “commons” can take on the verb form of “commoning,” which is the creation of a relationship between a social group and an aspect of its environment considered as a commons (Harvey, 2012). Commoning emerges out of social networks and practices of human exchange that are outside of market forms and that are based on intrinsic motivations.

3.3 Crowding out participation or enabling collective action?
While commoning can be understood as emerging through social networks, urban citizens live in a highly politicized and complex society where the public sector can play a role in shaping how common resources are managed. An area of interest in this study is how the public sector can enable or discourage collective action. There has been significant focus on top-down or external mechanisms to motivate people to change behaviour (Carlson, 2001; Sunstein, 1996; Lockton et al., 2008). An example of this is through affecting social norms, or social norm management, where a social norm can be understood as a nonlegal rule that certain individuals feel compelled to follow, despite the lack of formal legal sanctions because defiance would subject them to sanctions from others (typically in the form of disapproval, lowered esteem, or even ostracism) or because they would feel guilty for failing to conform to the norm (Carlson, 2001). Carlson (2001) discusses various mechanisms which can be used in changing social norms including legal, market, architectural, persuasive and social mechanisms. In her meta-study on changing social norms regarding recycling, she was able to draw some conclusions regarding what mechanisms are most effective. One of her conclusions was that convenience played a significant role in encouraging people to adopt recycling behaviour among people who already had a basic notion that recycling was generally a positive norm. These external factors have the potential of encouraging certain behaviour and changing norms.
While local governments may have the potential to change social norms, Ostrom (2000) argues that here is also a risk when introducing either positive or negative external inducements. Such external forces can imply that citizens may sit back and wait for the government to ask them to act in a certain way. A consequence with an expert led governance is that citizenship is “crowded out” in that they no longer develop their own solutions or experiment with coping strategies, thereby undermining the knowledge and experience of citizens (Ostrom, 2000). By framing environmental risks as a distant problem that is being addressed by complex sets of laws, technical professionals, remote institutions, and expert policy makers, individuals may feel disconnected from the problem and their potential role in addressing the problem. This differentiation of society may leave little room for meaningful collective action (Macnaghten, 2003).

At the same time, Foster (2012) argues that governments can play an enabling role for local communities to manage the common resources, also referred to as collective action enabling. In order for a group’s or neighborhood’s capacity for collective action to be encouraged, social “ties and networks need to be activated through actual engagement that enables residents to exert more effective informal social control on each other” (Foster, 2012, p.86). Foster argues that a tight community’s potential for collective action does not necessarily require stronger governmental intervention, quite the opposite. The role of the local government can be focused on supporting and sustaining already existing collective arrangements through incentivizing and reducing the cost of collective efforts. A local government can loosen its control over the resource and allow local associations to provide supplementary services and goods within the geographically bounded area. In such a case, the government might encourage collective action through technical assistance, training and financial support to groups willing to take on some responsibility of the shared resource. This can signal the importance of individuals in pooling and coordinating their efforts (Foster, 2012).

3.4 Summary of theoretical part

Urban stormwater governance is characterized by complex interrelations between actors and scales. Stormwater is not only a nuisance and a hazard, it is also a commodity and a resource that involves both private and public stakeholders. Urban commons can be a useful concept for understanding collectively shared management systems, such as urban stormwater governance, that experience regulatory slippage. It is likely to require collective action to
prevent the unequal distribution of risks that can be expected with future climate change predictions. This collective action can be encouraged through both intrinsic and external motivations that can play a role in changing social norms, as well as other enabling factors. In our theoretical framework, we try to understand how commoning emerges as a practice through social networks and human exchange at the community level, as well as the role of the government in encouraging or discouraging collective action in urban stormwater governance.

4. Methods

4.1 Case Study Method

Case study research is often associated with triangulation of methods, where data collection is based on a combination of qualitative and quantitative methods such as interviews, surveys, archival material, maps and participant observation. We chose a case study method since it requires few assumptions about the availability of the data and underlying causal relationships, allowing an open-ended and investigative approach. Based on specific research questions, different types of evidence can be extracted, analysed and collated to find the best possible explanation (Gillham, 2000).

There is no consensus among scholars on how a case is defined. Gillham (2000) defines a case as a unit of human activity embedded in the real world; which can only be studied or understood in context; which exists in the here and now; and that merges in with its context so that precise boundaries are difficult to draw. A case can also be understood as an intensive study of a relatively well-bounded phenomenon or class of events (Gerring, 2004). This latter definition is useful in our study as it emphasizes systems or relationships. Case studies often involved different levels of analysis, which in turn are made up of different units of analysis, where each level is related to a specific phenomenon (Gerring, 2004). In collective action research, the unit of analysis can be defined as either the central objects of collective action or the potential participants in collective action (Poteete et al., 2010). In this study the unit of analysis is defined as the main stakeholders that primarily affect or are affected by stormwater management in Rostorp.

Our decision to focus on an area of Malmö, Sweden was primarily because both authors live there and because the city has experienced serious floodings in recent years. In addition, the
city is actively working on addressing the challenges of likely future cloudbursts, increasing
the relevance of this study. Several different areas of Malmö were discussed in the beginning
of the study. Due to our area of interest in urban commons, we sought an area with a
combined sewage system that had previous experience of floodings and was part of an
intervention with VA SYD. Through contacts at VA SYD we were able to gain access to
informants as well as documentation and information about potential case areas. The area of
Rostorp, Malmö, was chosen based on the criteria that it has a combined sewer and
stormwater system, has experienced repeated floodings, and had gone through at least two
interventions with VA SYD, where the most recent one was in 2017 as part of a pilot project
to encourage the removal of downspouts from the municipal system. While this case study is
specific to this area with its unique attributes, we hope that some outcomes from this study
can be of interest in other areas in Malmö, elsewhere in Sweden, or in other cities where
collaboration in complex systems will become increasingly important due to climate change.

4.2 Literature study
Methods for data collection include both secondary and primary data. Secondary data was
obtained through various reports and documents, as well as responses from existing surveys.
The reports included the stormwater strategy, “dagvattenstrategi”, from 2008; the review
“Klimatsäkrat Malmö: Kraftiga skyfall med risk för översvämning” from 2015; an
investigative report commissioned by the Swedish governments on the responsibility of
stormwater “Vem har ansvar?” (SOU 2017:42); action plan “Åtgärdsplan för Malmös
avloppsledningsnät” from 2017; and Rostorps egna hem website as well as archived annual
reports. Planning and strategic documents included the cloudburst plan “skyfallsplanen.” We
also obtained survey material from two surveys: one conducted by VA SYD after the
intervention in 2017 and one conducted by the Rostorp homeowners’ association Rostorps
Egna Hem in 2012. The survey from VA SYD was distributed to all homeowners after the
directed effort in 2017 and a total of 42 homeowners responded. We were able to analyze both
aggregate information as well as individual responses in these surveys. While these surveys
provided useful information, they did not cover all aspects in the area of our study nor did
they offer us a clear history of individual homeowners since the VA SYD survey was
anonymous. We therefore decided to complement this with personal interviews.
4.3 Semi-structured interviews

Empirical data was collected through semi-structured interviews with key stakeholders that have a formal role in stormwater management as well as individual homeowners. Based on our aim and research questions, an interview guide was developed for all those we interviewed (see appendix A). Since the aim of the study was to seek to understand the enablers and hindrances that contributed to homeowners introducing collective or individual stormwater solutions, we chose semi-structured interviews as a method since it allows for the gathering of knowledge and the identification of reasons for specific acts. It also enables space for a dialogue and requires active listening and adapting questions to the interviewee (Kvale & Brinkmann, 2015).

The choice of interviewees included representatives from the three main units of interest that have affected or have the ability to affect sustainable stormwater solutions in the case study area. These include public servants working for VA SYD, the chairperson from the homeowners’ association, as well as homeowners. The public servants included communications officer (informant A), who led the communications aspect of the outreach effort, as well as the project leader (informant B) for the overall directed effort Tillsammans gör vi plats för vattnet (Together we make space for water), which included the directed effort in Rostorp. We also interviewed the chairperson of the homeowner’s association Rostorps Egna Hem, Jon. Jon provided us with additional background information as well as a map the association had made of the floodings. Through Jon we were able to post an online form through the neighborhood’s facebook page asking for volunteers to participation in this research project. Those who filled in the form were contacted for interviews and consisted of five people, made up of three women and two men, and who ranged in ages between 30 and 75. This interview guide was divided into three themes: Background, knowledge, interventions, social network and the future.

The interviews with homeowners were conducted at the local library and were recorded on two mobile phone devices and were later transcribed. Due to the small number of interviewees and the possibility of recognition we have decided to create pseudonyms. The interviews were conducted in Swedish and the relevant parts were later translated to English. The interviews were later analysed in relation to the analytical framework as well as the findings made.
The interviewees are not representational but allowed for some further insight into specific challenges that these individuals face in addressing stormwater issues. It is possible that these individuals had an existing interest or heightened awareness of water issues and that this might have affected the outcomes. It is also likely that some of these individuals had more time on their hands than other people in the area, which might again give a skewed idea of what people might prioritize.

### 4.4 Strengths and limitations

One of the strengths with these methods is that we obtained material from both VA SYD as well as the chairperson of the homeowner’s association as well as individual homeowners, allowing us to develop a more comprehensive picture of the history of floodings, attitudes, interventions and solutions. Through the chairperson we obtained insight into the area’s social aspects and were able to build up trust and find a channel to reach other homeowners. The homeowners were invaluable sources of information.

One limitation was the time and scope of this research project. For instance, we were unable to obtain maps of floodings from the various agencies and insurance companies in order to create a map of the aggregate floodings in the area. The qualitative aspects of the floodings are also unknown, such as what material or non-material valuables were damaged. Due to time constraints, we also were not able to interview more homeowners, or identify specific homeowners living in certain houses that fulfilled certain criteria. This might have provided us with additional important insights.

### 5. Framing the case study area

In this section we will provide a framework for the different aspects that affect our case study area and help address our research questions. The section begins with an overview of the legal framework including the various judicial tools that could possibly be applied in stormwater governance on private property. This is followed by a section on the formal institutions at the municipal level that have an interest in stormwater management, including the various departments within the municipality and their steering documents, as well as insurance companies. Together with the homeowners, these formal actors are some of the main stakeholders in the unit of analysis. Once the formal background is presented, the section
continues with an overview of the case study area, including a history of their experiences with cloudbursts.

5.1 Legal framework
There are several important laws that address stormwater management, including the national Planning and Building Act, the Environmental Code, and Act on Public Water Services (SOU 2017:42). The Planning and Building Act (PBL 2010:900) regulates the physical planning and provides criteria for the zoning, planning and construction of water infrastructure. According to chapter 2 of PBL the local government must take into consideration flood risks and risks to human health and safety in the planning stage. The Environmental Code (1998:808) is primarily concerned with ensuring that water is managed in a sustainable way. These two laws are the most powerful legal instruments when it comes to stormwater management for landowners (Stahre, 2008). The Law on Public Water Service seeks to regulate the legal relationships between the principal water and sewage service provider and homeowners and other users (Bengtsson, 2014). The municipality also has an obligation to meet the needs of drainage according to the Law on Public Water Services. This includes drainage of water, and waste water from an area of collective housing. The wastewater construction must meet reasonable security. According to this law, the municipality is allowed to demand a tariff for stormwater services as long as it is reasonable and fair. This tariff can be required regardless of whether a building is attached to the municipality’s sewage system or not, and regardless whether a building is benefitted or not. The current tariff for water and sanitation services for Malmö’s homeowners is 734 SEK (70 Euros) per year (VA SYD, 2018).

Other relevant laws include the Act on protection against accidents and the Act on municipal and county council measures in advance extraordinary events in peacetime, which state that local governments are required to analyse and compile data on how extraordinary events can affect their jurisdictions in a risk and vulnerability analysis.

These laws are meant to guide the city’s comprehensive plan for water infrastructure, as well as the local zoning plans where common versus individual interests are expected to be taken into consideration in deciding on specific water infrastructures for the area. It is during this local planning stage that all legal aspects need to be considered. The municipality has a responsibility for planning according to the PBL and may become liable for wrong decisions for a period of ten years after the decision was taken if the municipality had been negligent.
After this period, responsibility is shifted over to the homeowner, who bears the legal property rights.

The current laws come from a legacy of different political systems and views, which have led to an unclear legal responsibility of climate change predictions. In the case of cloudbursts, municipalities are obligated to take preventive measures against accidents and extraordinary events. While there is no legal definition of what is extraordinary, there is a widespread norm that the municipality is required to ensure that houses with combined sewage systems are able to cope with a 10 year rain. If climate change predictions indicate heavier and more frequent precipitation, it can be questioned whether this will continue to fall under “extraordinary.” Despite this uncertainty, the local government in Sweden has a legal obligation to manage cloudbursts. The investigation and legal changes proposed might require homeowners to be responsible for detaining a certain amount of stormwater. To what degree and how this will be measured and enforced is debated. While the goal should be to cover risks to a reasonable degree using the most cost-effective means, this will necessarily require weighing different priorities (SOU, 2017, p.196). As long as there is no political decision, it is unlikely that we can expect clarity from laws on how the question of responsibility should be handled.

5.2 Formal institutions and Steering documents

Formal institutions

At the local level, one of the main actors for stormwater management in Malmö is VA SYD, which is a publicly controlled regional organization, VA SYD, responsible for meeting the legal requirements of water and sewage services as stated by the law. The other main actors include the Urban Planning Department (stadsbyggnadskontoret), responsible for comprehensive and detailed planning; the Traffic Department (gatukontoret) responsible for parks and city environment, streets, traffic and maintenance; the Real Estate Authority (fastighetskontoret), the city’s legal property owner; as well as the Environmental Agency (miljöförvaltning), responsible for strategic environmental and sustainable aspects. Additional stakeholders are private developers, schools, media, academic researchers, consultancy firms, landowners and residents, and non-profit associations (Stahre, 2008).

Insurance companies also play an important role when stormwater damages are incurred. There are several homeowner insurance companies. For homeowners insured by Folksam, damages from stormwater are covered based on the insurance package, but if the damage is
caused by water infiltrating back up through the pipes, homeowners have a deductible of 10,000 SEK (around 950 euro) (Folksam, 2018). This seems to be a common practice among other private homeowner insurance companies. The reason for such a high self-risk is to encourage homeowners to protect their property and belongings from damages incurred from flooding (SOU 2017:42). Other costs related to floodings can currently be covered under natural catastrophes or climate change, but this coverage could be removed in the future since what has been described as sudden and unpredictable might no longer be able to meet this definition if floodings become more regular in the future (SOU, 2017:42). While the role of insurance companies is not the main focus of our research, it is worth noting that they are important stakeholders in discussions related to the future costs and responsibility related to damages from floodings.

Steering documents

In 2008 the city of Malmö came up with and developed a stormwater management strategy that seeks to define the areas of responsibility between the administrative actors VA SYD, Urban Planning Department, Environmental Agency and the Real Estate Authority, as well as property owners and individual homeowners (Malmö Stad, 2008). Because stormwater and cloudburst planning and management address overlapping systems, the strategic documents often overlap. In light of directives to prepare the city for climate changes, and encouraged by the recent cloudburst events, especially since the storm in 2014, the city is in the process of developing a new strategy which is being translated into various action plans, and is establishing an interdisciplinary, horizontal organizational unit which will address stormwater issues in concrete ways. The comprehensive preliminary version from 2017 on Malmö’s water is composed of various sub-plans including a cloudburst plan (Malmö Stad, 2017). The plan is designed to guide stormwater management and covers all water which cannot be handled by the stormwater management system, and which can be a risk for both life, infrastructure, property as well as the environment. The goal with the plan is that within 30 years, a cloudburst designated as a 100-year rain can be handled in Malmö with minimal material and personal damages, and minimal disturbance as a consequence. To achieve this, the plan mentions that is of great importance that different actors work together, including homeowners.
5.3 Rostorp – an overview
Rostorp is part of an area in Malmö referred to as Kirseberg and consists of 174 houses with 70-120m² of adjoining garden space. The area was designed as a garden city, where the many gardens faced each other to create a social space (Jakobsson & Dewaelheyns, 2018). The area includes a green park (Rostorps plan) and adjoins a larger city recreational park (Beijers park). See appendix A for a brief history of Rostorp. A homeowners’ association, Rostorps Egna Hem, was created in 1922. It is run by a board with legal statutes and currently has 150 members. While the association’s main activities have changed slightly over time, it is still involved in addressing common interests such as group procurement and social activities (Villaförening Rostorps Egna Hem, 2018). These activities include a regular 5-year anniversary party for the association, with the latest one celebrating 95 years in 2017. They organize midsummer parties, crayfish parties, excursions, flea markets, cooking courses, renovation courses, among other social activities.

5.4 Floodings and improvement efforts in Rostorp
Numerous buildings in Rostorp have experienced repeated floodings (VA SYD, 2017), most recently in 2009, 2010, 2011, and 2014. The buildings are attached to a combined sewage system, which is shallow, and contributed to the area experiencing many basement floodings during 2014. A survey was conducted in 2012 by Rostorp Egna Hem regarding homeowners’ experiences with flooded basements and the aftermath (see picture 5). Based on this, 62% had experienced flooded basements in the past, while 38% had not. On June 8, 2012 Rostorps Egna Hem held a meeting together with VA SYD where the findings from the survey were presented. VA SYD informed residents about their responsibility to maintain their pipes up to the contact point with the municipal system as well as various possible solutions that they could implement for retaining and delaying rainwater to prevent overburdening the system, and informed them about the possibility of receiving a compensation of 1500 sek per removed downspout. During this time, several homeowners installed a back-water stop in order to reduce the risk of floodings in their basements.
To address the increase in heavy cloudbursts and the high pressure on the water pipe infrastructure, VA SYD started a directed effort called *Tillsammans gör vi plats för vattnet* (English: together we make room for water) in 2017. The purpose was to inform homeowners of their responsibilities, to encourage them to remove their downspouts from the city’s network by offering them a financial incentive of 2500 SEK (around 240 Euros), and to inspire and give tips on how to introduce blue and green solutions on their own property (VA SYD, 2017a). A broader goal with the effort is to encourage different actors in the city to work together - the municipality, VA SYD and all living and working in Malmö.

A pilot project for this effort was the directed effort, or campaign, in Rostorp, which is, according to Informant A (the communicator of the project), a perfect area to work with due to their history and preconditions (Personal communication, 12 March 2018). There is no water coming from upstream, so if they manage to solve the problem locally in the
neighborhood, it will be solved. The area was selected because it had experience with previous flooding and because it has a wastewater system that is isolated from surrounding areas. The area has combined sewage systems and separating these would be highly costly and invasive. Additional solutions had already been implemented, such as cleaning out the combined sewer pipe and inserting a larger check valve in one of the main pipes, so that the nearby canal would no longer contribute to the area’s flooding. A campaign here could have concrete and visible results. The campaign included an information meeting, the distribution of information leaflets, as well as the survey.

6. Findings

6.1 Legal

The law provides little guidance

The lack of clarity in the current water laws leaves a vacuum for which actor bears the responsibility for existing buildings when a cloudburst event occurs. This confusion was acknowledged by the project leader of the directed effort. According to Informant B, one would one need to throw out all the laws on a table to create a new one (Personal communication, 12 March 2018).

In Rostorp, the homeowners we interviewed acknowledged that water management was a shared responsibility between homeowners and the city, but how this should be divided was unclear. One homeowner, Fredrik, said it was VA SYD’s responsibility to inform them and provide them with advice on how to protect themselves from climate change. Sara, another homeowner, stated that she had some responsibility for her garden, but pointed out that she pays a tariff to make sure someone else manages the stormwater on her property. She also stated that VA SYD should provide information about what homeowners can do to protect themselves. This was echoed by Natalia who lives in the same area. She mentioned that the city is responsible for sharing information about the problem and solutions property owner can adopt. Another interviewee, Lars, was aware that homeowners bear the responsibility to protect themselves from damages, while the city was responsible for the municipal network. These mixed answers confirm that the uncertainty of responsibility at the local level.

The same confusion exists between the municipalities and the insurance companies. In a survey conducted in 2011 one of the homeowners in Rostorp was confused about who had the responsibility for covering the damages from flooding. In one case, a homeowners insurance
company deferred to VA SYD, and VA SYD deferred to the insurance company. This can be confirmed by the various claims that were sent to both VA SYD and the insurance company, where each case was assessed individually, and there was no general policy or conclusion that could be drawn (SOU 2017:42).

6.2 Municipal level

Individual, grey solutions VS collective, blue-green solutions

One of the strengths of the campaign was that many residents became aware of their own responsibility as homeowners to protect their own property and contribute to collective solutions. There is not necessarily a contradiction between adopting collective as well as individual solutions. This was expressed by Informant B from VA SYD: “I have placed a reflux valve in my house. I have had two floodings. I don’t want to have any more. And I don’t plan on doing anything about my basement before I know that it’s dry. But I’ve also detached my downspouts. So it’s a bit of give and take.” (Personal communication, 12 March 2018).

She expressed the need to encourage people to adopt different solutions: “Green, less hard surfaces, plant more, rainwater tanks, detached downspouts, do as much as that as possible. But when you stand there with the seventh flooding in three years, yes, then you might also want to put in a reflux valve.”

In both presentations (personal communications, 11 June 2012 and 27 April 2017), VA SYD included both collective and individual solutions as viable options. The presentation in 2017 included slides stating that Rostorp could have prevented 9000 bathtubs full of water from entering the municipal system in 2014 if all downspouts had been detached. Environmental as well as economic benefits of detaching the downspouts were also presented, and examples were shown of how to remove downspouts, including images of swales, a percolation magasin as well as a rainwater tank. A biologist from the Swedish Agricultural University was present to discuss various green suggestions. These can be considered collective solutions. These were meant to be inspirational, noting various specifications that needed to be met. According to Informant A, it was up to the homeowners to choose from and adapt the various options (personal communication, March 12, 2018). They also presented individual solutions such as a reflux valve, attaching a stop to the floorwell, and installing a pump. These were simple and concrete, and held the promise of protecting the homeowners’ property, while the green-blue solutions promised to reduce the
amount of stormwater (personal communication, 27 April 2017). These individual solutions contribute to water being less likely to affect that house, but could possibly add to the amount of water flowing in the pipes, thus contributing to higher water flows reaching other nearby houses. The green-blue solutions can be considered collective solutions that can reduce the risk for flooded basements for the entire neighborhood.

But the results of the campaign reveal that the individual solutions outweigh the collective ones. There could be many factors contributing to this, including ones that lie outside of the campaign or previous communication with VA SYD. But our findings reveal that the campaign also favoured more technical, individual solutions, which may have contributed towards residents adopting these practices instead of more collective, blue-green solutions.

Based on the two surveys, there has been a gradual increase in homeowners installing reflux valves (see figure 1).

Figure 1. Timeline over the events in Rostorp and the evolution of homeowners installing reflux valves.

The survey from Rostorp Egna Hem that was sent out in 2012 asked homeowners if they had installed individual solutions: 16 responded that had put in a type of reflux valve that would prevent return flow, 33 responded that they had not, and 27 did not know. This large margin of unknown numbers makes it difficult to draw any conclusions, but it is clear that at least 16
had already installed reflux valves in 2012. It is possible that some additional homeowners installed reflux valves after storm Arvid in 2014. One of the questions asked in the VA SYD survey in 2018 was if the residents had implemented any solutions against stormwater in the last year (yes/no), followed by what kind of solution. If a homeowner had implemented a solution in earlier years the response would have been no. This does not connect the specific campaign to the overall work in the area, especially previous meetings and information. The number of homeowners that installed a reflux valve in the past year, since the meeting in 2017, was 8, while only 4 detached their downspouts. Meanwhile, the total minimum number of homeowners who have put in a reflux valve is, according to these surveys, 24 of 174 houses, which is 13% of the households in Rostorp. Regarding the question why certain respondents had not taken any actions, 8 responded that they had already done so in previous years. It is difficult to draw any concrete solutions from these surveys, but it interesting to note that the survey from 2018 revealed that 8 households implemented individual solutions and only 4 removed their downspouts (collective solution), while two households had implemented both individual and collective solutions (see figure 2). When asked what kinds of solutions they were planning to prevent future flooding, 5 additional respondents noted that they would attach a reflux valve. This indicates that households perceive the most effective solution to basement flooding to be a reflux valve. Based on this data, 24 households have installed reflux valves with an additional 5, resulting in a possible 29 individual solutions, though the 7 households answered that they are planning on detaching downspouts during 2018.

These results indicate that the campaign did have some effect on the collective thinking, but less on implementing collective solutions.
Homeowners involvement

VA SYD was active in seeking out local social networks by making contact with the board members of the homeowner association to plan their activities, which they acknowledged were important for both outreach and credibility (Personal communication, 12 March 2018). This was appreciated by the Jon, the chairperson, who was generally positive towards the outreach campaign (Personal communication, 2018). However, participation of the homeowners in the design and implementation of the campaign was limited and did not encourage feedback and input regarding local knowledge and resources that could have been useful in understanding homeowners’ behavior.

Based on the VA SYD survey and interviews, there are many reasons why residents have not implemented green-blue stormwater solutions. Most have not prioritized adopting solutions because they have not had any floodings (8), they had introduced measures previously (7), they were unsure about what kind of measure they should take (4), and that they lacked time (4). In figure 3 these results are presented. Note that some answered multiple answers.
Our findings confirmed the lack of priority despite that residents were aware of the collective nature of the problem and showing interest in contributing to solutions. Knowledge of the problem did not lead to concrete knowledge of the solution and eventually action. This can be seen in that 35% of the respondents in the Rostorp survey still feel unsure about what solutions can be adopted to prevent floodings in the future. Based on the interviews, factors such as interests, time and other resources led to different forms of knowledge of the solution and actions. It is unsurprising that those who have lived in their house longer, or are retired, and those with existing knowledge and interests that can be linked to sustainable stormwater solutions have more time and energy to dedicate to green-blue solutions. This was the case with Ingrid, Fredrik and Lars, all of who were retired homeowners and had existing knowledge, interest, skills and resources. Ingrid had been part of the association’s garden club and was knowledgeable about the important role of vegetation in stormwater retention and perceived water as a resource for her garden. Detaching her five downspouts went along with both her gardening interest and available time to spend in the garden, and she was pleased about the financial incentives. For Lars, who had had a career in asphalt and pipes, it was simple to cast his own tiles needed to construct a waterway in his garden, diverting the water from the downspout, using his tools and material in his workshop in the basement. Fredrik would like to do more, such as build a little pond, but felt that he needed more knowledge: “There weren’t that many solutions presented. It would be fun to build a little pond, but there wasn’t that much advice that one got.”
But for others, such as Natalia and Sara, the time and knowledge factors played a big role in preventing them from implementing measures. Sara moved in three years ago and has two young children, leaving little time for other projects or initiatives. At the same time, they had prioritized building an outhouse in the yard, and re-attached a downspout from a rain tank. She expressed that she would like to contribute but was unsure where to start. She mentioned the many design aspects that homeowners need to consider, and that this takes both time and money.

The campaign sought to inspire and came with simple, grey individual solutions that required relatively little knowledge or design competence from homeowners, while the collective solutions presented left homeowners with many questions and aspects to consider. The exchange between the homeowners and VA SYD was also limited during the meeting in 2017 due to limited attendance and low overlap between those that attended and those that responded to the survey (27%). There was little room for involving local networks or developing their ideas. The expertise they were met with gave clear, simple, grey solutions, which might have also contributed to many residents opting this form over the other.

6.3 Community Level

Potential for collective action

The community has a strong social network. Their Facebook page has 243 members, and there are posts shared every day, which is confirmed by all interviewees. They also have an active webpage which includes a newsletter and other updates. Through these platforms different social activities such as flea markets, children activities, cleaning days and solar panel procurements are arranged, as well as different discussions including advice on various topics (interviews). One of the members in the association noted that it was important to be a part of the online community, even if she was not so active with arranging activities. Sara confirmed the community's close ties:

“We do things as a collective, right now we are looking at solar panels. So, of course we help each other out... It's good to have neighbours and to be in touch with your neighbours. It’s nice with a sense of neighbourliness. The more we do together the nicer it is, also to see each other. It’s not like one has to become best friends though. I try to write in the Facebook group. It’s good for buying and selling things, craft tips,”
solar panels on the house, fiber. And that makes it feel important to me, and even though I have not spearheaded things myself, I'm in the community cheering and pepping good initiatives.”

The board of the association consists of seven members. Their job is to contribute to the association’s purpose, stated in its statutes, which is to establish a closer association between the homeowners in Rostorp in order to lead and promote common interests, and a sense of belonging. But according to the chairperson, the association has no formal role that can be directly tied to managing common stormwater issues.

There are also various informal groups based around interests, including a garden club. In Rosptorp Egna Hem, there are currently no rules concerning the garden. In the past, homeowners were required to have proper fences and they were prohibited from building any other house on their property (Jakobsson & Dewaelheyns, 2018). These regulations were communicated to the individual homeowners through the board of the housing association. Hedges and fruit trees were considered mandatory (Jakobsson & Dewaelheyns, 2018). All questions regarding infrastructure, including water and sanitation, were handled by the association together with the council. This is confirmed by Jon:

“In the beginning (when the association was founded), there was a lot of focus on doing joint procurements together in the construction of the houses, but since then there have been different characteristics throughout the years in the association. As mentioned, now there is a lot of focus on enjoyment and socialization but through that there are also lots of initiatives. We still do joint procurements about different things. A few years ago, we placed fiber lines in the whole area and now we’re focusing on solar cells. And that’s a really interesting project…. but the engagement from the residents in the stormwater issue is poor. It’s slowly changing. Back then, in 2012 there was an attitude that we pay a fee and we pay taxes, so please take care of the water. Now I think people have started to understand that there is a shared responsibility in making sure that water doesn’t reach oneself and the neighbours. But I think it will take a long time for the switch to take place. I think VA SYD needs to continue its work.”
According to Jon, neighbors stepped up and helped each other out during the heavy rain in 2014. This was in part acute help in the form of helping to empty basements of water, lending out pumps, etc, but also in terms of contacting the authorities and insurance company. Despite this, there is not a lot of focus on stormwater management question in the community, even if VA SYD has been working with stormwater management in the area the past year. According to Jon, there are often themes in the facebook group, like solar panels or fiber, but water does not get a lot of attention.

Still, some of the interviewees offered suggestions for how to act more collectively. The first time one of the interviewees, Natalia, began to think about stormwater management was when she owned an allotment cottage. One of the rules in the association there was that one was only allowed to have a certain percentage of impenetrable surface area. This made her aware of stormwater management and practices. Ingrid suggested to have information channels for all newcomers in the area about stormwater management. By informing residents in the area about what they can do to protect their basements, an interest can be awakened. According to Ingrid, many residents in the area pave their grounds, and to change this behaviour she thinks that a larger interest in gardening needs to be established. While these suggestions rely on various assumptions, they show that there are existing methods that could be established or strengthened to encourage homeowners to integrate more sustainable practices and contribute to a change in stormwater management norms.

**Collective green-blue solutions**

While many residents are adopting various measures, collective solutions that support more sustainable solutions are often more demanding in terms of time, knowledge, skills and resources. While detaching downspouts sounds easy from a technical point of view, the way the houses and area have evolved over the years makes it more challenging. Jon mentions that many houses have their downspouts on the front side of their house where the ground has been covered by hard surfaces due to driveways and garages. Each house is different, but for some this would mean redirecting the rainwater by changing the slant of the gutters so that the water would drain on the back side. This would be a lot of work and a high cost, more than the reimbursement that VA SYD is offering. This was the case for Fredrik, who would like to collect water from his roof, but since the downspouts are on the font of the house and by his garage, it would be difficult.
Interviewees noted that suggestions for their houses with their particular design would be beneficial. Natalia wanted to do more and had even changed from planning a tiled deck to a wooden deck which would allow water to pass through. She has thought about various options to remove downspouts but felt that she lacked information and no clear place to start. They have plans to remove the garage since they don’t use it and change the slant of the ground to avoid basement flooding, but it would be a massive project. She was open to planting more greenery and doing something in the garden. There are too many aspects to think about, such as who to contact, how to lead the water over the path around the house, will it be ugly? She expressed that the main obstacle was time and money.

This was reiterated by Sara, who stated:

“It wasn’t until now when we received a reminder to meet you (for the interview) that I thought, yes, yes, ok, I’ll do this, because one has so much to do…one has to pick up (kids) and one has to work and when there’s a meeting one should always try to go….but if we in the area could get some more practical solutions that would of course help with these thoughts. Because now it just a lot like, I know that something needs to be done, I can do a little bit myself, but I didn’t understand how I should do it. That’s how it feels right now.”

Sara is aware of the relationship between her actions and her neighbours, but this knowledge her case does not lead her to take significant action. She became aware of the various actions she could undertake through the campaign, including the letter in the mailbox and information posted in the facebook group.

“It’s good if one can use (rainwater) for something else instead of letting it flow down and mix with the other wastewater, also with what this area has experienced- affected by all the rainwater so it feels like a win for oneself too. Not only to use the water that comes anyway, but also since we’ve had this problem. But we’re not so good at it….”

- Sara

They moved into the house in 2015 and were informed that their house was one of the ones that was seriously flooded in 2014. The entire basement was flooded and needed to be relined. When they first moved in, there was a rain tank attached to one of the downspouts in the left
side of the house. But they had other plans for the yard and there was no space for the tank anymore, so they removed it and reattached the downspout. Their garden plans required this space. At the same time, they are planning on building a garden house with a green roof in the yard. She hopes to be able to use the water from this roof for the garden. She also pointed out that she would be willing to pay a higher fee to be allowed to let more stormwater flow down the drains and do other projects that can retain water. But she also notes that Malmo should be able to take care of this water, to upgrade the pipes, and to separate them. Homeowners can contribute as well, but the city needs to do its part.

Fredrik seemed keen on implementing solutions but struggled to find the right kind. He grew up with harvesting water for the garden, and sees water a resource, which is why he harvests water from the roof of his sunroom. He was willing to test different methods to retain or catch more water but lacked concrete suggestions that would work for him. He tried attaching a plastic hose to his downspout but removed it when it interfered with mowing the lawn. He also had an idea of constructing a pond in his garden, but this was never mentioned at the information meeting.

Jon stated that “...there are a few of us who are redoing the garden. People need to seem more examples of what and how one can solve this problem. I had another little more complicated idea to dig down a tank which could be used in the garden, but that’s also a lot of work, to dig down a tank.”

Everyone we interviewed expressed awareness of the problem and were aware of some shared responsibility between the city and homeowners. All interviewees were interested in contributing to a solution, but even the ones that had resources, skills and time had not detached all their downspouts.

7. Analysis

The practices surrounding stormwater management at the local level are shaped by norms, knowledge, incentives and material aspects. This can be approached by both the external motivations and enabling actions introduced by the municipality, as well as intrinsically within the community. In this section we analyze the space created by the lack of legal clarity, the role of the municipality in encouraging or discouraging collective action, as well as how commoning, or the potential of commoning, can be understood at the community level.
7.1 Urban commons and Regulatory slippage

The current legislation lacks clarity regarding responsibility towards stormwater protection and management, which was confirmed by interviewees at VA SYD as well as the homeowners. This can be understood as a form of regulatory slippage (Foster, 2012). Storm Arvid revealed that VA SYD, insurance companies and homeowners paid for damages, but it is unclear how these relations are governed both in terms of climate change adaptation and covering the costs of damages. There is a risk that the urban commons of stormwater management leads to an inequitable distribution of risks where homeowners can introduce individual solutions that only protect themselves while contributing to higher risks for their neighbors. Preventative measures that encourage collective solutions, on the other hand, can contribute to more equitable protection, but require collaboration from all actors which is currently missing from legislation.

While formal clarity could be useful, legal coercion and property rights assume that actors are rational and wish to maximize their own gains from the commons (Foster, 2012). According to Foster, collective management regimes in urban contexts require both cooperation from the resource users as well as support from the government in managing and sustaining the cooperation (Foster, 2012). In the next section we will look more closely at the role of the municipality in encouraging collective action of this urban commons.

7.2 VA SYDs campaign: Crowding out or enabling collective action?

VA SYDs approach to include communication staff in their outreach activities is important and likely necessary in changing local norms. The methods used in these outreach activities included social, economic and technical mechanisms (Carlson, 2001). The social methods included contacting and spreading information through social media, the distribution of pamphlets, contacting and communicating through the association board and integrating face-to-face information meetings with existing meetings. These provided VA SYD with a form of legitimacy and created a relationship with some of the residents, including the board. VA SYD also used an economic mechanism to encourage homeowners to detach their downspouts. Finally, VA SYD used technical mechanisms by presenting information about the combined sewage systems, the various individual solutions VA SYD had been working on, and inspirational examples of green and blue solutions. While these efforts were appreciated, they were insufficient in encouraging the development of social norms based around collective action of stormwater management.
The efforts were insufficient primarily because their strategies were based on several assumptions that encourage individual solutions. The first assumption is that individuals will implement both common and individual solutions because both are feasible. But according to our findings, collective solutions were not sufficiently convenient. This is supported by Carlson (2001) who notes that in order for mechanisms to be effective, a normative understanding of the problem is necessary, but the encouraged practices also need to be convenient. While most of the interviewees were aware of the problem and expressed a willingness to contribute to collective solutions, these required complex decisions, time and other resources, which were not convenient. The financial incentive was external, but was not sufficient in offsetting the cost of the actual work and investment required. Removing downspouts requires certain conditions including the right slant of the raingutter, location of the downspout, slope angle, as well as green surfaces or detention ponds to which the water could be redirected. Many houses in Rostorp have downspouts on the front side where there is more pavement due to garages and driveways, as well as low points (garage or basement) to which the water could flow in case of heavy rains, making it more difficult to adopt collective solutions. Instead, the approach encouraged individual solutions. The strategies of VA SYD focused on providing homeowners with advice on how to protect their own properties from flooding with expertise from engineers who have knowledge and experience from grey infrastructures that have traditionally favoured individual solutions at the household level. The biologists from the agricultural school presented some ideas for plants that can help retain water, but this was seen as an inspiration rather than guidance. By presenting grey solutions with clear arguments from expert engineers, homeowners could readily comply with this solution while their own knowledge and experience with gardening and landscaping was deemed less relevant and useful, even if this knowledge had the potential of being a foundation to green and blue solutions that could help address a common problem.

Another assumption was that experts from VA SYD came with knowledge and expertise that could be disseminated to the residents, and that one-way information was sufficient to enable action. The presentation did not enable the discussion of specific concerns or interest, or encourage homeowners with similar preconditions to jointly develop ideas. A risk with expert led governance is that citizenship may be “crowded out” (Ostrom, 2000) and that citizens no longer develop their own solutions or experiment with coping strategies. Local knowledge and experience is undermined, and homeowners deferred to the experts. While many of them
had ideas, they were unsure how to proceed and looked forward to more concrete or applicable examples. The risk of this crowding out is that residents continue to be dependent on external actors, including the municipality, to provide solutions. It also strengthens the notion that the city should provide solutions, and homeowners only play a passive role, contributing to the differentiation of society (Macnaghten, 2003). In our study, this way of thinking was stated by the majority of the interviewees who said that VA SYD had a responsibility of stormwater management in the area. Residents in the area wanted to have concrete stormwater suggestions on what they could do in their own garden. This deferral to the city can be confirmed by the chairperson who expected a follow-up meeting with VA SYD to continue supporting the area’s challenge with stormwater, despite the directed effort being finished. The directed effort’s approach did not encourage homeowners to look within the community for potential collaborative partners or existing groups that could be activated, and did not encourage intrinsic motivation for collective action.

Even if the community has networks, and some social ties, these must be activated through actual engagement (Foster, 2012). According to Foster, such a strong-knit community would not necessarily require strong governmental involvement in addressing common pool resources since external inducements can lead to residents in the in the area sitting back and waiting for the government to ask them to act in a certain way. VA SYD used meaningful methods to reach out to the local homeowners, but in order to encourage collective action, more attention could have been paid to incentivizing and reducing the cost of collective action (Foster, 2012). The financial incentives used were individual instead of collective. Reducing the cost of collective action could have included technical assistance, training or other tools to support local communities in addressing problems. This lack of support for activating collective action was likely exacerbated by framing the risk of flooding as complex and guided by a set of unclear laws and regulations, leading residents to feel disconnected from meaningful solutions and more “crowded out.”

7.3 Potential for collective action as a norm
Changing social norms can be important in moving towards more sustainable stormwater governance. According to Foster (2012) a tight community has the potential of creating strong social norms, and our findings show that Rostorp is a tight community that has good possibilities for changing social norms. It was stated that the community helps each other out and works together in different projects. There is a sense of community and a range of
networks for social activities. Despite this, homeowners need to exchange knowledge about stormwater management for it to become a common interest and norm. Today, this exchange is lacking, and the norm is the perception that rainwater should be able to enter the municipal sewage system and disappear. It is also not a strong norm to perceive stormwater as a problem for the area. For example, Lars did not think the area had a stormwater problem since he himself did not experience a problem. That some of the residents in Rostorp still do not think that there is a problem in the area shows that there is not a sufficient exchange of knowledge and experiences in the neighbourhood about stormwater.

Norm management is created through several social mechanisms, for example to communicate certain signals and esteem enhancement, but also on convenience. Carlson (2001) describes several social mechanisms, such as communicating certain signals and esteem enhancement, that can be useful in norm management. She applied this to changing norms regarding recycling behaviour, which is not a collective issue in the same way as stormwater management but based on our findings these mechanisms can be relevant for changing social norms around collective stormwater management as well. Mechanisms like signalling and esteem enhancement can be important in encouraging a collective norm, where the community works together with a common issue, as long as the norm is also convenient. Detaching downspouts and building additional green or blue infrastructures in the yard are often visible to other neighbours, thereby offering the opportunity for visible compliance and which allows for signalling (Carlson, 2001). This has the potential of leading to an exchange knowledge and changing norms, but based on the empirical findings, the impact is limited. For example, both Ingrid and Lars have introduced solutions in their gardens, but to their knowledge their neighbors have not implemented any solutions, nor have they discussed stormwater solutions with them. If sustainable stormwater management were a norm, the neighbours would have felt some pressure to conform in order to gain approval from the community (Carlson, 2001).

According to Carlson (2001), convenience is effective in changing social norms, but only when a certain basic attitude in support of sustainable stormwater practices is already established. Since some basic attitude based on knowledge about the problem exists in the area, convenience could play an important role. This can be related to Foster’s (2012) theory that collective action is enabled through incentivizing and reducing the cost of collective action. The findings showed that residents did not prioritise stormwater solutions on their
property in part due to time and financial limitations and that they found it to be too much work. The association in Rostorp could take an active role in commoning, as described by Harvey (2012) to encourage collective action of the commons. They could act as an information medium and collect knowledge and tips from individuals who have implemented sustainable solutions, integrate advice from VA SYD and share these with other homeowners, or even procure external experts such as landscape architects. If the association addressed the common pool resource problem, it would reduce the individual cost and make collective solutions more convenient.

To enable a sustainable form of collective action around stormwater management a continuous exchange of knowledge, experiences, skills, solutions and other resources between homeowners could be strengthened and made more convenient at the community level.

8. Conclusions and Suggestions

Our study has discussed stormwater governance in a specific area of Malmö. The study revealed that there is no clear legal, institutional, economic or customary responsibility regarding stormwater management, putting homeowners at risk for future climate change scenarios. Despite efforts from the utility company to encourage collective solutions through information, inspiration and a financial incentive, these efforts have not led to significant collective solutions. Factors that could contribute to collective stormwater solutions, such as encouraging homeowners to collaborate through collective incitements or support, or to exchange knowledge and other resources within the community, were not incorporated and activated by the directed effort. Rather, the effort used a primarily one-way method of communication with expertise that favored individual solutions over collective ones. At the same time, there is potential for collectively addressing the problem by activating these social resources and encouraging homeowners to act collectively. The next section offers some recommendations which could conceivably encourage commoning of stormwater governance from both the municipality as well as local level.

Recommendations
The efforts of the utility company succeeded in raising awareness of the shared problem and shared responsibility between the city and homeowners but did not go far enough in
encouraging collective solutions. In order to strengthen this aspect, they could support existing aspects that can enable collective action such as offering technical assistance, training or financial support at the community or interest group level. This could include supporting the board, groups such as the garden group, or homeowners through more time, training and other resources. The board could be consulted regarding the best possible use of resources. By activating the existing social resources, collective action could be encouraged. A change in norms could also be encouraged intrinsically through the association, including through individuals, interest groups, or even reintroducing more specific guidelines or incentives at the local level to encouraged collective solutions. By highlighting the importance of local skills and resources, both the municipality and the association could make space for homeowner involvement and encourage their collective participation. By activating their responsibility to the community, homeowners might become less dependent on the municipality which, in turn, could encourage more sustainable stormwater solutions and management.

This study has focused on one aspect of urban commons in a neighbourhood where the management of a natural resource is not yet perceived as a commons. There are numerous neighborhoods and areas in urban environments that have different social and political systems to take into consideration when encouraging collective action, so there is a risk in drawing general conclusions from this study. Still, the study was able to explore reasons why an area with existing knowledge, social ties, resources and other enabling preconditions still struggles to address a common resource problem. It would be interesting to continue with similar campaigns in other areas using methods based on collective action enabling to see the impact on social norms and collective action. Further research is needed in this field to study how different methods could encourage collective action, and to build up a stronger theoretical framework to understand how communities can become active in a commoning process of resource management that are governed outside the market and regulation.
9. Literature


SOU 2007:60. Sweden facing climate change – threats and opportunities.


Appendix A: Short history of Rostorp

The houses in the area were originally built between 1923-1925 on the initiative and primarily for railway workers, though in the end the area was opened to others as well (Villaförening Rostorps Egna Hem, 2018). A homeowner’s association Rostorps Egna Hem was formed in 1922 which has enabled the residents to work collectively on various shared interests over the years. Today, the main purpose of the association is to “establish a closer association between the owners of Rostorp in order to safeguard and promote their common interests and to promote the sense of belonging” (Association Statue 1). From the beginning, each house has an adjacent plot of land and there was a heightened interest in gardening (Rostorps Historia, 2018). During several decades it was possible to buy daily provisions from neighbours, including dairy, bread, fish, meat, tobacco and services such as carpentry and dressmaking (Rostorps Historia, 2018). Residents in the area, along with others in similar garden areas, supplemented their food purchases with garden produce. In a study on gardening in Rostorp, it is noted that the residents in the area take pride in their areas history as growing fruit trees, “the feeling of togetherness, the social aspects of low hedges, the sharing of crops and of gardening knowledge between neighbors (Jakobsson, V. & Dewaelheyns, V., 2018).
Appendix B
Intervjufrågor till Rostorps Invånare
Namn:
Address:

Bakgrund:
- Hur viktig är dagvattenhantering för dig?
- Berätta om dina/era erfarenheter med översvämningar
- Har du tagit del av information från VA Syd om dagvattenhanteringen?

Kunskap
- Kan du berätta om första gången du började fundera kring dagvattenhantering?
- Hur tror du området kan lösa sitt dagvattenproblem?
- Vad tror du är det viktigaste att tänka på när det gäller dagvattenhantering i Rostorp?
- Hur viktigt är det att försöka gemensamt arbeta med dagvattenlösningar?

Åtgärder:
- Vad tror du gjorde att du (inte) upplevde översvämningar?
- Vems ansvar tror du dagvattenhantering från skyfall är?
- Har du gjort åtgärder?
  - Om ja: vilka och varför?
  - Om nej: varför?

Sociala nätverk
- Hur aktiv är du i Rostorps sociala nätverk?
- Har du grannar som har gjort åtgärder? Vilka typer av åtgärder? Hur känns det?

Framtid:
Vad tror du om klimatförändringar och hur det kommer att påverka dig och ditt hus i Rostorp?
Vad tror du skulle hjälpa invånare att satsa på dagvattenlösningar?

Vill du vara anonym?