Collaborative Networks as a Tool for Kainwater Management

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Master Thesis Spring Semester 2015





AALBORG UNIVERSITY STUDENT REPORT



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Study program and semester:

4. Semester, Sustainable Cities

Project title:

Collaborative Networks as a Tool for Rainwater Management

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Project period: 2 of February – 3 of June Semester topic: Master Thesis	Abstract: During my internship in Roskilde Forsyning in the autumn 2014, one of my key findings was how Roskilde Forsyning and Roskilde Municipality experienced issues due to bureaucratic silo thinking. This project is therefore a practical example of how to overcome such issues and break with norms, tradition and zero error culture related to rainwater management.	
Supervisor(s): <i>Morten Elle</i>	The project therefore seeks to answer: "How can a process be planned and executed to enhance the development of an appropriate rainwater management system for Jyllinge Nordmark?"	
Group number: Group members:	The rainwater issues in Jyllinge Nordmark were related to such a degree of complexity that traditional overall planning measures were not appropriate. Therefore two workshops where hosted for strengthening the ties between Roskilde Forsyning and Roskilde Municipality, and thereby enhance their ability to challenge the professional norms and overcome bureaucratic silo thinking and work innovatively	
Mads Emil Rybner	At the workshops different consultancy companies specialised in climate adaption where invited to challenge the institutional zero error culture and individual responsibility focus. Furthermore the many different participants in the workshop represented different values; therefore collaborative work processes were applied for enhancing a mutual transformative learning. However as the workshops were focused on Roskilde Forsyning and Roskilde Municipality there was a risk for the exclusion of the citizens being too extensive, as they will be an important actor in the implementation. Due to the decision of this exclusion much effort was put in meeting with the homeowners' association before the workshop to insure their perspectives in the process, and thereby try to accommodate the extensive exclusion.	
Number of copies: 2 Number of pages: 85 Four digits upload code:	This project has only followed the planning phases, which means that the collaboration with the citizens in the implementation still remains.	

PREFACE

This report is a result of a 4^{th} semester master thesis project of 30 ECTS in the course "Sustainable Cities" under the study board "Planning and Geography". The report is written in the period from 2^{nd} of February – 3^{rd} of June 2015.

This project is written in cooperation with Roskilde Forsyning A/S the utility company in Roskilde, which are the institution responsible for sewers systems and their technical operation. Last semester I was working as an intern at Roskilde Forsyning, this project therefore build on the knowledge I gained there. The internship project focused on the connection and disconnection between practices and expectations from Roskilde Municipality, Roskilde Forsyning and the citizens in Jyllinge Nordmark, and unseen barriers between the main actors for creating a sustainable rainwater system in the area. A key finding of the internship was that Roskilde Forsyning and Roskilde Municipality needed to break with the bureaucratic silo thinking. This master thesis project is therefore taking up the issue of breaking with bureaucratic silo thinking and taking the next step in trying to suggest a solution for a sustainable rainwater system in Jyllinge Nordmark, and therefore focus lies on collaboration and innovation in climate adaption. By summer 2015 Roskilde Forsyning has to hand in a suggestion for how to handle the rainwater in Jyllinge Nordmark to Roskilde Municipality. This project collaborates with Roskilde Forsyning about this suggestion and thereby follows and influences the process of developing ideas.

I would like to dedicate a special thanks to the people this Project would not have been possible without the assistance of:

Morten Elle - Supervisor

Signe Nielsen and Roskilde Forsyning – Main contact person in Roskilde Forsyning

Roskilde municipality – the technical and environmental department have been very exited to participate.

Citizens and the homeowners' associations of Jyllinge Nordmark

Haveselskabet, Envidan and De Urbanisten – Consultancy companies participating in workshops

Orbicon - Consultancy company participating in workshops

Gronmij - Consultancy company participating in workshops

Tredje Natur – Consultancy companies participating in workshops

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1 CLIMATE CHANGES

In 1987 the first notions of Sustainable development was internationally recognised in the report "Our Common Future" (Bæredygtig Udvikling u.d.) with the general definition:

"Development which meets the needs of the present without compromising the ability of future generations to meet their own needs" (World Comission on Environment and Development 1987, 43)

This was the start of debating climate change and how these would affect the future society, which quickly led to the establishment of the Intergovernmental Panel of Climate Change (IPCC) (IPCC u.d.). UN established IPCC in 1988 to create a valid database of climate change and effects thereof, for governments to act on (IPCC u.d.).

In 2014 the fifth report from IPCC was published, stating the importance of climate mitigation and staying beneath the two degrease Celsius increase in the average global surface temperature. This will require a reduction of 40-70 % in green house gasses by 2050 (Salomon 2014). Despite this definition of a sustainable development and the understanding of urgency of mitigating climate change, the earth is getting closer to the limit where severe climate changes will occur (Hansen, et al. 2006).

The fifth IPCC report can by now verify that it is not just necessary to focus on mitigation, but urgency rises for adaption. The sea level is rising and storms, rainfall and heat waves are intensifying and increasing in frequency (Hansen, et al. 2006). This causes a lot of places, especially urban areas, around the world to be under heavy pressure (Salomon 2014). A fast look around Europe gives an idea of the urgency of climate adaption in the cities. In 2014 the city Montpellier in France suffered to a heavy rainfall of 250 mm within three hours (BT 2014). In Augustenborg, Malmö Sweden, the area has had several problems with floods, but since 1998 it has been renovated to adapt to the climate (DAC 2014). The second of July 2011 Copenhagen in Denmark experience what is known as the most severe cloud burst in Denmark (N. Hansen 2012). Local areas in Copenhagen received 135 mm in one day, with maximum intensities about 50 mm in 30min¹ (N. Hansen 2012). The cloudburst caused many floods and structural damages for about 3 billion DKK (N. Hansen 2012). These three examples gives an idea of some of the consequences of climate change, which makes it quite clear why floods are considered the most costly natural disasters in Europe (Fratini, et al. 2012).

¹ Cloudburst in Denmark is defined by an intensity of 15mm in 30min (N. Hansen 2012).



Figure 1 A picture from the cloudburst in September 2014 caused flooding in Montpellier (BT 2014)

Furthermore the urgency of acting increases since, the floods has increased the last decades and is expected to increase further in the coming years (Fratini, et al. 2012). These increased floods in Europe are posing a severe challenge to the urban environment (Wamsler og Brink 2014), where it causes huge structural damages and puts peoples lives at risk. However, when looking into the governmental actions from the national level focuses around mitigation, and the adaption is forwarded to the local levels (Wamsler og Brink 2014) & (Naturstyrelsen 2013). Nevertheless it is clear European Cities no longer can afford only to focus on mitigation, adaptation is a necessity.

1.1 Consequences in Jyllinge Nordmark

As before mentioned (see Preface) this project takes basis in an area called Jyllinge Nordmark (see Figure 2). The area have been flooded several times by either temporarily rise of sea level or heavy rainfall. Furthermore the areas are at high risk of being flooded (from every year till every 10th year), and it represents some of the most valuable areas in Roskilde. Jyllinge Nordmark is therefore categorised as a high priority focus area in the climate adaption plan of Roskilde municipality (Roskilde Kommune 2013).



The historical data of rain events in Jyllinge Nordmark can be difficult to find, but in 2007 and in 2009 Jyllinge Nordmark experienced floods due to heavy rain (Gangelhof 2011). The area only has few systems for handling the rainwater, which is private ditches or public watercourses (Gangelhof 2011). Though in 2014 Roskilde Forsyning and Roskilde Municipality improved the capacity of the public watercourse, Råmosegrøften (Roskilde Forsyning A/S 2013). In a survey sent out to all citizens² of Jyllinge Nordmark, 50 out of 712 answered that they have experienced problems with rainwater entering the house, which is a serious problem. Furthermore 255 out of 712 answered that they had experienced problems with rainwater on their property (see Appendix 8.2). However, it can be difficult to distinguish between what citizens would consider a problem and what is not considered a problem e.g. a gathering of rainwater on the lawn might not do any harm but can still be considered an annoyance and thereby a problem.

² This survey was developed during December and January by the Project leader from Roskilde Forsyning and me and send out to all the citizens of Jyllinge Nordmark in mid January. These answers serve as a central part of the understanding of the issues in Jyllinge Nordmark (see also 4.1Understandings of Problems and Complexity).

Citizens in Jyllinge Nordmark might not trust in the statistics, as they have experienced two events of 1000 years return period in the last 50 years (see Figure 3). These return period intensities for local areas can be very difficult to estimate, and there are different uncertainties bound to the different methods for estimation. Furthermore it becomes difficult when you are trying to say something about future scenarios, because it is then necessary to relay on a certain expected development of the climate (Willems, et al. 2012). In relation to predicting the climate change the last decade did not proceed as expected, while the temperature did not rise as much as foreseen, instead more ice melted (Brix 2014). Such a situation makes some of the most acknowledged scientists in the field doubt that the average surface temperature is the best way to measure climate changes, as there a many different factors affecting climate changes (Brix 2014). When some of the most prominent scientist still discusses when or if we reach the limit of the two degrees Celsius (Brix 2014), it is clear example of how difficult it is to predict the climate changes and the effects induced.



Figure 3 Illustrate sea level rise (Y) compared to statistical return period (X) (Roskilde Kommune 2014)

The project that I did last year about Jyllinge Nordmark, presented evidence of people in the area not being aware of their responsibilities in relation to maintenance of the water handling system. In interviews people argued that nobody told them about the importance of the system and the responsibility. Similar tendencies are seen in Sweden, Wamsler & Brink (2014) argues that citizens (especially in urban areas) think it is within the legal responsibilities of the municipalities, and therefore they do nothing to adapt to known threats. Furthermore the last project illustrated that many citizens in Jyllinge Nordmark did not know what was happening in relation to rainwater management in the area. Therefore the citizens in Jyllinge Nordmark believed that no action was taken, even though Roskilde Municipality and Roskilde Forsyning were working on the problem. These two situations illuminate the

disconnectedness between citizens, Roskilde Forsyning and Roskilde Municipality. Wamsler & Brink (2014) argue likewise that citizens often are willing to take more action towards climate change than they do, but often they don't know what to do. Furthermore, Wamsler & Brink (2014) consider the feeling of lacking assistance from the public institutions as an important factor for citizens not to engage in adaptation. However, the increased frequency of extreme events due to climate change causes high pressure on public resources to handle many crises, which is why Wamsler & Brink (2014) argues for adaptive citizens.

1.2 Field of Study

This section will try to elaborate on related research within the field of climate changes adaptation, sustainable water management, citizen engagement, adaptive practice, urban resilience³, and climate risk management. This section is going to just shortly represent some of the many issues and arguments in the field of this project.

Brown, Keath and Wong (2009) are studying sustainable water management, in a transition perspective. Looking all the way back to early 1800's where Australia's first water management systems evolved and they follow up until 2008, while combining it with water professionals expectations of the future. By doing this they try to establish a framework of urban water management and transition, by not just looking into technical development, but also how it have been connected to the state of society. This illustrates the interconnectedness between public and private institutions and citizens in the governing of water. The results show that water systems has developed from seeing water as something you did not whish visible, to connect water with many different positive aspects as social recreation and environment, which are becoming important parts of water management (Brown, Keath og Wong 2009).

Similar tendencies are seen in a case study of 18 water management projects done in Sweden since the 1989 - 2007 (P. Stahre 2008). Stahre (2008) has as Brown, Keath & Wong looked in the local context and tried to illuminate the transition. One reason for the sustainable water systems being difficult to implement for the administration, is that traditional measures focus on underground, which means less different stakeholders. The new measures of sustainable water management focus on surface solutions, which mixes between public and private land and thereby inevitable increases the amount of actors. Stahre (2008) argues that sustainable urban drainage is challenging the traditional institutional relations, which makes it risky for

³ The concepts resilience is most often defined: "*The capacity of a system to absorb and reorganize while undergoing changes so as to still retain essentially the same function, structure, and feedbacks.*" (Walker, Holling, et al. 2004, 2). The concept will be further elaborated in the Theory chapter (see 3.1 Resilience).

the administration and therefore tempting to proceed as usual. However, it is of high importance that the administration supports these projects, while traditionalist will be critical. In Sweden the newer measures have been successfully implemented because these systems often are able to handle more water than the traditional piped systems.

In line with the above mentioned Fratini, et al. (2012) stresses a necessity in flood risk management not only to focus on technical solutions and the individual system component's relation. It is of great importance to account for the uncertainties in relation to nature and society, while climate changes might have severe consequences in an urban context. Planning in relation to climate change is by European guidelines about sewers expected to handle five till ten year rain events (Fratini, et al. 2012). This kind of guideline based on assumptions about certain intensity rain events will only occur every 10th year. This kind of assumption is often presented without the uncertainties it covers. Stirling (2010) argues it is a problem because it removes focus from how severe different situations would be to an urban area, to creating a false security line for politicians to present. Stirling (2010) argues that it is of higher importance to have a debate about how to handle and adapt to these uncertainties, than trying to state something which is very uncertain and based on many assumptions. Therefore Fratini, et al. (2012) suggest the three point approach (3PA), which have proven a valuable tool in communication between many stakeholder both technical and laymen, about the complexity of many stakeholders, and many uncertainties. The 3PA exactly opens up for the discussion about these complexities related to rainwater resilient urban areas (Fratini, et al. 2012), instead of failing to "the temptation to treat every problem as a risk nail, to be reduced by a probabilistic hammer." (Stirling 2010, 1030). Furthermore the debate about handling different flood situations improves the social awareness of the risks and the acceptance (Fratini, et al. 2012). However, it is mentioned by, Fratini, et al. (2012) that urban flood risk is a relatively new issue in Denmark, and therefore perception between stakeholders might differ much and thereby making it less desirable to try new approaches.

In relation to bringing citizens into the flood risk management, Wamsler & Brink (2014) go further into the ensemble of practises and responsibilities between citizens and institutions. Wamsler & Brink (2014) argues that the adaptability⁴ of the society, and especially within the communities at high risk, is important for adapting to climate change. The importance in local adaptability is highly interconnected to the increased frequency of extreme events, because this puts the institutional capacity under high pressure (Wamsler og Brink 2014). As above mentioned the cooperation between institutional levels and citizens in climate risk reduction is a complex matter. Furthermore citizens in general have higher expectations of what is

⁴ Adaptability is most often defined as:" "*Adaptability is the capacity of actors in a system to influence resilience*" (Walker, et al. 2004, 3). The concept will be further elaborated in the Theory chapter.

within the situational legal responsibilities, than what is reality (Wamsler og Brink 2014). The gabs between citizens' expectations and institutional practice, causes an undesirable situation for experimenting. Furthermore it causes people act on their own, and risk going against the plans of the administrational level, or citizens sit back and wait for a solution, thereby the institutions miss the opportunity of utilizing the resources lying with the citizens (Wamsler og Brink 2014). However, Wamsler & Brink (2014) argues if the institutional level combines high individual engagement from citizens with high support, a higher adaptability can be reached, but this points at an active and explorative administrative level.

In relation to the above-mentioned study of the field, this project is contributing to the sustainable water management, by focusing on citizens' adaptability, and the collaboration in institutional and local levels. This is done in a very practical manner to guide and test measures for working innovatively in water management and thereby increase citizens' adaptability and the effect of engagement in water management in small scale.



1.3 Research Question

It is clear that the increased temperature from climate change is increasing extreme weather events, which have led floods to be the most common natural disaster in Europe. In the approaches of adapting to these disaster planners often relay on service levels for 5-10 year return periods. These standards often seem as very clear definitions, but in fact they are a result of assumptions and represents great uncertainties. The question therefore rises what should we try to adapt to, which can be difficult to give a straight answer for, but it increases the importance of understanding the limits within the institutions of a water management. Jyllinge Nordmark is a local area in Denmark, which situated in an area categorized as high flood risk. It is therefore of high priority to Roskilde Municipality to secure this area against floods. Roskilde Forsyning is working on a suggestion of how to handle the rainwater in Jyllinge Nordmark. But as just mentioned a service level does not in itself promise more that overflow every 5-10 year, which could imply the necessity to be more reflexive in the institutional practice for climate adaption. Furthermore my internship in Roskilde Forsyning autumn 2014 showed that Roskilde Forsyning and Roskilde Municipality had issues of thinking in bureaucratic silos, which made it difficult to handle the issues in Jyllinge Nordmark. Therefore this project seeks to answer:

How can a process be planned and executed to enhance the development of an appropriate rainwater management system for Jyllinge Nordmark?

The developing of an appropriate rainwater management system is in relation to the relatively low standards of a service level. This project tries to challenge this, so the service level or other legal restrictions does no become boundaries for thinking of climate adaption and taking in the awareness of what happens when the serviced level is exceeded. This is not promoting to go against the legal restrictions, but instead focus on developing a process that explores what is possible within the institutions in relation legal restriction and will. Therefore this project will focus on processes for inspiring innovative and creative thinking, and to push Roskilde Forsyning and Roskilde Municipality to be more reflexive about what is appropriate, and not just settle by fulfilling legal requirements.

2 Methodology

This chapter seeks to elaborate on methodological considerations and choices in this project. The first part Research Procedure explores the work process of establishing a platform for innovative processes between municipalities and utilities. Next part will shortly explain my role in this project as an action researcher engaged in the project. Thereafter follows the selection of different methods used throughout the project for collecting the various kinds of data. Finally I will try to justify how the overall quality of my research is insured by reliability and validity.

2.1 Research Procedure

This project is written on basis of a very explorative process where theory will be applied to qualify the actions taken, which in this sense relies on a very deductive approach. The project follows the process of Roskilde Forsyning⁵ in creating a sustainable rainwater management system. The project therefore lies within the field of action research, where the researcher does not dictate everything, but the process is a much more collaborative approach where the researcher participates in the study together with the organisation studied (Greenwood, Whyte og Harkavy 1993). This is an untested process for both Roskilde Forsyning and Roskilde Municipality, which created some uncertainties of what results could be found. Such situations are exactly where Greenwood, Whyte & Harkavy (1993) see the benefits of the action research, in which the researcher can affect the process. At the same time the researcher gets a better insight of the organisation by collaborating than would be possible by studying it from the outside (Greenwood, Whyte og Harkavy 1993).

In spring 2014 Roskilde Forsyning and Roskilde Municipality created an agreement, which bounded Roskilde Forsyning to suggest solutions for rainwater management in Jyllinge Nordmark by summer 2015 (Christiansen og Holgaard 2014). At my internship in autumn 2014 in Roskilde Forsyning I realised that traditional measurements were not going to help Jyllinge Nordmark, which forced Roskilde Forsyning to focus on new measures for rainwater handling (see also 3.3 Sustainable Water Management). However using new measures challenged the traditional settings of actors, which complicated the project, with both more actors and different settings.

Roskilde Forsyning is only going to suggest a possible solution for rainwater handling in Jyllinge Nordmark, and Roskilde Municipality will finally decide, what the sewage plan will

⁵ Roskilde Forsyning is the utility company of Roskilde municipality, and responsible for sewer systems and operation.

dictate for the area. Therefore it is of high importance to insure a general agreement between Roskilde Forsyning and Roskilde Municipality about sustainable solutions that would fit Jyllinge Nordmark.

Sørensen & Torfing argues that collaborative networks between public sector professionals and private professionals are a good way of coping with the challenges of breaking with the traditional procedures (2011). As the collaborative networks can help breaking with professional norms⁶, zero error culture⁷ and bureaucratic silo thinking⁸ (Sørensen og Torfing 2011). Hence this project is trying to establish such a collaborative network mainly focusing on Roskilde Forsyning and Roskilde Municipality, since they are main actors in accepting what kind of measures that fit Jyllinge Nordmark. This project therefore relates in its proceedings to Sørensen & Torfing's (2011) four general steps in innovative processes:

1. Generation of Ideas

This part takes basis the problems already are known (Sørensen og Torfing 2011), can be argued to be Roskilde Forsyning' findings until now. Roskilde Forsyning has different kinds of research as drillings for geology tests, surveys and investigation of Jyllinge Nordmark (see appendix 8.2, 8.4 & 8.7). Sørensen & Torfing (2011) argues that in this phase it is important to get different views with many different important actors to bring different experiences and challenge the ideas that are put forward. Furthermore it is important to consider who to involve and when (Sørensen og Torfing 2011). To reach this multi-actor collaboration an employee in Roskilde Forsyning and I will establish a workshop, focusing on creating ideas. For the first workshop we invite different professionals some from Roskilde Municipality and Roskilde Forsyning, and some from private companies working within the field of rainwater management (see appendix 8.3). The idea is that these people will be introduced to the problems in Jyllinge Nordmark based on the knowledge Roskilde Forsyning already have (see appendix 8.4). Furthermore the workshops will try to establish an arena for developing new solutions. After this the different private companies will work on possible solutions for three areas in Jyllinge Nordmark selected by their characteristics (see 4.1.2 Selection of Focus Streets and Areas). As part of explaining the problem there will be a trip to the selected areas and streets of focus, for the participants to get an understanding of the physical settings and to start talking about ideas (see Safari in appendix 8.4). This type of walk is by Agger &

⁶ Professional norms relates to traditions in institutions of choice of measures and ways of engagement.

⁷ The zero error culture relates to the "fright" making mistakes, which is also connected to the fact that institutions are bound by legislation.

⁸ Bureaucratic silo thinking relates to a very individual responsibility focus, which can be seem as a contrast to collaboration

Hoffmann (2008) considered a great tool for introducing local aspects and to generate ideas for development (see also 2.3.3 Walks).

2. Selection of Ideas

The second phase in innovative processes focus on selection of ideas, which involves deciding which of the generated ideas that a worth pursuing (Sørensen og Torfing 2011). Sørensen & Torfing (2011) argues that such a process is improved by having different actors and key stakeholders to collaborate on assessing ideas, for getting as many different perspectives on the risks and gains as possible. In reaching the goals of the second phase there is a follow up workshop. For the follow up workshop Roskilde Forsyning and Roskilde Municipality will collaborate on developing multi criteria for assessing the different solutions. Agger & Hoffmann (2008) argues that multi criteria assessments (see 4.3.1 The Creation of Assessment Criteria) are a strong tool for assessing complex projects and establish common ground for taking decisions. Therefore the follow up workshop will start with the presentation of the different solutions, which the consultancy companies can suggest. After the presentation the workshop will be divided into three groups each assessing and developing on the different ideas, based on the assessment criteria (see appendix 8.3 agenda and 8.12 for criteria). To establish the best possibilities for a mutual transformative learning process the groups will be a mix of people from different companies as an attempt to separate people from their usual collaborators. We will therefore try to split the representatives from each company, the municipality and the utility company, as much as possible while still maintaining about equal size groups. This was also to avoid people ending up suggesting their own proposal, which could be a worry if e.g. three persons from Orbicon where sitting together with the one person from Grontmij as a group (for presentation of participating consultancy companies see 4.2 Generation of Ideas). Furthermore this mixing perspectives and abilities in the groups are also interesting in relation to thinking innovatively and loosen up some restrains. After group work there will be a presentation of the different ideas and what the groups liked and disliked about the solutions. This will all be gathered on a big board so everyone can engage in the ranking of the solutions based on the multi criteria developed by Roskilde Forsyning and Roskilde Municipality. This process should lead to a common agreement of a few solutions for the selected areas, and could help pushing boundaries for what is believed as possible solutions. The last task that day will be for the participants to draw on a map where the solutions fit for all of Jyllinge Nordmark. Drawing on a map is a way of focusing a debate, and in this case the idea is to focus suggested solutions on very practical context, and make the stakeholders to use the knowledge they have build up together (Agger og Hoffmann 2008).

After the two workshops Roskilde Forsyning should have some well-assessed solutions that fit on specific characteristics in Jyllinge Nordmark, and which have broad support within both Roskilde municipality and Roskilde Forsyning. Haveselskabet (2014) argues for the importance of a broad agreement between municipalities and utilities in innovative rainwater projects, in their "perfect process suggestion".

3. Implementation of Ideas

The third phase is about getting from good ideas to good projects, which can be a difficult task that requires a great focus on creating ownership and positive incentives (Sørensen og Torfing 2011). Furthermore many unforeseen problems can appear when starting to implement, which requires the project leader to be able to react and adapt to the changes (Sørensen og Torfing 2011). Ownership for the solutions between Roskilde Municipality, Roskilde Forsyning and a consultancy company is established during the two workshops. Hence implementing the solutions also requires ownership from the citizens in Jyllinge Nordmark. To create this ownership and commitment from a local level the chairmen of the homeowners' associations is consulted before and throughout the workshop period. The homeowners' associations in the selected areas will be consulted before the first workshop for giving them the chance to come with local knowledge for this area (see appendix 8.17). All the homeowners' associations are informed of what is going to happen during the workshops, and which possible solutions are agreed upon, and will have the possibilities to affect the detailed planning of the execution of the solutions. Furthermore the answers in the questionnaire will be considered in the work on possible solutions, and much effort is put into the comments for the selected areas. This should help to create ownership in the local area, even though it can be argued that the citizens don't have much influence in picking overall solutions. The reason for involving the citizens in the rather late part is that Jyllinge Nordmark is a complex area, and only certain solution will fit in certain places, which means that the solutions will have to fit in each road. Therefore the focus lies on Roskilde Municipality and Roskilde Forsyning with help from consultancy companies in agreeing on possible solutions.

4. Dissemination of new practices

The dissemination of new practices is the last phase, which focuses on mainstreaming the innovative solution reached. This involves getting the gains from this procedure out in the organisation and further to other organisations, pointing at the possibilities in thinking and working innovatively (Sørensen og Torfing 2011). This is an important step in this project while much effort is put into trying innovative approaches for reaching solutions in complex areas. The success of this project will open possibilities for both Roskilde Forsyning and

Roskilde Municipality in overcoming complex challenges. Furthermore the collaboration with the citizens of Jyllinge Nordmark in the detail planning of the solutions increases their possibilities on adapting to climate changes. As the solutions most likely will focus on above ground measures, it will require the willingness of the citizens, which increases the importance of knowledge sharing between the homeowners' associations. These four phases of innovation relates strongly to the seven steps Haveselskabet (2014) suggest when working with innovative rainwater adaption.

Collaborative innovation does not as such imply the use of workshops, as it is used here, but higher focus on establishing networks across actors. However it can be argued that this type workshop and tasks enhances the collaboration and strengthens the network between the chosen actors especially for Roskilde Municipality and Roskilde Forsyning. Collaborative innovation from Sørensen & Torfing (2011) focuses on creating new work processes in the public sector, as a reaction to the traditional top down. In this case it can be argued that the procedure still is relatively top down. This project is not seeking the original goal of collaborative innovation, but focuses on the benefits of collaborative networks of professionals. However the establishment of the professional network and this way of working with solutions is challenging the traditional procedures, and fits the collaborative innovation theory in this way. The implementation phase will focus on the citizens as more active and direct stakeholders, which will change the process towards a bottom up process.

Creating a sustainable rainwater management system in Jyllinge Nordmark will challenge the traditional ways of handling projects for both Roskilde Municipality and Roskilde Forsyning (se theory 3.3 Sustainable Water Management). However, succeeding will also be an important step in the complex situation of sustainable rainwater management, while working on a mix of public, private and common ground.

2.2 My Role

I am an active part of the process for developing solutions in Jyllinge Nordmark therefore this section tries to elaborate on my role in the project. My role in this project is to support Roskilde Forsyning in reaching a sustainable and appropriate solution for rainwater management in Jyllinge Nordmark. Therefore I try to assist in facilitating good cooperation between Roskilde Municipality and Roskilde Forsyning, while they are the main promoters of the solution. Furthermore I wish to guide the further work with the citizens in implementing the solutions, and letting the citizens in on affecting the solutions. In Roskilde Forsyning they do not have professionals knowing about participatory practises, which is especially where I will support them. Furthermore this explorative approach is a new way of acting as a wastewater treatment company, and my presence as a student might increase their willingness

to try of new procedures. As mentioned this study lies in the field of action research, which indicates that I will have an active role in the field of study, and not just stay outside as an objective observer, I will try to affect the process by collaborating with the stakeholders (Berg 2004).

In the workshops my main role will be to help plan the workshops and evaluate them, therefore I will take the role of the referent, as this is an important role for the learning process of the workshop after it is executed. Furthermore I will try to mainly assist and not lead, and thereby not make myself an indispensible stakeholder for future process of the project and for replication. An important goal for this project is to create an innovative process for how to handle project in Roskilde Forsyning, and insure that the process is well rooted in the organisation. Even though the project might not have proceeded as it does now without my influence. Therefore it is of high importance to me that the procedures are driven by Roskilde Forsyning. I will as mentioned still affect the project, about further steps but still let her have the last word in the procedures.

2.3 Data Collection

This project relies on mixed methods in the data collection by the use of both qualitative and quantitative methods. The qualitative methods will be the main research technics, which are better at getting the deep understandings of actions or lived experiences (Kvale og Brinkmann 2009) (Hesse-Biber og Leavy 2006). Here technics as interviews, walks and workshops are practiced. Quantitative methods are good for answering questions as "how many" and "how often" in this project it is considered more of a secondary technique (Hesse-Biber og Leavy 2006). The quantitative methods is good for a superficial understanding of how spread the rainwater problems are in Jyllinge Nordmark. However to fully understand the extent of the problem experienced it is necessary to follow up by qualitative methods. As quantitative techniques used in the project is survey and geographical analysis. The strength of using mixed methods is as just mentioned the increased possibility for triangulation of data, by the multi level of aspects (Hesse-Biber og Leavy 2006).

2.3.1 Workshops and Focus Group

The workshops are used as part of the collaborative innovation that focuses on the benefits reached by establishing professional networks and open up for idea generation and then afterwards try to qualify and narrow down the ideas generated (Sørensen og Torfing 2011). Sørensen & Torfing (2011) are not arguing for the means for reaching the collaborative networks, rather the benefits of the goal. Likewise Agger & Hoffmann (2008) argues for the

importance of professional networks for knowledge sharing and establishing a safe work environment. Furthermore the collaborative networks should build a mutual transformative learning process, where trust and collaboration is enhanced, which increases the possibilities of challenging the professional norms and overcome bureaucratic silo thinking (Sørensen og Torfing 2011).

The workshop is as mentioned divided in two parts (see appendix 8.3) where the first part is focusing on presenting the problem in Jyllinge Nordmark and the task of finding solutions. For the task posed there will be different material, some presented at the first workshop the rest just handed over along with the task. The data presented will be the selected focus areas, some of the results from the questionnaire and the results of geological data⁹ from drillings in Jyllinge Nordmark (see appendix 8.7 & 8.8).

The data that will be handed out at the end of the first workshop will be; maps showing distribution of problems on property and inside households, a map showing placement of drillings and pump test, a collection of the comments from the selected areas, a map of aboveground water flow mixed with blue-spots¹⁰ (see appendix 8.4).

The materials handed out should provide the different participating consultancy companies sufficient knowledge about the area and the rainwater issues, for suggesting possible solutions for each of the selected areas. As mentioned in section 2.1 Research Procedure Roskilde Municipality and Roskilde Forsyning will work on multi criteria for assessing the suggested solutions. The purpose of this is for Roskilde Forsyning and Roskilde Municipality to discuss how they would value different solutions. An important part of this discussion is to see each other's values and argumentation of why this is of importance as well as common goal. These criteria also leave room for not agreeing on every single criterion, even though the purpose is trying to reach a common set of criteria for the assessing the suggested solutions.

2.3.2 Interviews

Though out this project different meeting such as meetings with the homeowners' associations and work meetings between Roskilde Municipality and Roskilde Forsyning, will be treaded as interviews but not as classical interviews. Therefore the interview guides will be overall agendas for the meetings, and still follow semi structured interview form. For the

⁹ Doing my internship in Roskilde Forsyning in 2014 I created some drillings for checking distance to groundwater and the composition of the top ground layers. Later on Orbicon have executed some pump tests to illustrate.

¹⁰ Blue-spot is a analyse in GIS showing areas where surface water naturally would gather due to the topography

meetings with the homeowners' associations, short resumes will be used as documentation, for workshops meetings and other meeting sound recordings will serve as documentation.

During this process meetings with 10 homeowners' associations will serve to qualify the understanding of the problems pointed out in the questionnaire (see appendix 8.2 & 8.17). This is done both to get a deeper understanding of the problems in the specific areas, but as well to validate the quantitative data. Homeowners' associations in the selected focus areas (see section 4.1.2 Selection of Focus Streets and Areas) will be prioritized so these meetings will take place before first workshop, and thereby increase the quality of data applied in the workshops. Meetings with the rest of the homeowners' associations will be planned after second workshop due to prioritization of time.

2.3.3 <u>Walks</u>

As mentioned a safari walk will be part of the first workshop to increase the physical awareness and to generate dialogue and ideas between the different participants in the workshop (Agger og Hoffmann 2008). Furthermore several of the participants of the workshop have never actually seen Jyllinge Nordmark, therefore the safari are centred around the selected areas of focus. Thereby the safari should serve as an introduction to the physical landscape and get an understanding of the space available and the local aesthetics.

The meetings with the homeowners' associations will be arranged around the concept of a meeting followed by a walk in the areas, for them to show the project leader from Roskilde Forsyning and me where and how they experience the issues in the area, related to the answers of the questionnaire (see appendix 8.2). Agger & Hoffmann (2008) argues that walks in local areas "safari" brings up small stories that can be very informative that would not be thought of in a different setting. Furthermore it offers the possibilities for the chairmen of the homeowners' associations to show the physical example of the issues in the area. The project leader from Roskilde Forsyning and I will attend in the meeting with the homeowners' associations, which is also a way of showing the homeowners' associations that we are willing to listen and interested in the case, this signals the willingness of collaboration from the institutional level. However a different approach could have been to invite the homeowners' association chairmen to Roskilde Forsyning for a meeting, but the signal here would be very different, showing Roskilde Forsyning as a leader and a traditional top down approach.

2.3.4 Questionnaire and GIS

In January 2015 Roskilde Forsyning sent out a questionnaire to every citizen in Jyllinge Nordmark (see appendix 8.1), which I have a part of though mainly the editing and the processing of the results. The questionnaire focused on if the citizens experienced problems with rainwater and if these issues where related to their house, garden or common street. The questionnaire where sent out to the 2049 properties in Jyllinge Nordmark, and there where 712 answers received (see appendix 8.2). In the questionnaire a comment box was placed after nearly every question, for citizens to add extra information. The questions where of a quite broad design asking "have you experienced problems related to rainwater", which can be difficult to interpret as there can be many understandings of experiencing problems. However the questions where in this form because the project leader and I wished to have an indicator of the citizens contentment with the situation in the area related to rainwater. Therefore it was interesting to know if people experience rainwater as a problem, even though it might not have been a severe problem, where Roskilde Forsyning needed to intervene. As an example of this one person answered "yes" to experiencing problems with rainwater and comment that the problem is a pond outside their driveway after heavy rain. Another informant has commented that only water in the furthest part of their property in rainy periods, and they are just not using this part of the garden at these periods. This off course shows some uncertainties of what exactly people are answering when setting "X" for either "yes" or "no" to these kind of problems (see appendix 8.1). However in this situation the comments box is helping to qualify the answers given, and thereby diminish the issue of uncertainty. Furthermore the answers from the questionnaires will be sorted by street and serve as material for the workshop (see appendix 8.4) and for information before meeting with the homeowners' associations. Furthermore as mentioned the meetings with the homeowners' associations served as a way of accommodating some of these uncertainties. However it is still important to have in mind that the citizens experience problems with rainwater differently, which is not to say some issues a not real issues but to emphasise the different thresholds for the citizens. Furthermore answers from the questionnaire will be illustrated in maps to show geographical references too e.g. to show concentrations of rainwater problems or if they are randomly distributed and other geographical relations in the problems. The point of mixing survey data and geographical is to get a superficial impression of which areas that a related to most problems and what kind of problem. This will help to guide the further investigation, before meetings with the homeowners' associations are being executed.

2.4 Reliability and Validity

To secure the quality of the project reliability is sought through this chapter "Methodology" and the documentation of the research done, such as recordings from interviews and minutes from meetings as well as from the workshops. The quality of these documentations of the work done will enhance the possibilities of a different researcher to follow the procedure and reach the same results, which is the essence of reliability (Kvale og Brinkmann 2009). In reaching validity, ensuring what is thought investigated is what is actually investigated, triangulations is used. The first step towards validity is basing my arguments and results on observed data (Yin 2009), a second step is using "triangulation". Triangulation is as mentioned sought reached by using different sources of data for results, such as follow up the results of the questionnaire by meeting up with the homeowners' associations (Hesse-Biber og Leavy 2006), but also just the fact that the arguments are not solely build on one type of source. A further step in reaching validity is by using theory to guide the process, this ensures that the steps are not randomly selected but based on a theory that seeks to establish certain conditions for reaching results (Yin 2009).



3 THEORY

This project focuses on sustainable water management in Jyllinge Nordmark, Therefore both technical and social aspects are important. The chapter therefore seeks to tie citizen engagement, resilience system thinking and sustainable water systems theory together to create a framework understanding the elements of this study and grasp the issues at stake. Therefore some of the theories will not be used directly in the project, but instead serve as a platform for understanding the field the project is working within. To grasp the aspects of the climate change adaption in a sustainable development the concepts of resilience, sustainable water management, and the Three Point Approach (3PA) have been in use. Furthermore the sustainable development of water systems is in this project closely interlinked with citizen engagement. To understand the citizens' role in a planning process and projects, concepts of participation, stakeholderness and exclusion is elaborated.

3.1 Resilience

Resilience is a general concept normally used in relation to sustainable development, and has its roots in ecology literature, alongside system thinking and stability domains. This means when using the concepts as resilience, adaptability and transformability it is within the understanding of social and ecological systems (Marten 2001). The resilience chapter represents a fundamental understanding of working with climate adaption, and is in this project used as a way of understanding systems and together with participatory theory create a frame for understanding processes of citizens' adaptability.

Ecosystems are the understanding of feedbacks mechanisms in nature, as social systems are for the human society. They are complex adaptive systems, retained in a stabile domain by many different internal forces. The systems can be affected from outside forces, but the forces of the system will always try to re-establish the stabile domain, unless the disturbance is too great and the system will change to a new system. This way of system thinking is both related to the social system e.g. cities, and ecosystem e.g. a forest. Understanding the stability of a system is an important part of understanding resilience. (Marten 2001)

The emerging understanding of human societies relations and interactions with nature systems vice versa is mentioned as the socio-ecosystem (Folke, et al. 2010). This is a central concept in sustainable development, while climate change expresses both ecosystems affecting social systems. However climate change is a product of the human society, and therefore an example of social system affecting ecosystems.

"Resilience is the capacity of a system to absorb disturbance and reorganize while undergoing change so as to still retain essentially the same function, structure, identity, and feedbacks." (Walker, Holling, et al. 2004, 2)

The ability of a system to withstand disturbances is mentioned as resilience, which is by Walker et al. (Walker, Holling, et al. 2004) divided into four main characteristics: Latitude, Resistance, Precariousness and Panarchy.

The latitude is the amount a system can change while still being able to recover its original state (Walker, Holling, et al. 2004). Marten (2001) gives the equation of high resilience of a rubber band; if a rubber band gets stretched it will expand, but as soon as the force stretching the band is removed it will retain the original form. In this manner a rubber band is an example of high resilience in form of great latitude.

Resistance is the ability of a system to withstand a disturbance, without changing (Walker, Holling, et al. 2004). Figure 4 illustrates the relations between stability and resilience as Marten (2001) explains it. In the figure stability can be compared to the resistance and resilience to latitude. The system in the left side of the figure is an example of high latitude, where the state of the system is not that persistent to disturbance, meaning that the system would temporarily change. The system to the right illustrates high resistance but lower latitude, meaning that more force is needed to change the system, but less change in the system can be endured.



Figure 4 The ball illustrates a current state of a ecosystem, moving the ball to either sides would represent a change in state of the ecosystem. The slope of the line illustrates the stability and resilience; a steep slope would represent low resilience, but high stability as the example to the right. The example to the left illustrates high resilience and low stability, because of a slope with a longer but slower rise. (Marten 2001, 169)

Precariousness is an expression of the direction of the system state and how close it is to its limits (Walker, Holling, et al. 2004). Looking back at Figure 4 the precariousness would be the direction of the ball, and how close it is to the "top of the hill".

Panarchy is how the three already described characteristics of resilience is affected by other systems, in the world a system will never be completely isolated and therefore systems will inevitable affect each other.

These four elements of resilience are as mentioned a way of describing how a system can be resilient. Figure 5 shows different systems, how fragile or resilient they are, related to the four elements.

When working within socio-ecosystems it is important to remember the interaction between the systems and how they affect each other. As mentioned the social system affect climate change, but the ecosystem also affect the social system through increased intensity in extreme rain. Marten (2001) argues in this manner that reaching high resilience of a system is trying to predict how severe disturbance the system can meet, and prepare for the worst. In this he argues further for



Figure 5 Different examples of systems and in relation to their stability and resilience (Marten 2001, 124)

thinking of increasing the flexibility of systems. This strongly relates to Fratini et al. (2012) as they argue for taking the discussion of extreme events and not just rely on the standard secure thresholds (see 3.2 Three Point Approach).

Another concept within resilience and socio-ecosystems is adaptability, which focuses on the institutional capacity to cope with disturbance (Marten 2001):

Adaptability is the capacity of actors in a system to influence resilience. (Walker, Holling, et al. 2004, 3)

Within the socio-ecosystems there is a mentioned interaction between society and nature, which implies the importance of working towards sustainability. The key of adaptability lies in predicting what changes would happen and the validity of this, to be able to take correct measures to prevent severe damage to systems. This is the people in the focal systems' ability to take action towards higher resilience before a disturbance occurs. (Marten 2001)

Walker et al. (2004) argues that adaptability is the collective ability of a social system to alter the four characteristics of resilience. The actions of a society will affect the ecosystem, and thereby affecting resilience either intended or unintended. This can happen by altering the

systems thresholds, though an increase or decrease of the latitude, or by affecting the resistance of the system, by making it more easy or difficult for the state of the system to change. Furthermore the state of the system could be altered to change the distance of it from the thresholds. The social system could affect other systems to alter the focal system e.g. politics can affect how people act and thereby alter the system. In relation to Figure 4 adaptability is the capacity of the system to alter the design of the illustration.

Even thought much focus in this section 3.1 Resilience has been on the equilibrium of the system and reaching this, the goal is not just securing the balance but understanding of disturbances to a system, and preventing severe unrecoverable changes (Marten 2001).

3.2 Three Point Approach

When working with water management Fratini et al. (2012) argues, for the importance of not only focusing on the technical issues in the water systems but also consider the dynamic surroundings such as the influence of human and natural system. Only in this way an integrated water management system can be established. In this relation Fratini et al. (2012) defines two types of complexity in the integrated water system functional and relational complexity. Functional complexity is focused on the specific context and the physical aspects. Relational complexity is considering the interaction of stakeholder involved and the many different opinions they bring. (Fratini, et al. 2012)

This project considering Jyllinge Nordmark and its citizens has a high degree of both relational and functional complexity. The relational is due to the many different homeowners' associations and all the people they represent. Furthermore Roskilde Municipality, Roskilde Forsyning and consultancy companies are involved, which all increases the relational complexity. The functional complexity is related to all the different physical settings in the area, the variation in these settings throughout the area. Some places are very undulated and the ground is dense with clay, other places the ground is filled with sand, but the groundwater level is very close to the surface. Fratini et al. (2012) argues that it can be difficult to communicate with stakeholders about issues of functional and relational complexity, and therefore suggest the three-point approach as a good tool for the communication of complex water management system. This is also something to have in mind when engaging with citizens, that even though the three-point approach is a communication tool to enhance the dialogue in complex rainwater issues, the situation is still complex and special attention must be giving to level with the citizens.

for Rainwater Management

3.2.1 <u>The Three-Point Approach</u>

The three-point approach is a communicative tool for water professionals, that helps to discuss and reflect about effect and possibilities different solutions bring in different rain scenarios (Fratini, et al. 2012). This approach helps to communicate and concretises the discussion in these very functional and relational complex scenarios. In this way both the technical system and the ensemble of this with the sounding physical environment is integrated in solutions along the influence and interaction of social system with the technical system (Fratini, et al. 2012).

The three-point approach is a graph with return periods of flood events along the x-axis and costs as structural damage and the risk of human life along the y-axis (see Figure 6). Point one in the figure is at a 5-10 year return period, which is what water systems in Europe are generally designed to cope with (also called design rain). Here is minor infrastructure enough to handle the water that would otherwise cause damage private and public structures. The second point (see Figure 6) is the extreme rain events with rather rare frequency as 100-1000 year return periods. These events can put human life in danger and cause severe damage to urban infrastructure, which needs good planning and resilient systems that can adapt to the impact. The third point in Figure 6 is the day-to-day rain, which doesn't cause any damage, but can bring recreational value to areas, and should be considered as this is how the area or system will look most of the year. (Fratini, et al. 2012)



Figure 6 Three-point approach, showing different water domains as function of return periods and costs/consequences (Fratini, et al. 2012, 320)

The purpose of three-point approach focused on dialogue with stakeholders, and considering the different opinions and aspects in the different events for integrating the involved in the water management solutions. In such discussion the three-point approach tool serves as a way of directing the discussion and visualizing what is at stake in the different situations. So even though flood risk management often focus on probability and cost/consequences, as the X- and Y-axis in Figure 6, the purpose is not sole focused on economic evaluation. The tool helps considering both the every day situation, which values does a solution bring to the area, the design rain, how to insure no damage at normal but heavy rains, and how can we handle the rare but very extreme events. (Fratini, et al. 2012)

3.2.2 <u>Communicating about Cloudburst</u>

Sewer utility companies in Denmark are obliged to insure the design level, which is stated by the municipalities in the sewer plans. However in these plan not much attention is given to the extreme events, though it is becoming much more urgent.

These extreme events are though rare but will still occur and cannot be avoided; therefore it is becoming crucial to manage these events. In the planning of water management system urgency rises for discussing the extreme events, and its connectedness to both the daily and design rain events. Fratini et al. (2012) argues if water professionals are to deal with both the functional and relational complexity, the three-point approach enhances the dialogue between the involved actors in creating multifunctional urban spaces, that can both handle 5-10 year events, secure extreme events will not have severe consequences and ad recreational values in the everyday situation. To do this it is a necessity to rely on technical knowledge, but not solely meaning that water professionals are depend on considering many different aspects such as the living environment.

"It is sometimes difficult to make people accept that the solution you give is not definitive. People always expect you to remove the problem completely but this is impossible. The notion of flood return periods is hard for them to understand. They think it is not acceptable to have flooding at all" (Fratini, et al. 2012, 325)

As the quote illustrates it can be an important part of water management to communicate the situation to citizens, for giving them insight in what can be expected from solutions. The understanding of flooding situation is very related to peoples own situation, e.g. the Netherlands have great areas below sea level, and people are therefore more used to it and know the importance of it. In comparison Denmark perceive flood risk as a relatively new

situation, which makes citizens, authorities and the rest of society less open minded for experimenting with solutions for flood risk management. (Fratini, et al. 2012)

As an example of how to involve citizens in water management, and thereby increase the understanding of it, Fratini et al. (2012) mentions a municipality that have had courses in creating rain gardens. The experiment was focused at a group of citizens that was thought how to use storm water in the garden. Technicians where used to teach, and to give suggestions of possible solutions, but the citizens had to design the garden themselves.

The three-point approach is a way to start a dialogue between citizens and institutions about very complex issues as climate adaption and rainwater handling. Therefore this communication tool offers a platform for interlinking resilience system thinking with citizen engagement, and thereby a way to reach increased citizen adaptability.

3.3 Sustainable Water Management

This chapter serves to elaborate on the understanding of need for sustainable water management, and what concepts this involves.

Today the urban environment has a rapid increase in population, causing challenges to the water resource and being challenged by climate change (Brown, Keath og Wong 2009). To understand these challenges the urban environment is situated in, due to the increased pressure from climate change, due to the intensifying rain events, it can be necessary to look back as Brown, Keath & Wong (2009). The traditional water management systems are sewers and the central point of these systems was quantity, moving as much water as possible, as fast as possible out of the urban areas without being seen (P. Stahre 2008). However the quantities of these systems are not scaled to the high intensity rain events experienced today, which in combination with the cost, have led to focus on solutions on the surface (P. Stahre 2008). In Sweden such systems has developed since the 1970's and on until today, where many different values such as aesthetic and biologic are in equal focus to the quantity (P. Stahre 2008). Though much development has happened towards a more sustainable drainage system in the cities, critics argue it is not developing fast enough, and the need for a benchmarking tool is appearing (Brown, Keath og Wong 2009).

In the development of a benchmarking tool for water management Brown, Keath & Wong (2009) have studied the Australian water systems, by looking at historical, current and prediction of future regimes. This as led them to identify six different key transition states of the water system: water supply city, sewered city, drained city, waterways city, water cycle

city and water sensitive city, which all are identified as a result of political drivers and service delivered (Brown, Keath og Wong 2009) (see Figure 7).

3.3.1 Water System Transition States

Water supply city; is the first transition state of the water system, the main purpose was to deliver freshwater to a growing urban population. The access to water was a symbol of wealth for both cities and people. A central utility would deliver as much water as possible. (Brown, Keath og Wong 2009)

Sewered city; this transition state is marked by epidemic water born diseases as cholera and typhoid, which led to the first sewer systems. In Australia extreme rain events would overflow the sewer systems, which forced a separated system. The political will was driven by hard pressure on public health, and the service provided was separated sewer systems. (Brown, Keath og Wong 2009)

Drained city; is cantered shortly after second world war, where there was becoming increased focus on infrastructure and wealth, furthermore materialism private housing blossoms, causing higher value at risk in floods. This caused a political will to secure many decentralised houses and the cities drains in channels as a result of flood risk reduction. (Brown, Keath og Wong 2009)

Waterways city; in this transition state the first critical views on the increase of service level on expense of the environment emerges. The water practice has overexploited and polluted the water resource, which led to emerging of environmental groups in the 1960's and 70's. A public demand for recreational values and open green spaces made planners use water as a visual of aesthetic value in the planning. In this period a greater focus on protecting the recipient was evolving and methods for cleansing water before it is released, as watersheds and bio-filtration. Signs of local societies engaging in water management were starting to show. However the aspects of waterways city are not yet fully mainstreamed. Political focus is environmental protection and social aspects of water, and the services delivers focuses on management different pollutions. (Brown, Keath og Wong 2009)

Water cycle city; comes as a reaction on a globally focus on sustainability and a realisation of reaching the limits of a sustainable exploitation of the fresh water source. Water professional and researchers are experimenting with full water cycle approaches, focusing on protecting waterways and "fit for purpose water use". Political drivers are focused around the limits of the water source. (Brown, Keath og Wong 2009)

Water sensitive city; the idea of a city with values of protecting the environment, supply security and insure public health. Society would be driven by such values supporting the

resilience of the cities and protecting the environment through e.g. sustainable lifestyles. The political emphasis is on integrating resilience and insuring equal possibilities for future generations in the cities. Delivering multifunctional infrastructure that increases water sensitive and adaptive behaviour, and thereby a resilient urban environment. (Brown, Keath og Wong 2009)





Figure 7 illustrates the different transitions states identified with the red boxes showing the political drivers, and the green boxes as the service delivered (Brown, Keath og Wong 2009, 850)

3.3.2 Values in Water Systems

The development described through the different transitions states of the water system illustrates how the expectations of the society will increasingly aspects of the water management adding many different values (see Figure 8). However a growing urban population is increasing the pressure on the fresh water resource, and the limits for sustainable exploitation of the water resource is about to be reached. This is causing increased complexity of the challenges that water professionals face, and the necessity for strategic action is increasing, for integrating many different social values along with environmental concerns. (Brown, Keath og Wong 2009)



Figure 8 Examples of different added values planners should integrate when working with sustainable water management systems (P. Stahre 2008, 9)

In the sustainable solutions of today the focusing is on imitating the natural water systems, by using percolation, infiltration, detention and surface runoff. These measures are used on different levels and of different capacities (see Figure 9). Focus lies in handling the rainwater where it land first, which can be categorised as source control, onsite control, slow transport and downstream control.

Source control; focuses on where the water first hits the ground and on handling the rainwater as best possible inside the private property, with small-scale facilities as infiltration in rain gardens or just on lawns. (P. Stahre 2008)

Onsite control; is similar to source control, but focused on common or public ground and can often be larger than source control but still relatively small facilities. The measures used are the same as source control, infiltration and small storage basins. (P. Stahre 2008)

Slow transport; has focus on transporting the rainwater and slowing it, on surface infiltration systems as swales, ditches etc. (P. Stahre 2008)

Downstream control; is bigger facilities, as wet or dry basins and wetlands, for storage in heavy rainwater situations, often placed downstream of the water system. (P. Stahre 2008)



Figure 9 categorisations of action areas in sustainable water management in prioritization from left to right (P. Stahre 2008, 8)

As this chapter and Figure 9 above shows, the sustainable development is focusing more on above ground solutions and involves the private land, which raises new challenges, and increases the complexity for actors taking decisions towards sustainable rainwater handling. Furthermore it is not only necessary as Fratini et al. (2012) argues to engage citizens about expectation of the future water systems and handling of these, but also about engaging the in the actual solutions, since they are the landowners of much of the areas where actions is needed taken. This means that water professional often will be forced to engage the citizens in water handling for unlocking the potential in the private plots. Convincing citizens that they sit on a key to water management is a thought that challenges the traditional way of water handling, and puts the citizens in an active role of the development of sustainable water systems, which is not common for neither the citizens nor the institutions and therefore requires innovative procedures. Furthermore it is a necessity to understand how to engage with citizens, and actually managing the resource they can bring to a project.

3.4 Participation and Exclusion

A new paradigm in rainwater management is approaching, focus is shifted from below ground sewer system to above ground resilient solutions (see 3.3.1 Water System Transition States), meanwhile rainwater is changing status from waste to a resource bringing life, aesthetics, environmental and social values (Gjeraa 2013) (see also 3.3 Sustainable Water Management). When shifting towards above ground in rainwater handling the solutions will be cantered around the private ground (see Figure 9), which enviable will involve the citizens of a target area (Gjeraa 2013). Therefore participatory methods are essential as a frame of understanding the engagement with citizens, especially when citizens are not just one homogeneous mass but very varied (Arnstein 1969, Gjeraa 2013, Agger og Hoffmann 2008). Often the people in the lowest areas are the ones with problems and therefore the most motivated. However the possibilities for detention the water is often at the citizens in the high end, which is not as motivated. Participatory methods are a way of engaging citizens and create local ownership, which can help with motivating the upstream citizen. (Gjeraa 2013)

3.4.1 Participation

Participation is not only engaging with citizens but an actual redistribution of power, meaning that authorities give actual power to citizens (Arnstein 1969). In general between authorities there is a consensus about participation being a good thing, but many public institutions find it difficult to use (Agger og Hoffmann 2008). However, there are many different levels of participation and there is a great difference in informing people of what is happening in their area, to letting the citizens decide what is happening in the area (Arnstein 1969). Participation should be considered a two way learning process, so both citizens learn about administrational procedures and public administrations learn about how citizens perceive different projects and how to take this into account (Agger og Hoffmann 2008). The involvement of citizens in public projects is neither for "their" sake nor for the approval of a project, but should be considered collaboration between institutional level and local level, because the project would benefit for such an approach (see also 3.4.3 Stakeholderness). For participation to be successful it is necessary that the citizens are having influence on the project and not just participating for the ritual of it (Arnstein 1969). The last part causes frustration of feeling powerless or useless, and will have negative effects instead of the positive effects intended (Arnstein 1969).
3.4.2 <u>Transfer of Power</u>

It is considered a democratic right to be heard, which is part of why public plans in Denmark have a hearing phase. Furthermore citizen engagement is considered a way qualifying public plans (Agger og Hoffmann 2008). Citizens are specialist in their local area and are therefore an important resource, which can be difficult to obtain without participation (Agger og Hoffmann 2008). Furthermore some citizens are very actively engaged in their local community or willing to be, which can be a big resource in a scarce public budget (Agger og Hoffmann 2008). Participation can help create ownership and thereby anchoring the projects in the local community, furthermore it can help solving the actual problems, since the local people often know exactly where and how the problem is (Agger og Hoffmann 2008). As mentioned there are many different levels of participation and even thought it is in general considered a good thing, a high level of participation is not a quality mark in itself. Different levels of participation gives different results and cost a different amount of resources. Therefore an important point is to consider what is the goal or aim of the participation in the specific project, or specific stage of a project. (Agger og Hoffmann 2008)

Figure 10 shows "the ladder of participation" developed by Arnstein (1969), showing eight different levels of participation defined as exemplifications of the degree of power transferred to the citizens in the specific process. The ladder scales from "nonparticipation" to "degrees of citizens power".



Figure 10 "the ladder of participation" by Arnstein, show a order of citizens role and power in a process going from manipulation as "nonparticipation" to citizen control as highest degree of citizen power. (Arnstein 1969, 217)

The eight-step ladder of participation is a simple way of explaining different ways of participating, but should not be seen as the only ways of participating or as sharply divided. This is just a simplification of thousands of different levels of participation (Arnstein 1969). Looking into the figure it divides the eight different participation levels in three sub categories; nonparticipation, degrees of tokenism and degrees of citizen power. Nonparticipation is by Arnstein (1969) not considered actual participation since the purpose is not to involve citizens in the project, but just to bring forward the believes of the institutions and no redistribution of any power, in this part of the ladder we find manipulation and therapy. The next sub category is degrees of tokenism here we find methods as information, consultation and placation, these three levels all transfer some power but maintain the power balance on the authorities site. Information and consultation gives the participant the possibility to hear about the project and be heard in relation to the project, but the final decision is still taken by the authorities. Placation is similar information and consultation, with a higher degree of involvement of the citizens, but still the authorities maintain the power. The last sub category is degree of citizen power, where steps as partnership, delegated power and citizen control are placed. Partnership is equal relationship between powerholders and citizens, which gives citizens the possibility of negotiating. Delegated power is the first step in the ladder where the power balance is tipped towards the citizens. In this step the citizens will have the possibilities to decide within certain limits. The last step citizen control is when citizens take the initiative to a project and control the execution of it. (Arnstein 1969)

The ladder of participation is a simplified figure to illustrate more clearly relations of power distribution and participation. Simplifying of course mean that something is left out, e.g. there is many different ways of participating not mentioned in the ladder, furthermore there will often be a mix of the approaches and a mix of use in different stages of projects (Arnstein 1969). Arnstein (1969) argues that an important thing in participating is realising that citizens are acting individually and cannot be seen as one group, which Figure 10 does not grasp. However she (Arnstein 1969) argues that illustrating the ladder of participation this way makes sense, since powerholders tend to see citizens as one group.

3.4.3 <u>Stakeholderness</u>

It can seem like participation is just something you need to decide to do, but in fact it is not as simple as that. Citizens are as mentioned not a homogeneous mass but a very diverse and individual group. This also means that within participation it is needed to be aware of who is included and who is excluded. Often excluding citizens from a participating is considered

wrong, but the fact is that it is not possible to include all. Therefore the importance lies in being aware that you exclude, when and who you exclude.

When speaking of participation the stakeholders are often spoken of as they are subjects wandering restlessly around, waiting for getting the possibility to participate. Metzger (Metzger 2013) argues that stakeholders are not something that just exists, but in fact something that are created. '*Stakeholderness' could perhaps be gainfully conceptualized as a relational effect, rather than as an ontologically given property of certain actors* (Metzger 2013, 783). Strategic planning often involves specific persons from a focal area, and are thereby "placing a stake" at the participating, in this there also lie a willingness of the involved of being guided or being an agent of a territorial place or statement (Metzger 2013). As an example of placing a stake: "*so you care about this playground? Then you are a stakeholder in this place, and you should also take interest in issues x, y, z*" (Metzger 2013, 788). Being a stakeholder therefore contains being part of or caring for the focal point (Metzger 2013). In this relation Agger & Hoffmann (2008) being a stakeholder and involving stakeholders are abilities that increase with practice and by time makes it easier for municipalities and citizens to reach higher degrees of citizen power (see Figure 10).

3.4.4 Inclusion and Exclusion

Following the line that stakeholders are "created" by actors such as planners increases the importance of being aware of exclusion. Agger & Larsen (2009) argues that within participatory methods they see three different types of exclusion: *Structural exclusion of actors, Discursive exclusion of issues and Deliberative exclusion in the process* (Agger og Larsen 2009, 1087).

Agger & Larsen (2009) divide Structural exclusion into external and internal exclusion. External structural exclusion relates to the fact that only certain people will participate, such as white, male, well educated. Even though it is sought to reach all affected by a decision it will most often end out with specific people will meet up and thereby have influence on a decision (Agger og Larsen 2009). Internal exclusion is linked to the fact that in groups some will always be louder or more used to speaking in crowds, this is often seen in big citizens meetings, where many are invited and all have the possibilities of speaking up but only few does (Agger og Larsen 2009). To overcome some of these exclusions Agger & Larsen (2009) suggest more specific meetings, which will also be some kind of exclusion, but a more deliberative and controlled exclusion.

Discursive exclusion is about how issues are addressed vocally, as what issues will be discussed. The discursive exclusion can in some sense relate to manipulation of therapy (see Figure 10), by inviting to participatory meeting about certain issues, other issues might be

excluded due to the focus (Agger og Larsen 2009). An example could be if you where to renovate a housing block, and invited the resident for talki1ng about energy class and related savings. Issues related to renovating and increase in rent could be excluded by focusing on other stuff. Agger & Larsen (2009) argues that in participatory discussion language can be a discursive exclusion, e.g. engineers and planners can talk very technical about a project, and laymen would not take part of the discussion. A similar exclusion could be related to what is considered valid arguments, are the feeling based or number based. Discursive exclusion can also be in trying to avoid big conflicts and thereby lead the discussion about areas where higher chance agreement and thereby leave out important issues (Agger og Larsen 2009).

Deliberative exclusion is related to the structural and discursive exclusion, in the aim of reaching consensus or success in relation to the over all goal. Deliberative exclusion is about finding the balance of who to include and exclude e.g. reaching most or specific targets or finding consensus versus taking long discussion both can leave out other issues. Deliberative exclusion is a strategic toll of governance. (Agger og Larsen 2009)

Being aware of how participatory process can transfer power towards citizens also requires the capability of the citizens. Every citizen is not just waiting to be a stakeholder, but it is an active procedure 'to create' stakeholders. When working with rainwater handling these are important points to keep in mind, as well as the participatory process might be as unusual to the institutions as it is to the citizens. Furthermore rainwater handling and climate adaption are as mentioned complex matters, and therefore to get a best possible participatory process is an important task for a project leader to consider when to include and exclude, as well as being aware of what and who such in- and exclusions would affect.



4 ANALYSIS

This chapter will analyse the processes of collaborative planning in relation to the process of finding and implementing sustainable rainwater solutions in Jyllinge Nordmark. Therefore the procedure of the analysis will follow the steps of collaborative planning, going through generation of ideas, selection of ideas, implementation of ideas and finally dissemination of ideas (see also 2.1 Research Procedure). This analysis will start by elaborating on some of the issues in the area and how these issues where found, by going through some of the main findings in the "Understandings of Problems and Complexity" which "Generation of Ideas" takes base in. However this project has been executed as an action research study, which implies that my role has been very active in the forming of the process in collaboration with Roskilde Forsyning. Therefore the focus of the first part of the analysis will centre on my findings in the process as it evolved in section 4.1, 4.2 & 4.3, which are the processes happening before the suggestion from Roskilde Forsyning will be handed in (see also 2.1 Research Procedure). The next sections 4.4 & 4.5 will focus on the next steps, which I unfortunately cannot follow since they will be executed after Roskilde Municipality has taken a decision on behalf of the suggestions from Roskilde Forsyning. The next steps will therefore be my reflections and suggestions of how to handle the procedure of implementing the ideas and making it a common procedure. These reflections and suggestions will be based on theory and the ideas I have already met throughout the study period. Throughout the analysis the theory about system thinking and resilience (see 3.1 Resilience) will serve as an understanding of the effect from different solutions and from citizens' awareness of climate change and thereby adaptability (Wamsler og Brink 2014). The concepts from resilience and system thinking will not be as directly used, but is a foundational understanding for climate adaption and citizens adaptability.

4.1 Understandings of Problems and Complexity

In the collaborative approach the first step *generation of ideas* is taking basis in known problems. In Jyllinge Nordmark known problems is a blurry concept, as there are many understandings of problems in Jyllinge Nordmark. Jyllinge Nordmark has a varied landscape and the problems with rainwater changes along the formation of the landscape. Furthermore Jyllinge Nordmark is related to a high degree of functional and relational complexity. The functional complexity is related to the very place spatial problems, due to hydrology, geology and the landscape (see appendix 8.6 & 8.7). Hence creating problems in areas with high level of groundwater that sometimes enters the surface in situation with increased sea level and areas dense with clay making infiltration very ineffective. In general there is very little

control of runoff water in Jyllinge Nordmark, mainly causing problems near the very steep areas or streets, while the water from a whole street will run uncontrolled to the downstream areas, and increase the pressure on their rainwater handling.

The relational complexity of Jyllinge Nordmark is connected to the different understandings of the problems between the different actors and how the problems are rooted. In this process several different actors are involved Roskilde Municipality, Roskilde Forsyning, consultancy companies and citizens of Jyllinge Nordmark. Furthermore there are not just one consultancy company but six different, having their individual views (see also The Solutions 4.2.5). Jyllinge Nordmark has 2049 private properties and these have different problems as well as they experience them differently. These properties are divided into 24 homeowners' associations, which underlines citizens are not just one actor. In the area there are 93 roads, 91 of them are private common roads and only two is public streets. The private common roads are maintained by the homeowners' associations (confer LOV 1537 of the 21/12/2010), which also means that the homeowners' associations are supposed to handle the rainwater problems on the road. However they cannot handle the problems by themselves due to the functional complexity and the lack of expertise in rainwater management (see appendix 8.17.1). Therefore the homeowners' associations need help, which relates the problems to Roskilde Forsyning, Roskilde Municipality, the different consultancy companies that are involved to advice or handle because it is a complicated case. Finding solutions in Jyllinge Nordmark will then both be related to functional complexity due to the physical settings, and relational complexity due to many stakeholders that are involved and the different responsibilities. In an attempt to get a clearer overview of the problems and where the issues are geographically rooted, Roskilde Forsyning send out a questionnaire to all the 2049 private properties (see results in Figure 11 & Figure 12).

How many	How many	Problems with rainwater		
asked	answers	Inside House	On Property	On Street
2049	712	50	255	251

Figure 11 Summarizes answers from the questionnaire about rainwater problems. (See appendix 8.2)

Even thought the questionnaire gave a good impression of the problems, still two main issues to be aware of maintained; the scatter of the problems and what is a problem. As the project leader from Roskilde expressed it in relation to the reasoning of executing the questionnaire:

I had hoped that the questionnaire would mark out areas with problems nice and clearly. However looking at the about 50 households that had experienced problems with rainwater inside the house, showed that the problems are not particularly in one place, but scattered out over the whole of Jyllinge Nordmark. (Own translation from appendix [58:20 – 58:54] Appendix 8.5.1)

Due to the size of Jyllinge Nordmark the project leader had hoped the problems to be centred in a few specific areas, making the task lesser, and general talk of problems had been about the very low northern part of Jyllinge Nordmark. Looking into Figure 12 areas, which seems to have no problems can have one or two houses where they get rainwater inside the house. However the scatter of the problems (see Figure 12) was not the only issue from the questionnaire to be aware of, but the answering of experiencing problems with rainwater gives very broad results. The Project leader from Roskilde Forsyning gives the example:

Questions as "have you experienced any problems due to rainwater on your property?" from the questionnaire are very subjective, and will have individual answers. There is much difference in what some people consider problematic, e.g. some thinks it is ok that their property is very wet certain season because they are used to it, being that way. Others will find it a big problem that they are getting wet shoes on their way to their car. This does not make the answers useless, but forces us [the people gathered at the workshop] to look through this and try to find solutions for the actual problems, and not all the minor irritations. ([56:06 – 56:40] own translation from appendix Appendix 8.5.1)

The answers in the questionnaire was as mentioned (see 2.3.4 Questionnaire and GIS) sought validated by a series of meetings with the homeowners' associations, which meant that the project leader and I met with 10 homeowners' associations (see Appendix 8.17). This helped to narrow down the focus, on areas where the homeowners' associations did not feel capable of solving the issues themselves, and asked for help. In this relation question towards which types of solutions they prefer was asked, in general most associations thought that separate sewer systems was to expensive especially compared to the issues they experienced. This understanding we gained served as guidelines for selecting the areas of focus in the workshop and the tasks asked (see workshop agenda in appendix 8.3, and 4.1.2 Selection of Focus Streets and Areas). This process of bringing forward the worries and specifications of how each homeowners' association experience problems and deal with them, to the workshops do

in some manner align with placation or consultancy. However it can easily become a hollow process, if the opinions of the citizens are not taken into account in the decision-making (Arnstein 1969). Treating the citizens this way does not take into account the difference within the homeowners' associations, but does only consider the variation between different homeowners' associations.

4.1.1 <u>Collaborative Networks</u>

The high degree of complexity of the task convinced the project leader for Roskilde Forsyning to seek a broader collaborative network for reaching solutions that could handle issues of this functional and relational complexity. As mentioned Roskilde Forsyning does not see a separate sewer system as a very suitable solution (see 1.3 Research Question). meaning the project leader from Roskilde Forsyning was thinking of possible alternative solutions. However the project leader is no expert in alternative rainwater solutions, so she needed assistance from specialists of what was actual possible to do in Jyllinge Nordmark. Furthermore as Stahre (2008) expresses many of the alternative solutions are focused on handing water on the surface, which in Jyllinge Nordmark means private ground, while even the streets in the area are private except the two main roads Osvej & Nordmarksvej. Suggesting rainwater handling on the surface in Denmark is crossing the traditional procedures and legal responsibilities in rainwater management (Haveselskabet 2014), and therefore requires a strong will and trust between municipality and utility to do, not to mention a collaboration with the citizens and their willingness. Therefore a process with degrees of citizen power would be inevitable, since the citizens are the landowners of both their private plots and the streets.

To reach a solution for an integrated water management system (see section 3.2 Three Point Approach) in Jyllinge Nordmark, the project leader is aware of the limitations in the traditional top down procedures and necessity to find innovative solutions, which is why a collaborative work process is sought, established through the workshops (see 2.1 Research Procedure). By hosting these workshops both the relation between Roskilde Forsyning and Roskilde Municipality was strengthened and a common goal or vision for Jyllinge Nordmark was attempted to reach (see section 4.3.1 The Creation of Assessment Criteria). Furthermore as the going against traditional top down measures, the utility and municipality challenge themselves and therefore the different consultancy companies was also a way of knowledge sharing.

An important point mentioned by the project leader during the first workshop was what service level¹¹ could the citizens expect. Normally in separated sewer systems the service level would be 5 years, meaning that flooding of the system can occur every 5 year. Building a separate sewer system in Jyllinge Nordmark would therefore only help the 16 landowners out of the 50 that had problems with rainwater entering their houses. Since only 16 had this issues more than once every fifth year (see Figure 13). This illustrates the

Frequence of rainwater inside house in the last 5 years



Figure 13 Self-made pie diagram showing the frequency people experience of problems with rainwater entering the house

importance of communicating with the citizens about solutions and the restrictions of a solution in relation to implementation. As Fratini et al. (2012) gives a fine example of, people will often think it is not at all acceptable to have floods (see quote in section 3.2.2 Communicating about Cloudburst), but in separated sewer system areas it is political accepted every fifth year confer the service level.

4.1.2 Selection of Focus Streets and Areas

Due to the degree of functional and relational complexity connected to Jyllinge Nordmark, the project leader from Roskilde Forsyning and I decided in the preparations of the first workshop to locate streets with a characteristic situation, which would serve as an example of the issues in a larger area. Choosing specific streets would force the consultants to be quite specific in their suggestion for solutions, while they had to come up with an idea that could solve the issue on the street. Due to the characteristic of the street it would also make the solution transferable to other streets, with some assessment.

The choice of selecting focus areas is also an attempt to tie the wishes from the homeowners' associations, and to find solutions on the streets that had complex rainwater problems, which the homeowners' association could not cope with (see appendix 8.17). The way the workshops where set up was based on, what (see 2.1 Research Procedure and 2.3.1 Workshops and Focus Group) the project leader from Roskilde Forsyning and I thought would be a way of reaching specific solutions to target the issues in certain areas or streets,

¹¹ A service level of 5 years for separate sewer systems and 10 years for common systems is European standard (Fratini, et al. 2012).

which could be presented as a list of possibilities that fit the specific area of a homeowners' associations, as they asked for (see appendix 8.17),

Eight streets were selected in collaboration with the project leader from Roskilde Forsyning and I. The selection was based on the information we had gained through my internship, the investigations of the geology and hydrology (see appendix 8.7) and the local knowledge gained through the questionnaire and in meetings with the homeowners' associations (see appendix 8.17). The eight streets exemplifies three roughly divided areas, the low areas with groundwater very close to the surface, the hilly areas dense with clay in the top layers of the ground and the border areas between the very steep areas and the very low and flat areas.

The very low and flat areas could be considered all the areas beneath three meters above sea level, but are mainly centralized around the northern part of Jyllinge Nordmark. The area is troubled with very little elevation, which makes gravitation difficult. Furthermore most of the area has less than one meter to the groundwater, which is very fluctuating along rain events and pressure in the fjord, making infiltration very inefficient (see Appendix 8.7 & 8.6). Representing these areas we chose, Åvej, Høgevænget, Storkevej and Lærkevej, these were also some of the streets that experienced most problems in the northern part, especially Åvej which both had problems with the rainwater in the area, and received much water from the high ground just south of Åvej (see Figure 12 & Appendix 8.17.6).

Rugvej represents the hilly and clayey areas, which have issues with clayey grounds and thereby very low infiltration. The area is very hilly which causes issues with valleys in the middle of the streets or near houses where the water is trapped due to low infiltration.

The borders between the steep areas and the low and flat areas are represented by the two public roads Nordmarksvej and Osvej and the private road Osvej vest. These three streets lie as borders between very high areas and very low areas, runoff water travels from the high and roughly untroubled areas to the low and troubled areas. The streets were picked because they seem like obvious water transport streets for handling cloudbursts.

Another less loud spoken purpose of having consultancy companies looking at these streets is for the project leader from Roskilde Forsyning to test some ideas. The project leader already had some ideas as the cloudburst streets in mind, and having a few different consultancy companies specialised in rainwater handling to suggest solutions could give a hint of the idea being reasonable, and knowledge sharing about details.

4.2 Generation of Ideas

The generation of ideas phase is focused around the procedure of creating an environment for ideas to be generated. It takes basis in the known problems (see 4.1 Understandings of Problems and Complexity) by using these as a frame for the work process. Furthermore the phase focus on establishing collaborative networks for creating ideas, therefore this section will also go into which values are represented and which solutions are then presented.

To generate innovative and creative ideas, it is important to deal with barriers such as "zero error culture", professional norms and bureaucratic silos. Especially the bureaucratic silos was something I saw in my internship at Roskilde Forsyning, the utility and the municipality are too focused on their individual tasks that it becomes an barrier for innovative solutions. To create an arena to break with the bureaucratic silos, zero error culture and professional norms, the workshops focused at working together and reaching many different aspects for a mutual transformative learning process. (Sørensen og Torfing 2011)

4.2.1 Creating an Arena for Experimentation

In a goal to break with some of the professional norms, the workshop took place in Jyllinge Nordmark, instead of a meeting room in Roskilde Forsyning or Roskilde Municipality. To reach as many different views and ideas of what is possible, the project leader from Roskilde Forsyning and I invited four different consultancy companies, with some difference profiles. However it ended up being six different consultancy companies, because Haveselskabet (who we originally invited) asked if they could bring Envidan and De Urbanisten to work with them. Therefore attending was Envidan, Haveselskabet, De Urbanisten, Orbicon, Grontmij and Tredje Natur (see participation list in appendix 8.3 and a short description of the companies just below). We invited Haveselskabet because they have a reputation for working with citizens in source control project. Orbicon was invited because they have specific insight in the issues in Jyllinge Nordmark and the process from both been assisting on the drillings Roskilde Forsyning made, and being responsible for the implementation of the dike project in Jyllinge Nordmark. Grontmij was selected because they had done some projects for Roskilde Municipality in the initial phases of defining the problems in Jyllinge Nordmark and have done calculations on the flow of water in Værebro å. Tredje Natur was invited because of the reputation from the projects in Copenhagen as Skt. Kjelds Kvarter, and to create a contrast to the engineering aspects. The different companies have different approaches and thereby also represent different values (see Figure 14).

4.2.2 <u>Workshop Participants</u>

A project leader specialised in climate adaptation and cloudburst resilience represented Envidan. Envidan is a company, which takes in the citizens as an important actor in their climate adaption work (Envidan u.d.). Haveselskabet is a gardening company that had hired a former city planer (an architect) to help with climate adaption project, with focus on rain gardens (Jensen 2014). The project leader in Haveselskabet was used to work with combining private and public rainwater handling (see Appendix 8.6). De Urbanisten is a Dutch water management company and are specialised in rainwater in the urban environment, and are know from projects as "the water square" in Rotterdam (De Urbanisten 2013). The company was represented by one of the founders an urban planner (see Appendix 8.6).

Three persons were representing Orbicon, one specialised in citizens participation and collaborative processes between municipalities and utilities (see Appendix 8.6). The second representative was senior engineer in charge of internal development of climate adaption, and working with project within climate adaption and cloudburst resilience (see Appendix 8.6). The third representative was a geologist specialised in geohydrology and had been working with infiltration, LAR and hydraulics in relation to climate adaption projects.

Grontmij is a company with a strong sustainability focus, working much with risk analysis and modelling in climate adaption (Grontmij u.d.), they were represented by an engineer specialised in hydraulic modelling within climate adaption (see appendix 8.1).

Tredje Natur is an architecture company known from the storm water planning and the designing of Sankt Kjelds Kvarter in Copenhagen (Tredje Natur 2015). They were represented by a landscape architect specialised in working with architecture and climate adaption, his focus lies on the superficial and aesthetic features.

Furthermore a PhD student from DTU was attending, the PhD student is studying the development of new processes and measures for rainwater management.

Roskilde Municipality were represented by four people, the road authority, the head of sewer planning, the planner in charge of the new local plan for Jyllinge Nordmark¹² and the person in charge of the dike project in Jyllinge Nordmark.

Roskilde Forsyning was represented by the chief of projects and constructions, their team coordinator from the department for wastewater and the project leader of the Jyllinge Nordmark Project.

¹² The planner in charge of the local plan was only attending in the 2. Workshop.

for Rainwater Management In relation to Stahre (2008) figure of added values (see Figure 8) this gave many different aspect of the water system, though it was still in a quite technical field (see Figure 14). Even though the companies represented different aspects they are all working with alternative measures for climate adaption, and thereby very capable in challenging the professional norms and zero error cultures of Roskilde Forsyning and Roskilde Municipality. Through their authority as consultants their suggestions affected Roskilde Forsyning and Roskilde Municipality in their understanding of what a reasonable solution can be (see also 4.3.2 Solutions Prioritised for Jyllinge Nordmark).



Figure 14 Added values by the different participants in the workshop based on the added value figure in Stahre (2008)

4.2.3 Internal Endorsement for thinking challenging Alternatives

The number of people showing up from both Roskilde Municipality and Roskilde Forsyning, was a clear indication of them believing in this process as a good way of reaching a sustainable rainwater management system in Jyllinge Nordmark. For Roskilde Forsyning the two workshops have been quite costly (approximately 180.000 DKK + internal work hours), which is also a clear indication of seeing a great advantage of this procedure. My interpretation is that Roskilde Forsyning is moving towards the waterways transition, while the focus lies on solutions on the surface in collaboration with the citizens. The workshops could in that understanding be an acknowledgement from Roskilde Forsyning that prioritising on source and on site control solutions is not an easy and usual task, while systems success relies on the local citizens. This is an example of a redistribution of power, which is an important factor for creating positive incentives on micro level and a clear sign of challenging the zero error culture, while it is a submission of some control. Roskilde Forsyning is not used to engaging much with citizens and working with these source control measures, which was why the different consultancy companies were consulted in this expansion of professional norms. In this relation it is also interesting to note that the strongest represented consultancy

companies were the ones, which are most experienced in engaging with citizens in their work with climate adaption, which only emphasis the will to create arenas for innovative solutions. Both Orbicon and the group of Haveselskabet, Envidan and De Urbanisten brought three representatives each and are familiar with citizen participation in relation to climate adaption projects. Grontmij and Tredje Natur only met up with one representative each.

The willingness to try alternative measures in rainwater handling was also on the mind of the participants in the workshop, and at the first workshop a person from the consultancy companies raised the question:

[1:30:40] Consultant: Is the political will present, e.g. to use means as expropriation?

Roskilde Municipality: [...] It is a difficult question to answer, but there is political will to work with he service level in relation to the extreme events [...] never again a catastrophe [...]

[1:33:02] Roskilde Forsyning: I think you should see this gathering of all of you [the many different consultants] in looking into possible solutions, and best solutions, as an expression of both the municipality's and utility's wish to handle the issues [in Jyllinge Nordmark]. I am aware that there probably will be many other issues in the economical distribution of financing the solutions, but right now there is much willingness and it is across both the municipality and the utility. So take this [process] as an indicator of the political will to find the best solutions for Jyllinge Nordmark. ([1:30:40 - 1:33:36] own translation from appendix 8.5.1)

Even though the original question was focused on expropriation the answer from the utility still expressed a more general willingness and open-mindedness to try out new solutions, and a sign of will to test the boundaries of what is "believed" possible and a break with zero error culture.

After the first workshop my impression of the situation was that the participants in general where very happy about the procedure, which was backed up by the poster notes the participants was told to fill out at the end of the workshops (see appendix 8.9). The participants where very impressed that Roskilde Forsyning and Roskilde Municipality where taking the initiatives to the broad collaboration, and open-mindedness about trying alternative solutions. This expresses examples of how workshops and collaborative networks can be a tool to overcome the bureaucratic silos and break with professional norms. It was clear from the dialogue and the notes from the first workshop that Roskilde Forsyning was establishing something new and challenging for utilities. Many saw the area as a difficult but manageable task, which had many interesting facets due to the area-specific problems, and the nearly forced necessity to engage with citizens (see appendix 8.9). However this also inquires a

further procedure that deals with legal and institutional conditions, which can be barriers for innovative solutions in public sectors (Sørensen og Torfing 2011).

4.2.4 Workshop Exclusion of Citizens

As mentioned the citizens had deliberately been excluded for an active engagement during the workshop, but the issues experienced by the citizens were brought forward from the meetings with the homeowners' associations. This is also related to the point of the workshops being partly to process the internal procedures of Roskilde Forsyning and Roskilde Municipality. However a big part of presenting these worries from the homeowners' association was the safari (see methodology), which was a guided tour to the selected streets of focus, where the main issues from the homeowners' associations were presented (see appendix 8.4). The project leader from Roskilde Forsyning and I had put much effort into explaining the issues and giving the consultants a very good and tangible understanding of the issues, which also

was why we wanted to bring all the participants to the focus areas and show them the issues. Furthermore it was to insure a focus on the issues, related to how the homeowners' associations experienced it. Most of the participants at the workshop seemed to think this was a very good idea to see the context of the issues and much dialogue was about the area, and especially of the high degree of impermeable areas in the private properties, and how broad the streets where compared to the size of the area (see Appendix 8.9). However one participant noted that the person would have liked more structure on the safari and a clear purpose (see note 9 appendix 8.9).

4.2.5 The Solutions

The first workshop ended up by giving the

Figure 15 illustrations of source control from the proposal from Haveselskabet, Envidan & De Urbanisten (see appendix 8.16.1)

different consultancy companies a task of finding principal solutions for two of the selected streets of focus each (see appendix 8.4). The solutions Haveselskabet, Envidan and De Urbanisten came up with, were two suggestions for Lærkevej both focused on the citizens and them taking care of the water, with help they could create very beautiful and aesthetic areas. The two suggestions were divided in one heavily focused on "source control" (see Figure 15), everyone should have rain gardens, and handle their water from their own plot. The other

focused heavily on "on site control" (see Figure 16), taking some of the private streets and the front part of the plot to store the water.



Figure 16 illustrations of on site control from the proposal from Haveselskabet, Envidan & De Urbanisten (see appendix 8.16.1)

Both solutions are fit for every day and design rain, but probably not capable of handling extreme events, though the second suggestion probably would be better for the extreme events, or even a combination of both. The second street Haveselskabet, Envidan and De Urbanisten was Osvej and Osvej vest. The road is creating issues as it functions as a barrier in the eastern part, making a small pond in the properties along the road, and as the western part the area south is very high and to the north very low (see Figure 12).

The suggestion was focused on slow transport, using the road as a transport corridor of water and leading it towards the sea where a small detention pond could be combined with bio filtering (see appendix 8.16.1). These suggestions will require participatory processes, where the citizens will have a high degree of control.

The solutions suggested by Orbicon were for the street Rugvej to drill through the hills so the small ponds would be punctured (see Figure 17), and then slow transport along the roads, leading the water safely around the buildings towards the

harbour (see Figure 18). In the low flat area by Fasanvænget Orbicon suggested, small trenches along the roads, reduction of the width of the streets and a general reduction of the impermeable areas. As general concepts they highlight the importance of people learning to live with the water and be happy for a wet garden, and in the implementation phase they



Figure 18 Illustration of how water can be lead along streets with minor barriers (see appendix 8.16.2)

focused on saving buildings not just every small pond, and focus on a pilot project, create local ambassadors and teach the homeowners' associations how to handle this kind of water problems. Orbicons suggestion does not require a process where citizens has as much control as the above mentioned, but instead they focus on teaching the citizens in adaptability, and emphasise the point that some of the gardens will remain wet.

Grontmij was looking into Storkevej and Åvej. In Storkevej their suggestion was focused on handling the water in the side of the road with different measures, they preferred a



Figure 19 Illustration of on-site control along the street (see appendix Grontmij suggestions)

combination of slow transport and infiltration, which focus much on on-site control (see Figure 19). In Åvej similar measures are suggested, but Åvej is further burdened with runoff water from higher grounds. The suggestion implied that water from higher grounds are controlled and led towards the recipient Råmosegrøften (see appendix 8.16.3). These solutions do not require the same participatory process as the two suggestions above, while Grontmij focus much on common areas.

Tredje Natur has been looking into Nordmarksvej

and Høgevænget. Their suggestion for Nordmarksvej was to combine a bicycle path, which is already in the idea phase, and storm water management. When the municipality is starting to plan the bike path it is important that they think of it as a barrier, which makes Nordmarksvej into a water corridor leading the water away, and taking off some of the pressure from the areas on the lower side of Nordmarksvej, when runoff water is storming down the steep sides of western side of Nordmarksvej (see Figure 20). Høgevænget is one of the lowest areas in Jyllinge Nordmark, the street has a small but natural fall towards Værebro Å (see Figure 12) therefore their suggestions was focused on slow transport along the street by either placing trenches in the sides or as a cloudburst road lowered in the middle.



Figure 20 Illustration of Nordmarksvej as a storm water road with bike lane as barrier for the water (see appendix 8.16.4)

In general the suggested solutions are placed in the waterways transition state, with most emphasis on on-site control and slow transport, but to some extent leave out source control. A more resilient procedure would be to firstly focus on source control, then on-site control, then slow transport and lastly focus on downstream control (as Figure 9). With such a prioritisation you might reach a more flexible system while taking in more measures, furthermore it reduces the amount the next solution should handle and thereby can handle a more extreme event. However taking in source control relies more on the willingness of the individual citizen, and using several measures in combination will increase the expenses as well.

Most of the suggestions focus on handling water on the surface and the creation of recreational values, but in the meeting with the homeowners' associations they did not express any whish for open water streams in the area. My impression was that most of the people just wanted to get rid of the water, which could be linked to the fact the area already have many green and blue recreational values. In this way it could be argued that the solutions does not fit the expectations of the citizens in the area. However the suggestion of open water system are not just for recreational values, but often due to the expenses of a sewer system but in most of the areas infiltration is not very effective.

Solutions' reliance on Citizen Participation

There are some differences as mentioned in who relies on source control or who focus more on on-site control. This could be an expression of trying to avoid "to much" engagement with citizens, as the architect from Tredje Natur said about their solution for Høgevænget:

"Working with streets in rainwater management is a relatively cheap and easy approach, and furthermore you do not harass the citizens more then just needed" ([48:56 - 49:02] own translation from appendix Workshop 2, part 1).

The mentioning of avoiding harassing the citizens with rainwater handling projects reflects some kind of distance to participation. It could be either because the company thinks it would complicate the process, or because they think that Roskilde Forsyning or Roskilde Municipality think it is complicated to engage with the citizens. The solutions proposed by Grontmij had a similar "attitude" focused on solutions where citizens are not necessarily an active part. However the architect from Tredje Natur mentions just after the quote cited above, that the same solution could be replicated in the edge of gardens instead, and have similar effect, it would just be necessary to convince the citizens about it. This not a clear example of that some companies deterred from working with active citizens in the projects, but it is a notable difference to the suggestions from e.g. Haveselskabet, Enivdan and De Urbanisten, which focus more directly of placing an active stake by the citizens. The balancing of such

solutions and thereby processes are also a balance of how ventured Roskilde Forsyning and Roskilde Municipality dare to be. Therefore the choice of prioritised solution will be a much more clear measure for how much the utility and municipality are willing to challenge the norms and experiment.

The project leader from Roskilde Forsyning was not moved much in her believes of what should be done in Jyllinge Nordmark. However seeing so many different consultants suggesting similar solutions as the project leader from Roskilde Forsyning had thought of, strengthened her believes of it being possible and the right direction, and thereby a way of overcoming zero error culture. As mentioned the project leader from Roskilde Forsyning is supposed to write a suggestion for handling the rainwater in Jyllinge Nordmark, which Roskilde Municipality shall assess and decide upon for the direction they will take. But the process with four different presentations of solutions focused on alternative measures with water on the surface and some engagement with the citizens, will also affect the municipality and their believes of what is possible and good solutions for the area. In this understanding the presentations of the solutions affected both Roskilde Forsyning and Roskilde Municipality towards a more common goal, and a willingness to go further into the challenging process of rainwater handling on surface between private, common and public land. Therefore the workshop have been a good arena for collaborative innovation in the generation of ideas, it is clear that some of the boundaries already are challenged, and excitement about breaking with norms are present.

Even though a solution that relies less on citizen participation can seem easier and more effective, it is important to have in mind, that the longer process with citizen participation gives more than just an implemented solution. Wamsler & Brink (2014) argues that participation and ownership increase the adaptability amongst the citizens. This means that because rain gardens would require a higher amount of participatory process, and thereby also a high degree of citizen engagement, it would increase the citizens' awareness of climate adaption. Increasing the roots of the solutions in the communities does increase the importance of the solutions due to the ownership, but citizens will also be more aware of the importance of a well-kept rain garden in relation to the effectiveness in climate adaption. If the citizens maintain the solutions because they have an ownership feeling or because of the awareness of the importance for rainwater handling the result maintain the same, the solutions is maintained and well functioning. This has been an issue in the area before with the different ditches in the area, which are some places used for trash.

4.3 Selection of Ideas

This phase will focus at how the network established in first workshop tried to prioritise the different suggested solutions for Jyllinge Nordmark. This section will therefore focus on how the criteria for the assessment of the suggested solutions where established, what values does it represent and how does it reflect the transitions of both Roskilde Municipality and Roskilde Forsyning. Next step will go into how the workshop participants worked with assessing the solutions, what solutions were prioritised and what transitions were sought.

4.3.1 The Creation of Assessment Criteria

As the different consultancy companies were asked to find solutions in the time between the first and second workshop, Roskilde Forsyning and Roskilde Municipality was asked to agree on some criteria for assessing the different solutions suggested by the consultancy companies. At the meeting for the creating the assessment criteria three persons represented Roskilde Municipality and three persons represented Roskilde Forsyning.

In the discussion of assessment criteria Roskilde Municipality started by mentioning:

The political talk in Roskilde have been focused on creating equal service level for citizens in Jyllinge Nordmark as for the rest of Roskilde Municipality, which would be water on terrain every fifth year. However I do not think this should to be transferred directly, but we need to decide how this can be translated to the context of Jyllinge Nordmark. ([4:00-5:10] In appendix 8.11)

This quote expresses the original state of Roskilde Municipality in relation to how the thoughts of handling rainwater were, which align with the traditional procedures aligning with the drained city (Brown, Keath og Wong 2009). However the quote also expresses a transition from relating to legal and institutional boundaries to challenge them in the interpretation, and thereby opened possibilities for thinking further than the legal restriction. The comment was followed up by:

Roskilde Forsyning: In the work I would start by focusing on the most severe cases, where the problems are most difficult to handle, but is that part of a goal? That every citizen of Jyllinge Nordmark has a possibility of getting rid of rainwater?

Roskilde Municipality: *Put in another way, it would be a good thing to be able to tell the citizens what to do with their rainwater. I think restrictions on having fascines are a joke they are dogged into water. [...] A goal could be: at every house owner of Jyllinge Nordmark could be assigned where and what to do with rainwater, without harming your neighbour. ([10:55-12:07] In appendix 8.11)*

This quote aligned with the before mentioned is one of the first clear examples I see for especially Roskilde Municipality shifting away from the traditional way of thinking rainwater handling aligned with the drained city (Brown, Keath og Wong 2009), and thereby taking up that Jyllinge Nordmark is a special place. The discussion here was an example of bending the understanding of the service level and thereby challenges a barrier to innovative practises at a meso level. This mentioning was an expression accepting alternative approaches in rainwater handling. However the municipality did mention some worries in working with an alternative service level:

Roskilde Municipality: we cannot create a higher service level for Jyllinge Nordmark than for the rest of Roskilde, that would be problematic. For example we cannot say Jyllinge Nordmark can never have problems, but we have to find some kind of goal for the service level, balancing between how much damage can you accept due to rainwater and how much is it up for the individual to secure? [12:44 - 13:20] In appendix 8.11)

This quote is a clear example of the issues for deciding an alternative service level at an administrational level, which related to the meso level boundaries to innovation as legal restrictions and institutional conditions. Is it ok to treat citizens in different areas differently or should all be equal? In some way it could be answered, "yes they can be treated differently" while Roskilde Municipality and Roskilde Forsyning agreed on a general goal or service level:

Being able of assigning every house owner a realistic place to drain of water. (Could be infiltrations or a connection point for drain, ditch or similar. (See appendix 8.12)

This sentence implies nothing about how often the citizens can experience water on terrain, which would be nearly impossible to secure in Jyllinge Nordmark due to groundwater entering the surface in certain situations. However it specified a wish of having a controlled situation where the runoff water does not just run unintended and cause problems for either the house owner or a neighbor. Instead it focuses on having some kind of overall system, which can vary from street to street, but everyone have somewhere to put their water. The goal still relates to the professional norms, but contains more flexible interpretations, and thereby keeps a window open for innovative collaboration.

Furthermore four main criteria for assessing rainwater solutions where agreed upon:

- 1. The ability to handle rainwater in everyday situation, design rain situation (five year), and cloudburst situation (e.g. 100 year). (See appendix 8.12)
- 2. Resilience of the suggestions and operational reliability. (See appendix 8.12)
- 3. Creation of added values (aesthetics, biologic, green, etc.) (See appendix 8.12)

4. *Economy both construction and operation*. ([42:16-42:36] in appendix 8.11)

These criteria are representing the values of a common goal from Roskilde Forsyning and Roskilde Municipality. This discussion of how to weight different solutions against each other was not only important for reaching a common ground for assessing, but it also strengthen the collaboration between the municipality and utility especially because they put words and arguments on their ideas and ways of viewing the case (Sørensen og Torfing 2011). As a participant from Roskilde Forsyning mentioned in the discussion as a reason for why he did not believe in a separate sewer system as a solution in Jyllinge Nordmark:

Roskilde Forsyning can guarantee that we will not solve the problem [with traditional rainwater sewer systems][...] The problem in the area is that water on terrain is equal to water entering the house, in the most exposed areas at least. This means that some will have water in their house every fifth year, because this is what our service level covers, which is not just something we can change. Therefore it would require someone to take care of some runoff water even though we implement sewers. ([30:25 - 31:43] in appendix 8.11)

This quote is an example of how elaborations of actions can help the understanding, Roskilde Forsyning is not just trying to escape an involvement in the establishment of an expensive separate sewer system, but more focused at this might not be the right solution for such an area as Jyllinge Nordmark. Therefore this part of the process helped Roskilde Forsyning and Roskilde Municipality to act as a united force, which will help them in the implementation phase, when they have to work with citizens about solutions that contest the boundaries of their legal restrictions. Furthermore it breaks with the routines of rainwater handling, and focus on common understanding and collaboration instead of fighting about responsibilities.

A comment like the just mentioned quote could affect citizens, which are emotionally involved due to the fact that it might be their house, which was part of why the citizens were excluded from this part of the process. Nevertheless this process focused on establishing strong ties between Roskilde Municipality and Roskilde Forsyning for creating a common goal, and it was therefore important that they could discuss freely. However the worries presented in the meetings with the citizens, where represented by the project leader from Roskilde Forsyning and me. Some of the homeowners' associations mentioned that they were more worried of the cloudburst situation more than five year events than the issues related to daily rain (see appendix 8.17.1). This was represented in the three criteria daily rain, design rain and cloudburst, which were inspired by a combination of the worries from the homeowners' associations and the ideas of Fratini et al. (2012). However Roskilde Municipality and Roskilde Forsyning agreed on the service level in its direct translation but

this is not an appropriate solution for Jyllinge Nordmark. Furthermore they are aware that the citizens in Jyllinge Nordmark are more worried about cloudburst than design rain, which together implies that nobody is satisfied by direct understanding of the service level. However taking up this issue of the service level's shortcomings can end up being very expensive business, and this discussion might also belong at a higher institutional level as the national or European. Though it emphasises the importance of going into the dialogue with the citizens about the service level and what it insures.

4.3.2 Solutions Prioritised for Jyllinge Nordmark

In the second workshop the four groups of consultancy companies represented their suggestions for handling the rainwater in Jyllinge Nordmark (see appendix 8.16). The next part was to use the criteria for assessing the suggestions (see appendix 8.13), first individually, then as two-man groups and then as a bigger groups of about five (see 8.3). Next step after the group work was a general discussion facilitated by the three groups mentioning three main points each (see appendix 8.10.2). Hereafter all the participants were asked to place two stars on the solutions they personally preferred (see Figure 21). Finally the participants were divided into groups of three and asked to draw on a map where they would use which solutions (see appendix 8.14).

In general the workshop participants were focused on finding the "exciting" solutions, not just boring sewers. It became quite clear that sewers where not a prioritised solution, when looking into the assessment tables (see appendix 8.13). The tables were divided into the different criteria and the solutions in as principles, the idea was the sewer system configured as a baseline and it was possible to give between -2 to +3. A fast overview of the tables would show that most scores were positive, meaning that nearly every solutions were ranked higher in most criteria than the sewer system, with few exceptions (see appendix 8.13). This could be a bias due to the settings, but more convincing was it that most participants thought sewer systems as a boring solution, which might not even solve the issues. However the lowering of the groundwater level was considered too risky, and did not get valued very high either. In the tables "community rain gardens"/"open ditches" and the "drain or trough" were ranked highest (see appendix 8.13). As solutions most prioritised (most stars) "private rain gardens" and "community rain gardens"/"open ditches" scored most votes (see Figure 21).

The above mentioned prioritization should been seen in the contrast of Roskilde Municipality started in the first workshop by presenting how rainwater the project in Jyllinge Nordmark, was not an easy case. The fast and easy solution for Roskilde Municipality was to write a sewer plan turning Jyllinge Nordmark into a separated sewer area. This required very little effort from Roskilde Municipality and made it into Roskilde Forsyning's issue instead, and a

clear example of the problems in silo thinking. But a clear transition happened when the in the discussions of sewers were mentioned as boring, and it seems like the more challenging the solution would be, the more the people from the municipality and the rest of the participants found it interesting. It therefore seems like that this collaborative network and platform the project leader from Roskilde Forsyning and I introduced have transferred an annoying and difficult task into something exciting with possibilities of trying of new procedures. It was a transformation to see the municipality and utility talking about challenging themselves with enthusiasm in being most creative instead of being afraid of such tasks.



Figure 21 Prioritisation of solutions made at the end of workshop 2, every participant put two votes (stars) each on the solutions they would prefer implemented in Jyllinge Nordmark

The prioritisations, assessments and discussions gave a clear impression of the participants on the workshop focused intensely on the transition states of waterways city (Brown, Keath og Wong 2009). As one participant mentioned as one of their group's main points in the five man group assessment:

We were very excited about the suggested wetland and detention area¹³ at the end of Osvejvest. It even got called a masterstroke, both creating recreational values and cleansing the water before releasing it to the fjord. ([2:05 - 2:32] in appendix 8.10.2)

Following the same group mentioned:

Some of the solutions we chose to value higher than the sewer, not because they are better at handling the water [in a technical perspective red.], but they add more, as creation of a more natural runoff and more visibility [of the water and solution red.]. ([03:18-3:30] in appendix 8.10.2)

These quotes illustrates very general perspectives between the consultancy companies, which also colours the focus of Roskilde Forsyning and Roskilde Municipality's focus on transition states. This was a focus on both high recreational values added to the open water, and expressed a focus of protection of the environment, along with trying to assimilate the natural water cycle, which holds values from waterways transition state (Brown, Keath og Wong

2009). However an important question is, if this really was the wish of the workshop participants or the citizens?

My general impression from the many meetings with the homeowners' associations (see appendix 8.17) was, that the citizens of Jyllinge Nordmark were more aligned to the drained city transition state. They were not expressing any notable expectations of open water and new recreational values. The focus of the citizens seemed to be centred at getting rid of the water, which could be



Figure 22 "the masterstroke" detention, filtration wetland (Appendix 8.16.1)

related to the big issues they experienced with water scaring them a bit, along with the fact that the area already have many recreational values, with access to the sea, a river and in general it is a very green area. However all the consultants were not thinking alike, and one group mentioned:

If you want to create a recreational element the wetland is a fine idea, but in our group we did not approve it, as one mentioned it can be difficult to imagine that you can create a more beautiful area [with a wetland] than the already existing salt meadows. ([05:35 - 05:45] in appendix 8.10.2)

¹³ The wetland and detention area she mentions is the second solution suggested by Haveselskabet, Envidan & De Urbanisten (see appendix 8.16.1).

This quote refers to the above mentioned masterstroke wetland, and argues against the heavy focus on creating recreational values, due to the elements of the area. Another argument that could express that the citizens of Jyllinge Nordmark are not interested in the creation of new recreational values. It is therefore important of the project leader from Roskilde Forsyning to ask herself, for whom are the recreational values created. It was mentioned in the first workshop that Roskilde Municipality have had issues with creating a path on top of the dike, for making the area more accessible, but the citizens in the area felt this was a violation against their private sphere (see appendix 8.5.2). Therefore it is necessary in the implementation phase not to focus on recreational values to create positive incentives, as the recreational values artificially created will have difficulties to challenge the natural recreational values of the area.



Figure 23 Illustration of the wetland at the end of Osvejvest, suggested by the group of Haveselskabet, Envidan & De Urbanisten (see appendix 8.16.1)

It is an important point to be careful about ending up with suggestions that does not reflect the perspectives of the citizens of Jyllinge Nordmark or a process that have been too excluding. If the citizens cannot recognize their ideas in the suggested solutions the participation becomes a hollow process, and will have no incentive for engaging in the further process (Arnstein 1969). As most of the suggested solutions incorporated private land it will be necessary to engage the citizens, and for succeeding the incentives needs to be there (Arnstein 1969) (P. Stahre 2008). Furthermore the participants on the workshops agreed that sewers was not a proper solution for Jyllinge Nordmark, along with Roskilde Forsyning mentioning that sewers are not solving the issues, makes it quite clear that citizens engagement in the solutions must have a high prioritisation. The traditional responsibilities and the silo thinking have been worked with, but for this innovation in the institutional practise to be incorporated in future practices, it is very important that the project is a success. Therefore is a participatory process important in relation the solutions suggested.

4.4 Implementation of Ideas

The three phases of the analysis up until now (see 4.1, 4.2 & 4.3) were built on what have happened in the workshops and different meetings with Roskilde Forsyning, Roskilde Municipality and the homeowners' associations in Jyllinge Nordmark. However the project leader from Roskilde Forsyning has not yet reached the implementation state of the process, and the following section in this report will therefore focus on what will happen. This phase will build on the ideas of the project leader from Roskilde Forsyning and my reflections about what could be, and what is important to have in mind when implementing the ideas. This section will start with a short recap of what is already planned to happen.

4.4.1 **Roskilde Forsyning turns in their Suggestions**

By mid June 2015 the project leader from Roskilde Forsyning will hand in the proposal of how to handle the rainwater problems in Jyllinge Nordmark, based on what we found during the generation and selection of ideas processes. Following, a new agreement of collaboration between Roskilde Forsyning and Roskilde Municipality will be written, as well as a new supplement to the sewer plan about how to handle the rainwater in Jyllinge Nordmark. However this is what is already planned, and most likely the supplement to the sewer plan will express the suggestions from Roskilde Forsyning.

In this phase the project leader from Roskilde Forsyning must focus on getting from brilliant ideas to supreme projects. Sørensen & Torfing (2011) argues that the most important elements in this phase are: "*Changing existing patterns of behavior is a difficult task that requires the exercise of leadership, the construction of ownership, and the creation of positive incentives* (Sørensen og Torfing 2011, 851).

4.4.2 Nordmarksvej and Institutional Leadership

Exercising leadership can be broadly translated, but one way that was mentioned by the project leader from Roskilde Forsyning: "*We should work hard on getting Nordmarksvej and Osvej Vest done firstly, so Roskilde Forsyning and Roskilde Municipality could show them self as a good example*" (see appendix 8.18). This suggestion is based on creating cloudburst streets, which can be a smart move for creating fast and good results that will strengthen the process (Haveselskabet 2014). This idea was also mentioned in the second workshop as a good procedure, especially in relation to Nordmarksvej, which is already in the planning phase of being equipped with a cycle lane:

We think synergies, it is extremely important to think of e.g. bike lane together with climate adaption on Nordmarksvej, then the citizens will experience they get some qualities in the urban environment along the handling of rainwater. This also relates to when you discuss with citizens about water, they do not really care until they are flooded. However if the focus of the discussion is about their city environment as streets and such you can get them engaged in the discussion and thereby rainwater handling becomes just facet of the implementation ([5:50 - 6:30] in appendix 8.10.2).

This procedure of going in front is a clear way of showing leadership, and the willingness of Roskilde Forsyning and Roskilde Municipality can help creating positive incentives. Especially the positive incentives can be crucial for the process when working with citizens, as Haveselskabet argues you need to figure out "what's in it for me" for the citizens (Haveselskabet 2014). On the other hand the cost of a rainwater system can be a heavy deal for the citizens, therefore a public project, as Nordmarksvej would show that Roskilde Municipality and Roskilde Forsyning are also taking some of the load.

4.4.3 Rain Gardens and Citizen Engagement

Looking back at the solutions prioritised (see section 4.3.2) the community rain gardens both scored high in the prioritisation and the assessment, but going into such a solution requires much more effort in engaging with the citizens. Therefore it is very important not to underestimate this process of creating ownership for the citizens, which requires that they need some kind of stake in the project. I believe in applying a delegated power process (Arnstein 1969), where citizens get to decide and control within some boundaries, is a strong way of handling this process. This could be Roskilde Forsyning engaging with a homeowners' association and present different solutions that are fit for the area, the citizens will then have the possibilities to decide between different systems, and get engaged in the more detailed planning. If they are working with rain gardens, every house owner can have their say in how garden should look and to some extent where it is placed. Thereby the citizens will get a nice garden, which can handle the water there it already is, which can be an incentive at the citizens. It is important to keep in mind that this will not happen if the citizens are not engaged and willing, there it is necessary to focus on the positive incentives. The role of the project leader is to create this interest and facilitate it, by engaging and guiding. Furthermore it is important to start with an area where the citizens already seems willing to engage, and thereby having an easier process with a higher chance of a common feeling of success, which can then be used as a pilot project. It can be an important act to use positive experiences within the homeowners' associations as knowledge sharing with other homeowners' associations.

4.4.4 Focus on Existing Networks

An interesting approach would be to focus on the existing networks such as the homeowners' associations, which was also suggested during the second workshop: *I think the homeowners'* associations are a perfect setting for a combination of private solutions and common solutions. ([8:30 - 8:40] See appendix 8.10.2)

The homeowners' associations do already have an existing network, which is used to handle tasks as repairing the road, but also to ask something of the homeowners. There is off course much difference in how active the homeowners' associations are, and exactly how much they tell or ask of their members. Therefore there is much sense in starting with the more willing and active homeowners' associations, as they probably will be easier to engage with. However as there are differences between citizens there are differences between citizens inside homeowners' associations. Therefore it is important to try to grasp what the whole homeowners' association is willing too, and not just their chairman or a few members, this of cause can be difficult. Nevertheless the citizens and homeowners' associations placed in the more troubled areas will have stronger incentives in spending resources on handling the rainwater, but maybe also be more internally troubled as having water entering your house is a stress factor and make most people more sensitive. However the potential for handling the rainwater is higher among the upstream citizens, but the incentives are lower, while spending resources on something that does not benefit the citizens themself directly. Furthermore it is required that upstream citizens solve problems; they might not even know exist, for people they do not even know. This is asking a lot, and therefore it is very important to take up the dialogue of what happens to the water, and the individual responsibility for detent of rainwater. My understanding is that most citizens are not doing this because they do not care, but because they do not know. However when economics are involved it might also require more than the feeling of being a good neighbour at least for some. This requires effort, and I think meetings across homeowners' associations are a good idea, which also where mentioned half as a joke in the criteria talk between Roskilde Forsyning and Roskilde Municipality, but still serves a purpose. They mentioned a meeting called "Meet your recipient", which was mentioned as a joke due to that many problems in Jyllinge Nordmark is as well related to runoff water leading from one plot to another. However such a meeting can help creating ties and thereby creating more positive incentives amongst the upstream homeowners' associations towards helping the downstream homeowners' associations. Fratini et al. (2012) have an example of a municipality that is teaching a course in how to build beautiful rain gardens. The course was free for the participants, while the citizens would hold all the expenses with their garden (Fratini, et al. 2012). The course was very popular, and could in Jyllinge Nordmark serve great purpose, if it were offered to the upstream citizens. As

stated earlier, the rainwater handling should not be the focus of the engagement but just a facet of something in their interest e.g. their beautiful gardens. The example of the rain garden focus on creating something beautiful, which at the same time can handle rainwater, which would in the case of upstream and downstream citizens move main focus from helping the downstream stranger, to focus on doing something nice for yourself. The project leader from Roskilde Forsyning also suggested that she would like to create some kind of course in how to handle rainwater, for the citizens to be more adaptable.

4.4.5 <u>Communication about Possibilities</u>

During the summarising of the main points from the group criteria assessments in workshop 2 (See appendix 8.10.2), it was mentioned by a group that an important point was also to "tell the story right". It is important to take up the dialogue with the citizens placed in the very low areas, about Roskilde Forsyning and Roskilde Municipality cannot insure a dry garden, but they can help the citizens with securing their houses, help with what a wet garden is good for and how to make it exciting. Fratini et al. (2012) argues for the importance of talking with citizens about the three situations; daily rain, design rain and cloud burst. Because most citizens do not think it is acceptable at all to have floods, but especially due to focus on the service level in the legislation, floods are accepted to some extent (Fratini, et al. 2012). To take up the discussion of the different situations, is a way of preparing citizens and institutions about what can happen, even though some of it is a rare situation. Furthermore it is important to be aware that citizens can help themselves lowering the damages in extreme events, which otherwise cannot be ensured against, or would require much more resources from the institutional level (Fratini, et al. 2012) & (Wamsler og Brink 2014). When floods happens they most often hit in more than one little area, therefore it will require much of an emergency corps that has to handle many areas at the same time, therefore the citizens adaptability can be a great resource in such cases. Furthermore this relates to the dissemination of ideas amongst the citizens, if they do not experience it as a good process. Sørensen & Torfing (2011) stresses that it can be a barrier for the citizens, if they have negative experiences in participating in projects.

The project leader from Roskilde Forsyning did mention that she would focus on helping the areas with most issues first or where they seem most difficult to handle for the homeowners' associations. However she did also mention that some of the areas, might not need any change in the sewer plan of how they should handle their rainwater, but she thought it would be important too keep a dialogue with these areas about how to handle the rainwater, and show them some solutions they could use. (See appendix 8.18)

As many things can go wrong in the implementation phase, public innovators must be prepared to deal with uncertainties, unforeseen problems, and temporary setbacks. (Sørensen og Torfing 2011, 851) I think this is an important statement, while it is important to keep in mind that the citizens are not alike, which means that the way of handling the situation can vary much from house to house, or street to street. This makes it very difficult to put out a strict guideline for how exactly to implement the ideas in Jyllinge Nordmark. Therefore it asks of the project leader to be flexible and fast at adapting to the dynamic situations – be a problem fixer, to keep the processes smooth.

4.4.6 Suggestions for Procedure

In relation to what have been presented in section 4.4 Implementation of Ideas, this section will express my personal suggestions for the implementation phase. These suggestions will express some of the point already mentioned above, but will here be mentioned in a concretised form related to areas and actors and where to start. This part will focus on the different steps of the implementation, which are thought of as collaborative approaches, therefore it is not always important here to state a financial model, as it often is a compromise during the collaboration. Instead the focus lies on how leadership, ownership and positive incentives are created. The following sections are divided into Cloudburst Streets, The high Areas and The low Areas, which relates to the division of the task during the workshops (see section 4.1.2).

Cloudburst Streets

Roskilde Municipality and Roskilde Forsyning should start as a first step by turning Nordmarksvej into a cloudburst street, as mentioned in synergy with the already exiting ideas of equipping the street with a bike lane. This will cut of some of the runoff water flows, and thereby handle some of the issues in the low area Birkeengen. The solution will at the same time increase a larger part of Jyllinge Nordmark's resilience and decrease structural damage in cloudburst situation. In relation to this it is important to think Osvej as a future cloudburst street so possible synergies are taking into the planning, as well as starting to plan the possibilities of turning Osvej into a cloudburst street. Along should be thought of the possibilities of a connection to Osvej Vest. Furthermore it is as mentioned a clear execution of leadership, and thereby an important action in the implementation of ideas, which can inspire positive incentives amongst the citizens. However it is secondary how the financials of this is split between utility and municipality as focus lies on the institutional level taking first step and thereby showing leadership.

Osvej Vest is a private common road separating a very high and steep part of Jyllinge Nordmark from the north-western very low part of Jyllinge Nordmark. As this is a private common road it is maintained by a road guild, consisting of board members from each of the adjacent homeowners' associations. Therefore Roskilde Forsyning and Roskilde Municipality should collaborate with this road guild in turning Osvej Vest into a cloudburst street. However this street is private and is prioritised later in the process. It is less important to show institutional leadership, and therefore I suggest focusing more on positive incentives, though I still believe the three parties have incentives for being a financial parties. The guild will need to maintain their street and Roskilde Forsyning and Roskilde Municipality is interested in turning this into a cloudburst street, here a synergy between the two internal purpose and wishes could be found.

The high Areas

In the high areas I think there should be a focus on the citizens financing themselves, as the issues in these areas are less severe. Furthermore the sewer systems in the high areas are gravitation systems (Terkelsen 2011), and are therefore less vulnerable to rain than the low areas¹⁴. However there is still a need to assist and guide the citizens in how they can handle the rainwater, especially in relation to lowering the pressure from runoff water to the lower areas. Some of the steps in this section could happen simultaneously with procedures in the low areas.

In the work with the citizens in the high area, I would start by inviting for rather big information meetings. There are too many citizens for just one meeting, even though not everyone will or can participate. I believe it is best to reach for most people in these meetings, though representatives of the homeowners' associations are a minimum. These meetings will aim to explain the situation with runoff water and the issues this create. It is important in such a meeting not to be accusing anyone as the citizens will get defensive, instead of focus on the issue runoff water creates, the aim is to inspire positive incentives. Furthermore the prioritised possible solutions for these areas should be presented as ways of handling this runoff water. At the end of the meetings catalogues with the assessed solutions could be offered.

Roskilde Forsyning and Roskilde Municipality should facilitate a "meet your recipient" meeting, which could focus at the representatives of the homeowners' associations. This needs to be in collaboration with the homeowners' association in the low areas, but be presented in the information meeting. Hopefully this can help to increase positive incentives

¹⁴ In the low areas the sewer system is a vacuum system, with common sewage wells in the streets, which stop if rainwater enters, which means rainwater on the streets in the low area stops the black sewer system in the low area.

by establishing a collaborative platform for solving some of these runoff issues, with emphasis on the collaboration between upstream and downstream and not for accusing each other.

Roskilde Forsyning and Roskilde Municipality should collaborate on developing a course in source control, how to handle rainwater inside your property e.g. rain gardens, but also other measures. This course should be sent out to all the homeowners' associations in the high areas, to let them spread the word of such a course. This course could be a general offer available through Roskilde Municipality to all the homeowners in Roskilde.

The low Areas

In this case I believe Roskilde Forsyning should pay part of the expenses, as issues with rainwater in this area has a very direct effect on the vacuum sewer system. Therefore it is important for Roskilde Forsyning and Roskilde Municipality to be clear about how big a part they are willing to pay, in the following suggestions, before starting the process. This is important because if a process is focusing on working with the citizens about e.g. rain gardens, there needs to be a clear understanding for the citizens to relate to in what kind of expenses they are going to have. It is not thought of as a promised price, but could as well be a part.

The meeting of "meet your recipient" should be arranged with the low areas, where it makes sense (where they are the recipient e.g. Åvej). (See same suggestion in "high areas")

Similar to the upstream citizens I would start by a big general information meeting, presenting the situation in the area, and the specifics of the problems related. Further the prioritised solutions should be suggested as how the issues could be managed. In this presentation it is important to talk about expectations, such as some plots will remain wet but can be interesting gardens anyway. A catalogue with the assessed solutions for the low areas could be offered at the end of the information meeting. Finally the information meeting should present the possibility for suggesting one homeowners' association as pilot project if they think they would be willing.

After the information meeting one of the homeowners' associations should be picked, by an comparison of who where willing to participate in the pilot project, and who would be preferable in relation to knowledge about how active the association is, and in relation to size. A large homeowners' association will reach more, and have better possibilities of thinking synergies, on the other hand a small homeowners' association would be easier to manage and a shorter project. The homeowners' association picked for the pilot project could be invited on a bus trip to visit good examples of the prioritised solutions, to actually see how it looks. A

less costly version could be a more thoroughly presentation of the solutions, but I would suggest seeing the real thing. At the end of the trip it should be discussed what kind of solution would fit best their area. Such a trip is a way of creating positive incentives and trust in the solutions.

As a next steps will be inspired by Haveselskabet (Haveselskabet 2014), and start by arranging a workshop meeting with the selected homeowners' association, and talk about the solution they preferred, with the possibilities and conditions it brings. This would be followed by a walk in the area or garden visits dependent on the solution. At this walk a consultant or a contractor will be attending, and the ideas from the citizens about how they use the area would be translated into practical designs. After this walk the citizens can talk in groups of neighbours about synergies between them or more general thoughts of the suggestions, which will be noted. Roskilde Forsyning and the consultant will now develop a detailed project, based on the knowledge gained about the more local ideas and touch. This project will again be represented for the citizens and remarks will be handled and the implementation will begin.

As this was used as a pilot project, the idea is to use the area as a showcase, which the homeowners needs to be aware of, it is not necessary that everyone wish to show e.g. their garden, just as long some does. Furthermore it would be a great idea to use some of the homeowners as ambassadors for the project, to spread the word of a good process, and thereby spread positive incentives.

This procedure in the low area is thought of as something that can be replicated, without the buss trip, because the good example is the neighbour homeowners' association. The most important in my opinion is to start by Nordmarksvej and the low area, then the high area can be started or simultaneous with the low area, lastly I would focus at Osvej Vest.

The importance of this chapter is not the specific procedure or how the finances are divided, these are just suggestions, which I believe will strengthen the implementation. Importance lies in how the different acts empower certain citizens, and then is it important to show institutional leadership. Further it is important as a facilitator, to know when and how to focus at creating positive incentives or ownership, which this section 4.4 Implementation of Ideas have shown examples of.

4.5 Dissemination of Ideas

This phase focus on mainstreaming the new practice in the institutions, therefore this section will elaborate on what Roskilde Forsyning and Roskilde Municipality can do to make this a common procedure.

Furthermore this process has created some development within both Roskilde Municipality and Roskilde Forsyning. The high amount of participation, both number of persons as well as the internal commitment is a clear sign of this process being more prevailing. Furthermore the collaborative process between Roskilde Forsyning and Roskilde Municipality has enhanced their internal networks, which increase the ease of collaborating about new and challenging projects. In this relations the high focus on source control and on-site control solutions, in collaboration with the local citizens shows a strong will and trust between Roskilde Forsyning and Roskilde Municipality, and thereby also enhance what can be reached, while the legislation is still in some ways rigid in relation to handling rainwater on the surface, especially in relation to the allocation of responsibilities. Therefore the process also shows that Roskilde Forsyning have been able to overcome the silo thinking, challenge the professional norms and legislative restrictions, through a more collaborative procedure. In relation to the issues of working in the edge of the legal restrictions the project leader from Roskilde Forsyning mentioned:

There is much difference in where the legal restrictions "reach" and where the water "reaches". There have been many suggested solutions that are outside the legal restrictions of a utility, which would be good possible solutions, but Roskilde Forsyning would not be allowed to participate in. But this problem will first be a real issue when we start to implement, for now we focus on what is best for the area. (See appendix 8.18)

The success of this project is also strongly related to the replication of this procedure. If this project is not being a success it will also have severe effect on the willingness in future projects to challenge the common approaches with alternative approaches. Therefore the media awareness in the case can both be very positive or very negative, because it makes the project more political. It will therefore be very strong statement if the project is a success, the difficult issues will be handled in a manner where the citizens experience a good or satisfying service, and vice versa. The project leader from Roskilde Forsyning also mentioned this as a challenge:

Many different actors have an opinion of how to handle the issues in Jyllinge Nordmark [...] There has been much politics in this project and not just a focus on technical solutions.

This is a reflection related to high media covering of everything happening in Jyllinge Nordmark, and the thereby derived political awareness. This can make it difficult to act, while many different actors can have a say in the project, and some agendas can be more political, which again is connected to what is within legal restrictions and what is not. As the discussion mentioned earlier in the criteria talk (see section 4.3.1 and appendix 8.11), it is not possible to neither give or promise a better service level for Jyllinge Nordmark than the rest of Roskilde, but it is possible to work with different solutions within these boundaries. However these types of rainwater management systems on the surface will inevitable involve the local citizens in some degree dependent on the procedure for implementing and the solution. Therefore it will also affect the citizens, they will become more used to being engaged, as Agger & Hoffmann (2008) argued participation is something both citizens and municipalities have to practice, both involving and being a stakeholder is abilities that increase when exercised. In this way dissemination of ideas also happens amongst the citizens of Jyllinge Nordmark and all of Roskilde. The more used participatory processes get in water management, the better will the citizens be in participating, and by time it will be easier for citizens to engage at a higher participatory level. It is important to have in mind, that it is not just Roskilde Municipality and Roskilde Forsyning that would be trying a new procedure with engaging citizens in surface rainwater management, but as well the citizens engaging in new and unfamiliar procedures. Therefore it will in the beginning of such procedure require more effort, which only emphasises the importance of starting with already willing citizens, that show capability and willingness of engaging.


5 DISCUSSION

In this chapter I will elaborate and reflect upon some the issues that came up throughout the analysis. I will start by reflecting critically about deliberative exclusion of the citizens in workshops, as much participatory theory emphasise the importance of having the citizens engage throughout the whole process and not just at the end, where every decision is already taken. Next section will go into how different solutions will require different types of engagement with citizens, which affect their adaptability, followed by the importance of not seeing citizens as one homogenous mass. Furthermore I will go into how legislation can be a limitation for utilities and municipalities in their work. Lastly I will elaborate shortly on high-risk areas in relation to climate change.

5.1.1 Deliberate Exclusion

The citizens are not an active part of any of the workshops, as everything in the workshops where at a very "water-professional" level, making it difficult to participate, for not water professionals, and thereby the process is very internal and external exclusive. Citizens were not invited due to the purpose of the workshop and there are too many citizens, and even homeowners' associations for a workshop like these ones in this project, which is an external exclusion. However if the citizens had been invited, much of the professional language and details in the discussion would be difficult to understand, and thereby be an internal exclusion. However this exclusion can be critical in relation to participatory theory (see 3.4 Participation and Exclusion), where it is argued that citizens needs to be involved early in the process to still have influence, especially in relation to the creation of ownership.

It was considered to be difficult for the citizens to engage in the discussion of the solutions, due to a natural internal exclusion in a project with this high degree of relational and especially functional complexity. However the purpose of the workshop was to work on innovative solutions, which is a setting that can be difficult to handle in too big crowds. Therefore it was decided to have this very extensive but deliberative exclusion of the citizens. The citizens were more indirectly represented by the project leader from Roskilde Forsyning and me, on behalf of the many meetings we had had with the homeowners' associations during the preparations of the workshop. Therefore citizens have been consulted or maybe even placated (Arnstein 1969) during the preparations for the workshops, and their opinions and ideas have been brought forward by the project leader.

Was the exclusion too extensive and thereby distant of the local citizens in Jyllinge Nordmark? As mentioned in the analysis (see 4.3.2 Solutions Prioritised for Jyllinge Nordmark) the solutions prioritised were focused on the aspects of transitions towards waterways city (Brown, Keath og Wong 2009), but the citizens might be more interested in aspect aligned with the drained city transition state. However some of the reason for this focus on waterways city aspects is due to the functional complexity in the area, this could be accommodated by having the citizens involved in the discussion, and therefore it is important to have a dialogue about the situation when starting to implement the solutions. However it can be an issue if the citizens are not feeling ownership for the solutions, when the implementation starts. This lack of ownership could be a problem if the solutions suggested focus on creation of new recreational values, but the citizens already have a high natural degree of recreational values due to the surroundings of Jyllinge Nordmark. Therefore it is risky? To mismatch the suggestions if the presentation of the solutions focus too much on creation of recreational values, instead focus must lie on explaining the complex settings and hence the solutions. On the other hand the project leader from Roskilde Forsyning, experienced that people where really asking for help with the rainwater, and was very fond of the project leader taking her time to go and visit, and hear them out. This can accommodate the exclusion of the citizens during the workshops, and thereby still foster ownership for the solutions, as the citizens felt heard during the initial phase of the workshops positive incentives was already created.

5.1.2 Solutions in Relation to Adaptability

This project has some focus on creating adaptable citizens, through the solutions prioritised local ownership and willingness to engage should be created. This is according to Wamsler & Brink (2014) increasing the climate awareness between the citizens in Jyllinge Nordmark, and thereby increases their understanding of the importance of a well kept rainwater facility as a ditch or a rain garden and citizens adaptability. But is this enough or are other measures needed? If we look at the existing facilities for rainwater handling, there is already open ditches, which should according to Wamsler & Brink (2014) increase the awareness of the citizen in relation to climate adaption. However the ditches in the area are not maintained, though some are putting great effort into maintaining the ditches, others are not active leaving the ditches clogged in the middle. Thereby the ditches can even cause problems for those homeowners' associations that are very active in maintaining the ditch system. This could be a result of lacking information about the importance of the ditches, or a result of the people living by the ditches now did not live there when the ditch where made, and are therefore not aware of their purpose. If the case is issues happens along owner shifts, it would make sense

to make an organisation for maintaining the ditches that are not relying on the house owner e.g. a common ditch cooperation, as it would be less vulnerable to newcomers.

Another aspect of the waterways focus that can cause issues, is if it decided to have individual rain gardens, then everyone needs to participate and if not then the system does not really solve the problem. The issue is especially in this relation that the person who might not wish to join the collective decision and create a rain garden, it might not be the same person who would suffer the consequence of the lacking rain garden. In a project described in the book "The citizens in the climate adaption" by Haveselskabet (2014) the project are focused at a street and if 20 people are asked to create a rain garden and disconnect rainwater from the sewer system, they might have 10-15 people attending. For the people not wishing to attend in the disconnection, nothing will happen. They will continue with sending the rainwater into the sewer system. A similar case in Jyllinge Nordmark would be a problem, as there is no sewer system to handle the rainwater. Therefore will solutions as private rain gardens be very sensitive to the engagement in the local area. However this is not arguing that such systems are not possible, but rather illustrating some of the complications and issues in such a process, which emphasises the importance of taking up an open dialogue with the citizens in the implementation phase. In this way to harmonise the expectations about what is a good solutions and what would it require. Wamsler & Brink argues the importance of balancing the expectations, as most citizens has higher expectations of what the public institutions should handle than is within the legal restrictions, which can cause a undesirable situation for innovative solutions (Wamsler og Brink 2014).

5.1.3 Not One Citizen

Citizens are not one homogeneous mass and do not see the same things as problems. As mentioned some people commented in the questionnaire that they had problems with rainwater, because a small puddle was gathering just in front of their property when it rained. Others commented that they did not have any problems with rainwater, but in some season they could not use the garden because it was very wet. These are just examples of how much difference in the perception of rainwater as a problem there can be. Similar situation happens when you talk with the homeowners' associations some very interested in handling the rainwater problems themselves, others expect the municipality handle it. When the project leader from Roskilde Forsyning and I visited Gyvelvej's and Plantagevej's homeowners' association they were busy telling how they have solved different problems with rainwater (see appendix 8.17.4). However the project leader from Roskilde Forsyning also mentioned that she found it challenging that there are many citizens in Jyllinge Nordmark and thereby

many views, where some are even contradictory. Therefore it is important to have in mind, when working with the citizens that different procedure is needed, and different levels of commitment can be expected. However more committed homeowners' associations can also inspire other less committed, and thereby be a useful resource. Even though the theory about participation from Arnstein (1969) talks of difference in people, it still seems like it is purely up to the administrations to decide upon how much the citizens should participate, and thereby to some extent neglect that for participation to happen the citizens must wish to participate as well.

In relation to just mentioned diversity between citizens it can be critical that the project leader from Roskilde Forsyning and I only spoke with chairmen or board members of the different homeowners' associations. It might not have been a very objective understanding of what where an issue presented by the chairmen. As an example of this is Rugvej, where the project leader from Roskilde Forsyning and I was told that they had a big problem with a valley on the street where the water gathered, but they did not mention that very close by at the end of Rugvej were two houses that got rainwater in from the street in heavy rain (see appendix 8.17.5 & Figure 12). This was first realised by the project leader from Roskilde Forsyning later, when she was looking into the questionnaire answers from that street. The homeowners' association in example was not aware of the problem with the two houses or did not think of them as serious. This is a case where the procedure is weakened a bit, by focusing in the perception of the homeowners' associations view on the issues in the area. To mitigate this there could have been a more direct dialogue with the people with issues, however this would require a very different amount of resources from Roskilde Forsyning. I consider these prioritisations of homeowners' associations as a strategic procedure, where you get a very local perception without meeting everyone, and thereby get a quite good picture of the situation but spending fewer resources.

5.1.4 Citizen Participation and Adaptability

As mentioned above, it is not enough that a project leader wishes for a participatory process, the citizens need to be willing to participate as well. Working with creating positive incentives amongst the citizens is not something every consultant or institution is familiar with, and it is a complicated process. There were signs of this fright from citizen participation processes to detect in some of the suggestion from the consultancy companies. The suggestions cannot be translated directly to the opinions of citizen participation in rainwater handling internally in the consultancy companies, but it is still an indication of what they see

as best solutions¹⁵. Especially two of the companies did not include the citizens as an active part in their suggestions. The solutions were focused on common ground as the streets, and would therefore be a rather easy and fast solution. In these solutions the most participation would probably be about the financing, and how they solve the problems. This can be an indication of the two companies thinking that this is how far you can go with citizen engagement. The citizens can influence a bit on the look of a ditch, but it will not require anything more than an accept and probably partly financing. In the other end of the solutions we have some solutions, which require some more active engagement with the citizens for succeeding. These will of course take up more resources, and be more complicated, especially if some people on a street does not wish to participate. But the two different processes will also give different result in the attitude amongst the citizens. The first mentioned are aligned with the traditional top down thinking, the municipality and utility deliver a solution, which the citizens pay for. The will not move the citizens understanding of the issues Jyllinge Nordmark has. The latter mentioned focus on engaging the citizens, and not just deliver a solution that can handle the issues in the area, but also teaches them about how to handle the rainwater, and it actually requires something from the citizens. Starting to require something from the citizens is also a way of pushing the understanding of a traditional top down. This is important because the citizens will experience that they can do something about the rainwater, which can also help them understand what cannot be helped. For example of the solutions presented¹⁶ will not give the citizens in the low part of Jyllinge Nordmark a dry garden all year (see appendix 8.16). Therefore a big difference in the two types of solutions is that, the first solutions declares incapability of the citizens, and the second ones increases the citizens adaptability, the capability to influence the resilience of the area. The two types of solutions of course requires different amount of resources as time and money, but also increases the awareness between the citizens of climate change and adaption in different ways.

5.1.5 Legal Obligations and Citizens' Expectations

Jyllinge Nordmark's issues with water have been a focus in the medias, which made Jyllinge Nordmark a much more political case than other areas. Most areas must accept a service level of 5 - 10 years; meaning overflows from the sewer system every 5-10 year. As mentioned overflow of rainwater system in Jyllinge Nordmark is equal to flooding of houses. In Jyllinge

¹⁵ Under the assumption that the consultancy companies saw the workshop assignment as an opportunity to show of and maybe win contract later on, when Roskilde Forsyning and Roskilde municipality starts to implement.

¹⁶ Maybe except the lowering of the groundwater level, which would cause severe risk for the foundations of the buildings.

Nordmark the collaborative approach between especially Roskilde Forsyning and Roskilde Municipality seems to have enhanced a common understanding of looking more flexible at the service level. This is not just something Roskilde Forsyning and Roskilde Municipality can do with ease, as it challenges the boundaries of their legal restrictions, which require a common understanding between the two actors to do. In this case the heavy media cover, and the functional complexity might have provoked this flexible understanding of a service level, but where does that leave the areas with similar problems. I believe this is an example of the service level being too rigid, making municipalities and utilities focus at a rather low goal, instead of taking the discussion of a bigger vision. Along this discussion is the black boxing that lies within the discourse of five-year rain events, which often seems like bulletproof evidence, but in fact covers high uncertainties and many assumptions. Sterling (2010) argues exactly this point; society is too focused about stating something tangible about very complex consequences of climate change, which makes us blind for the discussion about how to handle severe impacts. Society ends up hiding behind this statistical unsure safe line, instead of going into "what if?". This is not to say what we need to quit the service level, but a "fake" feeling of safety must not be a barrier for looking further. I think most citizens are not aware that the service level means that potentially they can be flooded every 5-10 year, put on an edge. If the general public society really were aware of the low standards of a service level, I think it would have been a much bigger issue in the societal discourse. However such a societal discussion could have severe economic consequences, as an increased service level would require much retrofitting, which maybe ask the question "do the institutions dare to take up the discussion?".

The project leader from Roskilde Forsyning mentioned (see first quote in section 4.5 Dissemination of Ideas), there is much difference in the spatial boundaries in the legal restrictions for handling rainwater than the spatial boundaries for rainwater. This is a challenge both by the more obvious limits of a strict service level, and thereby the legal restrictions for the utilities, but also the citizens' understanding and accept of the reality related to the service level. However Fratini et al. (2012) suggest the three-point approach as way of accommodate this issue of not letting the service level to be hindering for looking beyond the service level. They suggest it as a communicative tool for public institutions to take this dialogue with citizens of design rain, cloudburst and everyday rain. This is a two way illuminative process, the public institutions engage in the dialogue of what happens in the different scenarios, but especially they are forced to talk about what happens in the really severe cases. Not because it is expected for the public institutions to be able to handle 1000-year rain events, but maybe by taking the dialogue they resist some of the worst issues and at least are more prepared that even though the events are rare they will happen. On the other

hand it is also affecting the awareness of the citizens, that the society secure until a certain level, but some situations will happen, which society cannot handle, and therefore this ask more of the citizens and there preparedness and adaptability. As Wamsler & Brink (2014) argues most citizens expect public institutions to handle more than they are restricted, and Fratini et al. (2012) also mentions that citizens in general thinks it is unacceptable to have floods, which only emphasises the importance of taking up these discussions.

5.1.6 Climate Change in Relation to High Risk Areas

As a worry the project leader from Roskilde Forsyning mentioned:

I think it is very difficult with the solutions for Jyllinge Nordmark – it is important that the solutions we suggest can handle the climate change, and we can today, but what about in 20 years. Will there be areas which are at too high risk, and we cannot help them anymore?(own translation from appendix 8.18)

She was worried about if it was even a good idea to do something now about Jyllinge Nordmark, not because she did not think the people should be helped, but is the solution to increase the resilience of the area? What if in 20 years or more the sea level rise and increased intensity cloudburst makes parts of Jyllinge Nordmark unliveable, and it is necessary to expropriate them at a later time. It can seem like there might need to be a national assessment of which areas should already be prepared for expropriation. It can be difficult to say if some of these placed at high risk from climate changes should be expropriated or tried to be secured, though this raises the questions of where are the limits of how resilient we can build, and when is it ok to abandon an area? However it seems like nobody is really taking up this discussion, which means nobody is taking the decision. Though the municipalities are responsible for the spatial management, and thereby in some way are forced to take decision about this. But if it is decided that certain areas are at too high risk due to climate changes should it not be the societies decision?

6 CONCLUSION

Climate change is causing severe structural damages at increased frequency and intensity. Aiming to accommodate these, the present institutional legislation and tools are challenged. Roskilde Forsyning and Roskilde Municipality are working with complex rainwater issues in Jyllinge Nordmark, which cross the traditional responsibility roles and boundaries. This project therefore is a practical example of how to challenge the existing conditions, including bureaucratic silo thinking and institutional barriers. Therefore this project has been guided by the research question: "How can a process be planned and executed to enhance the development of an appropriate rainwater management system for Jyllinge Nordmark?". This has been done in close collaboration with Roskilde Forsyning through focusing on collaborative network processes.

One of the first findings in this project is that **applying one overall solution to handle the rainwater issues in Jyllinge Nordmark is inappropriate.** This is due to the high degree of both functional (hydrological and geological) and relational complexity as well as the geographical scattering of the issues. However traditional measures and the legislation for rainwater management to a great extend focus on sewer systems, and do not bring many possibilities for alternative and more diverse solutions. Therefore the character of the rainwater issues in Jyllinge Nordmark pushes for alternative measures, which require Roskilde Forsyning and Roskilde Municipality to be reflexive and innovative.

This project challenged the traditional methods through establishment of different workshops. **The workshops created arenas for experimentation, which detectably showed a higher degree of innovative thinking, and challenged professional norms and zero error culture.** The creation of a new platform located in Jyllinge Nordmark removed the participants from their regular work patterns, which challenged working structures and perceived limitations such as rules, norms, routines, discourses and the zero error culture. Through the workshops the perception of the issues changed from being cumbersome problems to exiting to work with.

The collaborative networks established through the workshops dealt with the traditional bureaucratic silo thinking by creating stronger ties and more trust between Roskilde Forsyning and Roskilde Municipalities. This strong collaboration between utility and municipality is an important factor, because most of the proposed solutions go across their traditional roles and areas of responsibility. Additionally the enhanced collaboration between Roskilde Forsyning and Roskilde Municipality made them agree on a common goal for Jyllinge Nordmark, which bended the traditional understanding of the service level, a transformation unlikely to have happened without the collaborative network. The detected

reflexivity about the service level and internal discussions on the situation beyond the limits of the service level is a clear break with bureaucratic silo thinking and professional norms within Roskilde Forsyning and Roskilde Municipality. This questioning the sufficiency of the service level leads to a broader societal discussion about a potential necessity for changing the service level or the legislation around it. As I believe that most citizens would not accept water on terrain every fifth year, especially not in areas where water on terrain enters the house.

Mutual transformative learning through the workshops pushed the boundaries of what the utility and municipality believed possible, as the different consultancy companies had a certain degree of authority and respect because of their success in the field when presenting their suggested solutions. Furthermore the broad variety of stakeholders represented different aspect of climate adaption, which increased a mutual learning process by adding many different values. These factors contributed further to the increased willingness to experiment with new solutions, which challenged the zero error culture.

Based on the finding in this project, I have proposed some suggestions for the implementation phase to come. First of all it is important that Roskilde Forsyning and Roskilde Municipality start the work on transforming Nordmarksvej into a cloudburst street to exercise leadership, by going in front. This is a clear expression of willingness from the institutional level, and thereby creates positive incentives amongst the citizens, to show that responsibility is shared. Next step should be to engage in the issues in the low area, as they are the most prevailing. Roskilde Forsyning and Roskilde Municipality must take the role as facilitators, to build ownership and create positive incentives. However the main focus must be on ownership, which presupposes citizens' possibility to affect the process. Creation of positive incentives is less important as the extent of the issues already in itself creates positive incentives for adaption. Therefore I suggest very close collaboration with the citizens in the detailed planning of the solutions and their design. Hereafter or simultaneously attention should be given to the high grounds. In the high grounds in contrast I suggest a main focus on creating positive incentives, as the rainwater issues are less explicit, but rather affect the citizens downstream. Here I suggest inspiring positive incentives through a course in how to manage the water in the garden, and a collaborative meeting with downstream citizens, for raising the compassion and introducing the issues of runoff water in downstream areas of Jyllinge Nordmark.

The importance of the suggested close collaboration with citizens is emphasised through the consultancy companies' suggestions, which mostly focused on handling rainwater on the surface, necessitating the use of private land. It could be argued that bringing in the citizens earlier in the process is important to create ownership. **However there was a dilemma here**

as the high degrees of complexity could create internal exclusion in the discussion. As a result it was chosen not to include the citizens at the workshops, but to accommodate this exclusion much effort were put into meeting with the homeowners' associations in the preparations of the workshops. In this way the issues experienced by the citizens of Jyllinge Nordmark where incorporated in the workshops, represented through the project leader from Roskilde Forsyning and myself. However this representation of ideas might not be sufficient to create ownership and incentives, which necessitate the suggested close collaboration in the implementation phase.

Additionally the communication with the citizens is crucial to ensure balancing expectations. One example of differing expectations is the big focus on creating recreational areas in the suggestions by the consultancy companies which potentially could contrasts the citizens' wishes, as there are many recreational natural sites in the area already. Another example is the potential difference in expectations for what degree the issues can be solved and what amount of water will remain in the area. In this regard it is important to communicate that Roskilde Forsyning and Roskilde Municipality can help to secure the houses to a certain level, but some cloudbursts will still cause trouble. Furthermore when securing the houses some of the gardens may remain wet because of the high groundwater level, which is something the citizens need to get used to but can be thought of as to take advantage of.

To sum up establishing a collaborative network creates a new arena and thereby enables the possibilities for thinking passed the professional norms and institutional traditions, which opens the possibilities of creating more appropriate solutions. In Jyllinge Nordmark such arenas were created through a workshop process, which enhanced Roskilde Forsyning and Roskilde Municipality collaboration and to think reflexively. Furthermore an important common factor for the processes has been a continuously developing mutual learning, which constantly expanded the participants' perspectives. It still remains for Roskilde Forsyning and Roskilde Municipality to collaborate with the citizens of Jyllinge Nordmark to implement an appropriate rainwater management system, but the foundation for it is set.

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