



JÖNKÖPING UNIVERSITY

*School of Education and
Communication*

“But I have always had the greenest lawn in my neighbourhood” – When what is taken for granted becomes rare

A qualitative study of how municipalities communicate sustainable use of drinking water

COURSE: *Bachelor thesis, 15 credits*

PROGRAMME: *International work, Global studies*

AUTHORS: *Hedvig Petersson and Sofia Irevall*

EXAMINER: *Radu-Harald Dinu*

SEMESTER: *Spring 2019*

Acknowledgement

The truth is: the natural world is changing. And we are totally dependent on that world. It provides our food, water and air. It is the most precious thing we have and we need to defend it. - Sir David Attenborough

This bachelor thesis was written as a final part of the bachelor's program in International Work during the spring of 2019.

We want to express our gratitude to the Water and Sewage Managers and the heads of communication in Värnamo, Eksjö, Mullsjö, Jönköping and Habo municipalities who decided to participate in this study during the spring of 2019. We feel thankful to have interviewed a competent group of professionals and would like to thank them for their time and willingness to answer our questions.

We want to thank our supervisor at Jönköping University, Marco Nilsson, for always challenging us and inspiring us to think in new ways.

Furthermore, we would like to show appreciation to Andreas Olsson from Länsstyrelsen in Jönköping county. Your inputs have been valuable, thank you for your time and willingness to answer our question, and for helping us to forward into new insights.

Finally, we would like to thank our family and friends for being helpful, patient and supportive throughout this insightful process.



Hedvig Petersson & Sofia Irevall
Jönköping, 2019

Hedvig Petersson Sofia Irevall

Abstract

During the past three years, substantial parts of Sweden have experienced a decrease in the groundwater levels, whereas some geographical areas were more affected than others. Requests from the government, counties and municipalities have been sent out to the citizens, to attract attention, increase awareness and decrease the use of drinking water. The communication strategies have looked different in the municipalities depending on their water situation, prerequisites and resources. This study aims at explaining how five municipalities in Jönköping county communicate with their citizens regarding water resources and use of drinking water. The five participating municipalities are; Jönköping, Mullsjö, Habo, Värnamo and Eksjö. Jönköping county is one of the counties that were affected by the low groundwater levels, if so to varying degrees, which is the reason the study focuses on Jönköping county.

Therefore, the purpose of this thesis is to examine how municipalities communicate in relation to intervention strategies, to create a behavioural change regarding the use of drinking water among citizens.

Intervention strategies were analysed in the study to compare the municipalities' communication work and have been used as an analytical tool during the process. Intervention strategies can be separated into antecedent strategies and consequence strategies to change behaviour. The antecedent strategies consist of commitment, information, goal setting and modelling, and consequence strategies consist of feedback, rewards and prompts. A combination of multiple strategies has been proven to create a more extensive impact, and behavioural change can, in that way, easier be accomplished.

A total number of seven interviews were performed for collection of data. Two communication managers from Värnamo and Eksjö municipality participated, and five Water and Sewer Manager from Jönköping, Mullsjö, Habo, Värnamo and Eksjö municipality. An important factor that has been taken in consideration is that the municipalities take their water from different sources and in that way are affected in various extensions of the low groundwater levels. In that way, the municipalities have communicated the question of water differently.

The result of the study shows that ongoing communication work regarding the use of drinking water is done, mostly by spreading information. Two municipalities use multiple strategies in their spreading of communication. The result also shows that there is no underlying communication work regarding a decrease in the use of drinking water. Instead, it has been demonstrated that the communicative work takes place when a crisis occurs.

Keywords: Communication, intervention strategies, municipalities, groundwater and behaviour change

Förord

“The truth is: the natural world is changing. And we are totally dependent on that world. It provides our food, water and air. It is the most precious thing we have and we need to defend it.”

— Sir David Attenborough

Denna uppsats är skriven som en avslutande del av vårt kandidatprogram i Internationellt arbete under våren 2019.

Vi vill ta tillfälle i akt att tacka de vatten- och avloppschefer samt kommunikationschefer från Värnamo, Eksjö, Mullsjö, Habo and Jönköping kommun som deltagit i vår studie. Vi känner stor tacksamhet över att ha fått intervjuva en sådan inspirerande och kompetent grupp av människor, och vill därför tacka er för att ni tog er tid att delta i våra intervjuer och för er bidragande kunskap.

Vi vill även tacka vår handledare på Jönköping University, Marco Nilsson, för att du hjälpt oss att tänka i nya banor och bidra med andra perspektiv.

Vi vill dessutom visa vår uppskattning till Andreas Olsson från Länsstyrelsen i Jönköpings län. Ditt stöd och råd har varit värdefullt. Tack för att du har tagit dig tid att besvara våra frågor och funderingar.

Slutligen, vill vi tacka våra familjer och vänner för att ni har varit hjälpsamma, tålmodiga och stöttande genom denna givande men utmanande process.



Hedvig Petersson & Sofia Irevall

Hedvig Petersson & Sofia Irevall
Jönköping, 2019

Sammanfattning

De senaste tre åren har stora delar av Sverige upplevt minskade grundvattennivåer, där vissa geografiska områden påverkats mer än andra. Uppmaningar från regering, län och kommuner har skickats ut till medborgarna med syfte att väcka uppmärksamhet, öka medvetenhet och minska dricksvattenanvändningen. Kommunikationsstrategierna har sett olika ut i olika kommuner beroende på deras vattensituation, förutsättningar och resurser. Denna studie ämnar till att förklara hur fem kommuner i Jönköpings län kommunicerar med sina medborgare kring vattenresurser och dricksvattenanvändning. De fem kommuner som deltog i studien är; Jönköping, Mullsjö, Habo, Värnamo och Eksjö. Jönköpings län är ett av de län som drabbats av låga grundvattennivåer om än i olika utsträckningar, vilket är anledningen till att studien fokuserar på Jönköpings län.

Syftet med studien är att undersöka hur kommuner kommunicerar i relation till interventionsstrategier, för att skapa en beteendeförändring kring dricksvattenanvändning hos medborgarna.

Interventionsstrategier analyserades i studien för att jämföra kommunernas kommunikativa arbete, vilket har fungerat som ett analytiskt verktyg under processen. Interventionsstrategier delas upp i förebyggande strategier och konsekvensstrategier med syfte att förändra beteende. De förebyggande strategierna innefattar överenskommelser, information, modellering och målsättning, och konsekvensstrategier innefattar påminnelser, belöningar och feedback. En kombination av flera olika strategier har visat sig skapa en mer omfattande påverkan och beteendeförändring kan på så sätt lättare uppnås.

Totalt genomfördes sju intervjuer för insamling av data. Två kommunikationschefer från Värnamo och Eksjö kommun deltog, samt fem VA-chefer från Jönköping, Mullsjö, Habo, Värnamo och Eksjö kommun. En viktig faktor som funnits i åtanke är att kommunerna tar sitt vatten från olika vattentäkter och på så sätt påverkats i olika utsträckningar av de låga grundvattennivåerna. I sin tur har kommunens kommunikationsarbete skilt sig mycket åt i vattenfrågan.

Studiens resultat visar att ett pågående kommunikationsarbete kring dricksvattenanvändningen sker, främst via informationsspridning. Två av kommunerna använder sig av flera strategier i deras kommunikationsspridning. Resultatet visar även att det inte pågår något förebyggande kommunikationsarbete i någon större utsträckning, gällande minskad dricksvattenanvändning. Istället har det visat sig att det kommunikativa arbetet utvecklats först när en kris tar vid.

Sökord: Kommunikation, interventionsstrategier, kommuner, grundvatten och beteendeförändring

Table of Contents

1. Introduction	1
1.1 Purpose and research questions	2
2. Groundwater in Sweden	2
2.1 Water scarcity in Sweden 2016-2018	3
3. Theoretical framework and previous research	3
3.1 Definition of concepts	4
3.1.1 Definition of Shortage of water	4
3.2 Tragedy of the commons	4
3.3 Previous research on antecedent strategies and consequence strategies	4
3.3.1 Antecedent strategies	5
3.3.2 Consequence strategies	6
4. Method	7
4.1 Research strategy	7
4.2 Selection of participants	7
4.3 Interviews and interview structure	8
4.4 Analysis of data	8
4.5 Reliability and validity	9
5. Results	10
5.1 Jönköping municipality	10
5.1.1 Intervention strategies for reducing the citizens' water use	11
5.2 Eksjö municipality	11
5.2.1 Intervention strategies for reducing the citizens' water use	12
5.3 Värnamo municipality	14
5.3.1 Intervention strategies for reducing the citizens' water use	14
5.4 Habo municipality	15
5.4.1 Intervention strategies for reducing the citizens' water	16
5.5 Mullsjö municipality	17
5.5.1 Intervention strategies for reducing the citizens' water use	17
5.6 Table of the municipalities' use of intervention strategies	18
6. Discussion	18
7. Conclusion	22
References	23
Appendices	25
<i>Appendix I: Interview guide Swedish</i>	25
<i>Appendix II: Interview guide English</i>	27
Table 1	18

1. Introduction

Water is an essential prerequisite for all living organisms on earth, and consequently, a prerequisite for humans' health and sustainable development (Globala målen, 2015). It is vital for food and energy production and healthy ecosystem. It is also critical for adaptation to climate change, which is the link between the environment and the society (United Nations, 2018). The first effects of climate change are seen through water: floods, drought and storms. Disasters such as these can lead to a lack of water suppliers and contaminated water, which put the lives of people at risk (Unicef, 2016). Developing countries are the worst affected regarding water scarcity. Drought specifically affects some of the poorest countries in the world, worsening undernourishment and famine (United Nations, n.d).

Due to the ongoing climate change, not only developing countries or countries that are seen as vulnerable are in danger zones for being affected by drought, floods and storms. Global warming also concerns countries that earlier were resilient to different weather conditions. Climate change does not only affect the global temperature, but it also affects the hydrologic cycle through changes in evaporation and precipitation patterns, which is a problem Sweden is facing today. Groundwater is an essential part of the hydrologic cycle, and changes in temperature and precipitation will affect the amount of groundwater that forms and is available for use. (Sveriges geologiska undersökning, n.d) In Sweden, the majority of the drinking water comes from groundwater, it describes the importance of the groundwater's accessibility and the consequences of its absence. The last three years, Sweden has suffered from drought and high temperatures, which has led to a lack of groundwater in the south-eastern part of Sweden (Regeringskansliet, 2018).

Since global warming is ongoing, the groundwater issue is evident. In Sweden, the population has access to water 24 hours a day and it is mostly taken for granted. Due to the heat wave during the three previous summers, the citizens of Sweden had to start to think and reflect differently because of the irrigation ban that was introduced. (Svenskt Vatten, 2019) To create a behavioural change, the citizens have to reflect on their behaviour - something that might be easier if alternative options get presented or if the alternatives get presented in a different way (Lindahl & Stikvoort, 2015).

In Sweden, the water and sewage systems are mostly operated by municipal administrations (Svenskt Vatten, 2016b). This commitment entails a responsibility, especially in crucial times when the groundwater level is low. An essential part of this responsibility is to impact attitudes and behaviours concerning the use of water. However, without information and alternative solutions related to the groundwater issue, it will be difficult for the citizens to change and start saving water.

1.1 Purpose and research questions

As mentioned above, the communication between municipalities and their citizens is essential to make a change in the households' water use. To change the households' use of water, one way is to create behavioural adjustment among the citizens. One strategy is to help the citizens make better decisions through interventions, aimed at influencing underlying behavioural determinants.

Therefore, the purpose of this thesis is to examine how municipalities communicate intervention strategies, to create a behavioural change regarding the use of drinking water among citizens.

The following questions are framed as a part of this research, as well as to address the problems and fulfil the objectives mentioned above:

- How do the municipalities work with communication to the citizens with the purpose to reduce the households' use of water?
- Do the municipalities communicate in different ways? If so, why?
- Do the municipalities have the ambition to create a behavioural change through their communication work among the citizens, regarding the use of household water? If so, how?

The best possible outset would be to examine municipalities and their communication work all over Sweden. Although, due to lack of resources and time, this study will focus on five municipalities in Jönköping county. Jönköping county was chosen because it is situated in an area of Sweden that has suffered from low groundwater levels. Another reason is due to its geographic proximity to the basis of the authors, which simplifies the working process and the possibility to collect data face-to-face.

2. Groundwater in Sweden

This section aims at giving the reader background information about the groundwater in Sweden.

Groundwater is the rainwater that does not evaporate or is absorbed by plants. Instead, it seeps down and fills the void of the ground and the cracks of the bedrock. Eventually, the groundwater runs out into lakes and other watercourses, or it is taken up by humans to use as drinking water. Groundwater is clean and safe to drink because it has slowly filtered through the soil layers. (Sveriges meteorologiska och hydrologiska institut, 2016)

The levels of the groundwater vary over time due to the formation of the groundwater may look different. Also, the difference in climate means that the average changes in groundwater level during the year look different in different parts of the country. (Sveriges meteorologiska och hydrologiska institut, 2016) In the northern part of the country, the long winter makes most of the formation of the groundwater to take place in connection with snow melting during April,

May and June. During the summer, the groundwater levels usually fall when most of the rainfall is generally taken up by the plants or evaporates. In the fall, when temperature drops and the evaporation decreases, the levels rise slightly, and then decline during the winter when the precipitation usually falls like snow. In the south of Sweden, rainfall often falls as rain even in winter, which means that the groundwater levels rise from autumn until spring. (Sveriges meteorologiska och hydrologiska institut, 2016)

The groundwater is to be found in two different waterbeds – the small and big waterbed. The small waterbeds are located in mountains or soil that is denser and is often used by people with private drilled wells. These waterbeds are fast reacting; therefore, they get filled more quickly by the rainfall than the big waterbeds do. The big waterbeds are found in sand or eskers, far into the ground, and it takes longer before they are replenished. The municipalities usually take drinking water from these waterbeds. (Sveriges Geologiska Undersökningar, 2019) In Sweden, the average water consumption is 140 litres per person and day. (Svenskt Vatten, 2019)

2.1 Water scarcity in Sweden 2016-2018

During the last couple of years, Sweden has experienced less rain and snow, consequently threatening with water scarcity in many places in the country. Authorities have requested the citizens to do what they can to save water and prepare for a potential water scarcity during the summer and fall. (Krisinformation, 2017)

In 2017 the country prepared for a situation of what was presumed to be the worst water scarcity in several decades. Around 40 counties introduced water restrictions and irrigation bans. Some of the counties experiencing difficulties in 2017 were: Östergötland, Gotland, Jönköping, Kronoberg, Kalmar, Blekinge, Halland, Västra Götaland, Uppsala and Dalarna. The water scarcity creates negative consequences for several areas, including agriculture, water supply for houses, outdoor life and cultural environments. As a response to the low water resources, eight national authorities and representatives from Sweden's counties met to support the counties in their situation. (Havs- och Vattenmyndigheten, 2016)

In 2018 the whole country received less rainfall than average, which resulted in low waterbeds and restrictions in use of water. The annual precipitation in 2018 as a percentage of the average yearly rain was 90 per cent. The rate is based on the average rainfall between 1961-1990. The average precipitation percentage so far in 2019 is between 100-150 percent, whereas 100 percent is normal in Jönköping municipality. (Sveriges meteorologiska och hydrologiska institut, 2016)

3. Theoretical framework and previous research

This study is based on the analytical tool *intervention strategies* aimed to solve the problem explained by the tragedy of the commons, described below. Therefore, the study is not based on a regular theory. The analytical tool is based on intervention strategies that attempt to influence behaviour. The conducted interviews in this study are based on this model. Its appurtenant intervention strategies are explained below.

3.1 Definition of concepts

3.1.1 Definition of Shortage of water

Water shortage is based on how low groundwater levels and flows are and what they are expected to be. The groundwater levels are compared with normal levels for the period. The flows are compared with historical low flows, and the risk of water shortage is issued if the water flow is expected to be low for an extended period. Risk of water scarcity, low flows can also be issued in a smaller area if the source of water is deemed to be extra sensitive. (Sveriges meteorologiska och hydrologiska institut, 2016)

3.2 Tragedy of the commons

The tragedy of the commons is a social dilemma of the behavioural dynamics of environmental problems (Gardner & Stern, 2002). The process was conceived by Garrett Hardin (1968). He explains the dilemma as a “[...]behaviour that makes sense from the individual’s point of view, when repeated by enough individuals, ultimately proves disastrous to society.” Gardner & Stern, 2002, p. 23) In other words, it implies that the consumption of natural resources by many individuals, with unrestricted access to the resource, will eventually lead to a destruction of the resource. This leads to a disaster for all. Hardin (1968) argues that every individual is self-interested and gains by consuming the natural resource. These persons also see little or no harm in doing so, since the resource is vast, and the personal impact is so small. This behaviour and way of thinking become problematic since the human population and resource-intensity not only reach high levels, but also since the resources can be rapidly destroyed.

The tragedy of the commons can be associated with the use of water resources and drinking water. Since Sweden always has had a vast amount of water resources and drinking water of high quality, the resources have been taken for granted. The citizens in Sweden have, in principle, unrestricted access to drinking water, due to the low price and high amount. Additionally, every individual has to consume drinking water, but if there is an overconsumption the water treatment plants will not be able to produce enough water. If this occurs, it will be a disaster for all, which is a tragedy of the commons. Thereby, this dilemma explains how the problem of water use occurs. The dilemma is used to identify the core problem, although it does not answer how to handle it.

3.3 Previous research on antecedent strategies and consequence strategies

In this section the analytic tool is explained. The tool is based on Wokje Abrahamse, Linda Steg, Charles Vlek, and Talib Rothengatter’s definition of the intervention strategies. The article “A review of intervention studies aimed at household energy conservation” by Abrahamse et al. (2005), evaluates the effectiveness of interventions that aim to encourage the households to reduce their energy consumption. It is a summary of studies using intervention strategies, made by several researchers. The purpose of the article is to review the effectiveness of interventions to promote household energy conservation. The interventions are aimed to influence underlying behavioural determinants, which in turn are believed to influence behaviour. The authors of the article used behaviour change interventions by antecedent and consequence strategies. Antecedent interventions such as commitment, goal setting,

information and modelling are assumed to influence one or more determinants of environmental behaviours. A consequence strategy is used to influence determinants after the incident of pro-environmental behaviour. For example, giving people feedback about their energy savings may challenge them to reduce energy use further. Feedback and reward are considered consequence strategies.

3.3.1 Antecedent strategies

The interventions mentioned above are all described below, starting with *commitment*. A commitment is a written or oral promise to change behaviour. It is often linked to a specific goal and can be made public or be a pledge to oneself. If a commitment is made public, social norms may play a role as determinants of conservation behaviour through expectations of others. (Abrahamse et al., 2005) In a study written by Pallak and Cummings (1976), a commitment was used to promote electricity and gas conservation among households. The households that signed a public commitment also showed a lower rate of increase in both electricity and gas consumption than those in the control group. It was also lower compared to those that had signed a private commitment.

The next intervention is *goal setting*, which means giving the households a reference point. Either the households themselves or the experimenters can set a goal. It can be in combination with other interventions, for example feedback. It can also be as part of a commitment to save a specific amount of energy. (Abrahamse et al., 2005) Becker (1978) made a study where either an easy goal or challenging goal was given with the purpose to reduce the electricity use. A combination of both the goal and feedback were given to some of the participants, while other participants did not receive feedback. The households who received a challenging goal and also got feedback, saved the most. It implies that households need feedback on how they perform in relation to the goal, for a challenging goal to work.

Another strategy in the antecedent interventions is *information*, which is a common strategy to promote certain behaviours, including energy conservation behaviours. Providing information can lead to an increase in awareness, and it can be both general information and information related to a specific problem. It can be conveyed in different ways, and some examples are through workshops, mass media campaigns and tailored information. (Abrahamse et al., 2005).

Lastly, it is assumed that *modelling* can function to encourage a specific behaviour if the models are understandable, meaningful, rewarding and relevant to people. (Abrahamse et al., 2005) In a study by Winett, Lecklitter, Chinn, Stahl, and Love (1985), the modelling group received a booklet with cartoons depicting energy-saving measures. The cartoons can be seen as a way of modelling, since they demonstrate a certain action. The modelling group reduced their energy use by 10% compared to a control group. It also led to an increase in knowledge for the experimental group, but not for the control group.

3.3.2 Consequence strategies

Feedback is one of the consequence intervention strategies and consists of giving households information about their energy savings or consumption. It influences behaviour when households associate certain outcomes with their behaviour, which entails that it is ideal if the feedback is given straight after the behaviour occurs. (Abrahamse et al., 2005) In a study made by McClelland and Cook (1979-1980) households received continued feedback about costs of electricity use by means of a monitor displaying electricity use per hour. The result showed that households who had a monitor in their homes used 12% less electricity than those who did not have a monitor. One sort of feedback can be given to the inhabitant through focus groups within the society, by discussing the use of water and its consequences. (Abrahamse et al., 2005)

The final type of intervention presented is *rewards*. Monetary rewards can function as a motivator to conserve energy. It can either be a fixed amount, or it can be contingent on the amount of energy saved. (Abrahamse et al., 2005) Hayes and Cone (1977) studied the effect of rewards, information and feedback on electricity use. The combination of these interventions led to a reduced electricity use for all participating households.

A part of the intervention strategy rewards is *prompts*. They consist of small messages or slogans designed to remind people to do things that they are already knowledgeable enough to do. These slogans or messages are intended to reduce indolence and ignorant behaviour. (Gardner & Stern, 2002)

The article's conclusion is that interventions have been used with varying degrees of success to promote energy conservation. Commitment and goal setting have been successful in bringing about changes in energy use – especially when they are combined with other interventions. Information alone is generally not an effective strategy but has proven to be more effective in combination with other interventions. When it comes to consequence interventions, rewards are effective although there are some indications that this positive effect disappears as soon as the intervention is discontinued. (Abrahamse et al. 2005)

4. Method

4.1 Research strategy

This study aims to examine how municipalities communicate intervention strategies, to create a behavioural change regarding the use of drinking water among citizens. Interviews are used to explain the municipalities' different ways of communicating and comparing them to the analytical tool intervention strategies. Since the interviews only describe how the municipalities communicate from one or two employees' perspectives at the five municipalities, a biased description is a risk. A triangulated method with a combination of both interviews and a content analysis would lower this risk (Bryman, 2008). However, due to lack of time this study only uses interviews for conducting data.

The study was conducted with a qualitative research strategy with the aim to create a deeper understanding of a social phenomenon in a specific context. The qualitative research places more emphasis on perceptions and interpretations of social reality, while quantitative research emphasizes the quantification of data and analysis. (Bryman, 2008) The alternative could have been to do a qualitative study in the form of a survey. However, a survey would not have made it possible to ask additional questions.

4.2 Selection of participants

The respondents participating in the interview were selected through purposive sampling. The sampling method is chosen due to the wish of interviewing people relevant to the questions at issue. (Bryman, 2008) In this study, the relevant participants are the Head of Communications and the Water and Sewer Managers within the municipalities of Jönköping county.

The respondents were selected from Jönköping county's 13 municipalities. The two different departments were contacted by an email of interest within all the 13 municipalities. Of all of them, five municipalities responded with interest to participate in an interview for the study. The participating municipalities were Eksjö, Mullsjö, Värnamo, Jönköping and Habo. In some of the municipalities, both of the departments responded, while only one responded in others. In Jönköping municipality, the Water and Sewer Manager participated, in Värnamo municipality both the Water and Sewer Manager and the Head of Communication participated, as well as in Eksjö municipality. In Habo and Mullsjö, only the Water and Sewer Manager participated in the interviews. There is a risk of default information since only two communicators did participate in the interviews, which can affect the result.

The number of interviewees required depends on the purpose of the study. Qualitative interviews studies tend to have either too few or too many respondents. The result of the study risks being difficult to generalize and hard to test against a hypothesis, if the number of participating respondents is low. If the number of participants would have been higher, it is not possible to make any accurate interpretations of the interviews (Bryman, 2008). If the purpose of the study would have been to generalize, a more significant number of respondents would have been desired to increase the validity and credibility. Since this study only consists of five municipalities of 290, the result cannot be generalized to all municipalities in Sweden.

Concerning empirical investigations, there is always a risk of data loss. Data loss can be divided into two different types; internal/external data loss. The internal data loss means that the participants respond, but do not answer all question, which is more common in surveys. The external data loss means that some desired participants did not reply at all. (Rosengren and Arvidsson, 2005) In this study, an external data loss occurred since only five out of thirteen municipalities responded to the enquire to participate in this study, which is 38,4 per cent and a loss of 61.6 per cent of requested participants. If more municipalities responded to the enquiry, this could have contributed to another conclusion and a different pattern among the municipalities in Jönköping County. Although, the focus of this study is to identify the municipalities' communication work with the purpose to implement a plan of improvement, which means the quantities of participating municipalities was not the main focus.

4.3 Interviews and interview structure

In this study, the data was collected using semi-structured interviews. Semi-structured interviews were conducted to allow the interviewees to reflect upon the subject more freely. An advantage of using semi-structured interviews is that respondents have the opportunity to speak about their perceptions and opinions while being able to follow up this by asking in-depth questions.

The interviews were conducted face-to-face. By sending out the questions in advance, the interviewees had time to prepare for the interview. A consequence of sending out the questions in advance is the loss of spontaneous answers. Some questions required data from the interviewees; therefore, the choice of sending out the questions was made. Due to technical reasons, one interview did not get recorded, which was not made aware until after the interview. Instead, an email with the defaulted questions was sent to the interviewee who answered them via email instead. Awareness of that some information was lost is taken into consideration.

In the beginning of the interview, the participants were asked if they wished to be anonyms in the study. All of the participants approved to use their name in the study. The participants also received the questions of consent form to record the interviews, which all of them approved. While recording can make the interviewee feel uncomfortable, it enables the study to have more focus on the interviewee and the subject. The information from the interviews was documented, transcribed, coded and presented in the result, which increased the validity of the study.

4.4 Analysis of data

The data collected through the interviews were transcribed before being analysed. Coding was used to enable an overriding understanding of the data. The goal with coding is to narrow the information down to a collection of essential components (Hjerm, et.at, 2014). The categories created from the questions at issue enable the process of identifying connections and information in the data.

The interviews were performed in Swedish and translated to English by the authors, when used to quote in the result. A risk of translating the data wrong was taken in consideration. In the case of direct citation, the respondents exact wording was retained, and the interviews were written down ordinarily to the extent deemed sufficient.

4.5 Reliability and validity

Credibility, transferability, dependability, and confirmability the result, are four criteria to achieve reliability in qualitative research. (Bryman, 2008). Qualitative research tends to focus more deeply than widely; the result focuses on the contextual uniqueness, and the importance of the aspect of the social reality studied. Transferability is therefore ensured, through detailed descriptions providing other researchers with information to help them assess how applicable the results are to another context. (Bryman, 2008)

To evaluate the credibility of the study, reliability and validity are taken into consideration. Reliability refers to how useful findings and analysis can be consistently achieved if this study is to be replicated. Validity refers to how the results reflect on what the research is intended to capture. It is of significance if the result of a study is to be meaningful and relevant to the broader population. (Bryman, 2008) Bryman (2008) describes different views on the concepts reliability and validity, which means that they are sometimes more applicable on quantitative studies. Although, the concepts can be applicable in quantitative studies.

To increase the external reliability of the study, an interview guide was used when performing the interviews. The guide ensures the questions at issue are being answered by all interviewees, while leaving room for additional questions. The guide allows other researchers to put themselves in the same role and thereby have greater possibility of receiving the same result. Although, the external reliability risk becoming an error because of the semi-structured interviews. The arrangement of the questions creates a flow where there is an opportunity to change the order depending on the answers from the interview.

One threat to the validity in this study is generalizability (Bryman, 2008), sometimes also called external validity, since the study is limited to a few municipalities in Sweden. By conducting further studies on the subject, one would be able to test the results better.

5. Results

This section of the study presents the data collected through the semi-structured interviews with the five municipalities. The structure is divided to each municipality, describing their water situation and how they work in relation to the intervention strategies.

5.1 Jönköping municipality

In this section, the result is based on an interview with Roger Rohdin, who is the Water and Sewer Manager in Jönköping municipality. The water and sewage department is operated by the municipal administration and consists of approximately 700 employees. The interview took place on the 2nd of May 2019.

The second biggest lake in Sweden is called Vättern and is situated next to Jönköping. It functions as a water catchment, which means Jönköping municipality has good prerequisites. Except for five water treatment plants that are taking water from lake Vättern, there are eight groundwater treatment plants producing drinking water to the municipality. Jönköping municipality did get affected, but not to that extent that it affected the citizens. (Rohdin) “Spring 2018 looked fantastically good. The water sources were full, and we thought ‘now we will not suffer from any drought’, but it declined so fast. It was so dry during May. It is so easy to underestimate the evaporation, but it has a significant effect on the water and where it ends up.” (Rohdin)

In either 2018 or 2019, Jönköping municipality did not impose any irrigation bans, but in comparison to 2018, the groundwater levels are today lower than average, and also lower than last year. (Rohdin) Rohdin mentions “[...] since our groundwater plants do have enough water, or have had so far, we have not had any problems at all within the municipality.” The use of water in Jönköping municipality has decreased the last years but has since three to four years been uninformed. Rohdin supposes this is because of efficiency in apparatuses and machines, whose development has reached a peak.

Rohdin evaluates that the average use of water per person and day in Jönköping municipality is 180 litres, which is 40 litres more than Svenskt Vatten recommends. Due to the high quantities of water that is found in the water catchment in the municipality, Rohdin believes that this amount is sustainable. He deems that the water consumption was above average during the warm summer 2018, because of a general increase in the use of water.

Due to the vast water quantities in Jönköping municipality, the water and sewage department in Jönköping aims to protect the quality rather than reducing the quantity of the water. Their primary focus is to keep the water clean, since the water cycle through lake Vättern is reasonably sustainable. To keep the use of water sustainable in Jönköping municipality, Rohdin argues that the solutions are long term and straightforward information, and also easy-to-use technique. (Rohdin)

5.1.1 Intervention strategies for reducing the citizens' water use

Rohdin says that they do not have any *commitment* between the municipality and its citizens that aims to change the citizens' behaviour regarding their water use. The municipality does not have any *goals* set between the municipality and its citizens that aims to change the citizens' behaviour regarding their water use (Rohdin). However, Rohdin says that he believes that the municipality does have the knowledge to change the citizens' behaviour regarding water use, but not the personnel resources to conduct long-term advocacy. He argues that it takes long-lasting and straightforward information to change the citizens' behaviour.

When asking Rohdin if the municipality spread any *information* about their water resources, he said that they do, if there is a need from the citizens. When the municipalities spread information, they mostly use their website or social media, like Facebook. If there is a request from mass media, they also spread information through that channel. Jönköping municipality does also spread information about alternative methods for reducing the water use via brochures, including information about how to act when then the water levels are low. The municipality also spreads information about sustainable water resources to the citizens via cinema commercial, billing, brochures to all households and also through tailored information.

The municipality does not use any *modelling* that aims to change the citizens' behaviour regarding their water use (Rohdin).

Feedback aimed to change the citizens' behaviour regarding their water use, is not a method used by the municipality according to Rohdin, except for the feedback the citizens receive on the invoice. The only *reward* Jönköping municipality use is an indirect reward. Rohdin says that since the water tax has a volatile part, it rewards financial savings. However, drinking water is cheap, which means that the reward effect does not get very noticeable. *Prompts* are not used to change the citizens' behaviour regarding their water use, within the municipality, due to high quantities in water and lack of resources (Rohdin).

5.2 Eksjö municipality

The result presented in this section is based on the interviews with Anette Stendahl, the Head of Communication in Eksjö municipality, and the Water and Sewer Manager Torbjörn Johansson from Eksjö Energi. Eksjö Energi is a limited company owned by the municipality and responsible for the municipality's water and energy. (Eksjö Energi, 2018) Both of the interviews were performed on the 23rd of April 2019.

Eksjö municipality was largely affected by the drought in 2018, according to Stendahl. The municipality introduced water restrictions early in 2018 because of the shortage of water in the municipality's water catchment (T. Johansson).

There is water, but as said before it is in the wrong place and where we were most affected was in Eksjö. "[...] The previous summer, there was a low amount of rain, and there were two competitors, the vegetation and the evaporation. So,

we introduced an irrigation ban early last year, which was the third year in a row, and each year, we have had a worse starting position." (T. Johansson)

The restrictions in 2018 contained irrigation ban, which meant no use of drinking water for pools, washing the car or watering the plants or grass with a hose (T. Johansson). The restrictions are being communicated to the citizens through the municipality's social media, the municipality's website, press media and brochures sent out to the citizens. The information in the brochures was converted into movies in 2017 and was reused in 2018 on the municipality's social media and website. (Stendahl)

In the long-term, Stendahl means that an alternative discussion about how the water can be produced sustainably is essential. The information can help to create awareness and change behaviours, but an alternative debate on how to supply the other needs is crucial in the long-term. She means that a national plan would help to create greater awareness. "Information, communication, actuating promotions from the government, an individual municipality can't change that[...] It needs to come from above." (Stendahl) Since the municipalities create their information and illustration on their water situation, it could have greater impact if the message looked similar in more places. Stendahl compares this to the fires that Sweden experienced as a consequence of the drought in 2018, whereas MSB (Myndigheten för samhällsskydd och beredskap, The Authority of Societal protection and preparedness) created, together with the government, a national communication plan. She argues that a similar collaboration with campaigns is important and that the information could thereafter be adapted to the municipalities' situation.

5.2.1 Intervention strategies for reducing the citizens' water use

Eksjö municipality does not have any *commitment* between them and its citizens, that aims to change the citizens' behaviour regarding their water use. Commitment, regarding the use of water for the citizens, would be challenging to implement because of the current system (T. Johansson). T. Johansson explains that with the current system, it would be challenging to supervise the use of water and fine if overused. That kind of system would demand an administration and more resources than available at this time. (T. Johansson)

T. Johansson says that the municipality do not have any *goal* set between the municipality and its citizens that aims to change the citizens' behaviour regarding their water use. He explains that the municipalities' goal is to create water that meets all the demands.

Information is spread through different channels in the municipality, including brochure, newspapers, websites, radio and the movies based on brochures played on TV. The information includes what water resources the municipality have, and possible restrictions (Stendahl). Because of safety reasons, T. Johansson explains that the municipality do not mention how they handle their water or where their water sources are located. To reach a greater number of citizens, Stendahl explains that they translated the brochures.

In 2017, we chose to send out the brochure with a request, we needed to reach out to all citizens with information, and then it was partly some background information about the use of water. [...] so, we created the brochure in different languages.

Spreading information and educating citizens can also be done by visiting schools and other agencies. It is something the municipality would be willing to do, but due to lack of resources, it is not possible. “We don’t have the resources to visit the schools, it takes too much time to do it. Even if we would have been open for it, we can’t do it, we are too few, even if we want to.” (T. Johansson)

Eksjö municipality’s brochures and movies demonstrate ways of how to use the water sustainably. This can be seen as a way of *modelling*.

Feedback on the citizens’ use of drinking water has been published on the municipality's website, in the newspaper and on the radio. (Stendahl and T. Johansson). In 2017 Stendahl means the municipality published a graph of the citizens’ water consumption each week on their website. The graph was not published in 2018, and it has as of now not been published in 2019 as of yet. Stendahl means it depends on how much water the municipality will have this year. On social media and their website, the municipality has spread positive feedback on reduced water consumption to the citizens in 2019. (Stendahl) To obtain confidence from the citizens, T. Johansson emphasizes the importance of presenting trustworthy information. If the municipality implemented a constant water restriction, the citizens’ trust towards the municipality would decrease. T. Johansson means that if a real crisis occurred, no one would react. It is the reason the municipality removed the water restriction on the 20th of March 2019.

Focus groups are another way of working with feedback and Eksjö municipality has not directly implemented these types of groups to work towards sustainable use of drinking water. T. Johansson explains that Eksjöbostäder (Eksjö housing) had an introduction for immigrants of things to think about when living in Sweden, and that included how to handle the water sustainably.

Stendahl says that they do not use any *reward-system* that aims to change the citizens’ behaviour regarding their water use. She means that it has been a discussion of using rewards such as discounts or a barrel to collect rainwater, but it was not implemented.

Prompts in the form of stickers with encouragements of saving water, has been sent out by the municipality to all citizens. Prompts as daily reminders were published on the municipality’s social media. (Stendahl) Stendahl can see an increased awareness among the citizens about sustainability by their response to the post on social media today, compared to two years ago. Sending out the prompts in an actual crisis has greater penetration than sending them too often or without a purpose, means T. Johansson.

Stendahl explains that the information spread by the municipality regarding the water has the same design and illustrations each year. The purpose is to create a reminder for the citizens of taking actions.

5.3 Värnamo municipality

In this section, the result is based on two interviews. The first interview took place on the 25th of April with the Water and Sewer Manager in Värnamo municipality, Antti Vähäkari. The second interview took place on the 3rd of May with the Head of Communication in Värnamo municipality, Anita Johansson. The municipal administration operates the Water and Sewer department in Värnamo.

Värnamo municipality was affected by the hot summer and imposed water restrictions from the 30th of May until the 3rd of October. Additionally, summer 2017 was problematic, and restrictions were imposed that year as well (A. Johansson). A. Johansson argues that some areas of the municipality were more affected than others. In those places, the municipality had to administer a tank truck to provide water. According to Vähäkari, the main problem was not a shortage of water, but rather to produce enough water when the demand increased as the temperatures were rising. As soon as the restrictions were imposed, the water reservoirs levels started to restore. Due to the drought, Vähäkari says that summer 2018 was a problematic period and the municipality, especially the water and sewage department, had to gear up. After all, the use of water in Värnamo municipality has decreased since a few years back, which is due to increased efficiency and improved jets (Vähäkari).

5.3.1 Intervention strategies for reducing the citizens' water use

According to A. Johansson, there could be an increase in communication to the citizens regarding water use and sustainable development. She believes that a discussion in society about water resources is essential to find a long term and sustainable solution. Today there is an ongoing discussion about saving water, but not why there is a need to do it. (A. Johansson)

Vähäkari and A. Johansson say that they do not have any *commitment* between the municipality and its citizens that aims to change the citizens' behaviour regarding their water use. Except for the water restrictions in previous years, there has not been any other kind of commitments.

Värnamo municipality does not spread any *goal settings* to the citizens that aim to change the citizens' behaviour regarding their water use. However, Vähäkari says that the water and sewage department have internal goals to improve the water pipes, which will reduce seepage.

Information about the water situation is spread by the municipality in different ways. Due to the drought last year A. Johansson says that the municipality did send out a dispatch to all households with information about the irrigation ban. It contained information about how to act and what the ban meant. During this period, they also used their website and social media, such as Facebook, to spread information. Besides, the information was spread via the newspaper. For tailored information, the citizens can visit, call or email the contact centre in Värnamo

municipality. A contact centre can either answer directly or forward the question to the expert in that specific field. (A. Johansson)

The municipality does also organize study visits at the water treatment plant for schools. When the new water treatment plant was built in the municipality, an Open Day was held which assembled a lot of people. (Vähäkari) Information about the restrictions and water resources, in general, was also spread during the yearly festival called “Värnamo dagarna” (Värnamo days).

Both A. Johansson and Vähäkari gave one example of *modelling* that is being used in Värnamo municipality to reduce the water use. The energy director in the municipality is working on installing effective jets aiming to reduce the water use (Vähäkari). His task is as well to promote and show the installation to the citizens, which will also be made during the yearly festival that takes part in August this year (A. Johansson).

Vähäkari and A. Johansson say that they do not use any *feedback* that aims to change the citizens' behaviour regarding their water use, due to lack of recourses.

Reward-system that aims to change the citizens' behaviour regarding their water use is not used by the municipality. Although, Vähäkari mentions that since the water rate is volatile, the citizens have a chance to influence their expenses, which can be seen as an award if the costs decrease due to this. However, the paradox is that since the water and sewage department is self-sufficient, they would have to increase the rate in the long run if the citizens reduce their consumption (Vähäkari). Additionally, the municipality does not use any *prompts* that aim to change the citizens' behaviour regarding their water use (Vähäkari).

5.4 Habo municipality

The data presented in this section is based on the interview with Lubomira Eng, Water and Sewer Manager in Habo municipality. The interview was performed on the 3rd of May 2019.

Habo municipality has three water treatment plants for the smaller parts of the municipality. Urban Habo receives its water from the city Bankeryd, who takes water from Vättern. In 2017 the groundwater level was low, and in August a water leak evolved. The municipality tried to restore the problem as soon as it emerged, without implementing restrictions for the citizens. The municipality did not implement any water restrictions in 2018 since they did not experience low groundwater levels. Of loyal reasons towards the other municipalities, the municipality published a list of suggestion of how the citizens can decrease their use of water when other municipalities in Jönköping county introduced restrictions. In 2019 the municipality has as of yet not seen any effect on the groundwater. (Eng)

Habo municipality is expanding with increased population, and the main focus is to renew the water pipes to areas with no access to water. There is no data on how much water a citizen uses per day in the municipality. If a noticeable increase in the use of water would occur, the municipality investigates for a potential leakage in the pipes or if any citizen is filling up their pool. The water is measured to be enough for a family, but not sustainable to fill up pools. (Eng)

The municipality has seen a decrease in the use of water in the amount of water sold. The reason is hard to determine; it can be both because of new pipes and less leaking or that the citizens use less water for different reasons. (Eng) If a crisis of low water levels would occur in the municipality, Eng means that the communication with the citizens would increase. They also have the option to contact the citizens directly through a text message with requests.

To make the citizens' use of water more sustainable, Eng means that the public discussion is critical. By talking about it in public places, the awareness would increase among the citizens. A collaboration between the government, counties and municipalities is vital to create greater awareness. Eng means that the municipality is not the only party to raise awareness.

5.4.1 Intervention strategies for reducing the citizens' water

Eng state that they do not have any *commitment* between the municipality and its citizens that aims to change the citizens' behaviour regarding their water use. Eng means that the municipality needs to sell water to be able to invest in new pipes, which is one way they work for sustainable use of water. Even though the municipality wants the citizens to use drinking water, there are other water sources to replenish pools or watering plants (Eng).

No *goal setting* is spread to the citizens that aims to change the citizens' behaviour regarding their water use. However, the municipality has internal goals of working towards a sustainable delivery of water, which includes inserting new pipes to decrease leaks and ensure a safe provision of water.

In previous years, the municipality has created a brochure with *information* about their water treatment plants and waste. Due to changes in the structure of the municipality, the current brochures need to be updated. Current information and data are spread on the municipality's website and social media, but information about water has not been published for a while. (Eng)

Modelling that aims to change the citizens' behaviour regarding their water use, is not used by the municipality.

Eng says that they do not use any *feedback* that aims to change the citizens' behaviour regarding their water use. In case of increased use of water, the customer service calls the citizen to let them know and ask if they are aware of the situation. If the citizen wants to know their water consumption, they can call the customer service and find out their use and history of it. (Eng)

The municipality does not use any *rewards* or *prompts* that aim to change the citizens' behaviour regarding their water use, because the municipality did not experience low groundwater levels in the last couple of years. They only published a reminder of a list of ways to use the water sustainably on the website and social media. (Eng)

5.5 Mullsjö municipality

This section of the result is based on an interview with the Water and Sewer Manager from Mullsjö Energi & Miljö, Claes Johansson. Mullsjö Energi & Miljö is a free-standing company with nine employees, owned by Mullsjö municipality (C. Johansson). The interview took place on the 25th of April 2019.

Mullsjö municipality takes its drinking water from groundwater sources. Mullsjö Energi & Miljö have two water treatment plants, producing water to Mullsjö and also to a place called Sandhem which is situated within the municipality. (C. Johansson)

C. Johansson says that they did not get affected by the high temperatures and drought 2018 due to enough water in the groundwater sources. “We have managed to deal with it, we have had enough water in the groundwater plants.” (C. Johansson) An irrigation ban was imposed at the beginning of May 2018 when the temperatures were rising quickly, and the demand did get too substantial. Except from these four weeks with an irrigation ban, Mullsjö municipality has not been affected by the low groundwater levels. However, C. Johansson says that 2016 was problematic, but they did not have to impose any irrigation ban even though 2016 was more critical than 2018. The water use trend in the municipality has not changed perceptibly over the last years. The total amount has increased a bit, but due to an increase in the population.

Due to the good levels of groundwater in Mullsjö, the main focus is to produce water of good quality rather than work on insufficient quantity. (C. Johansson)

To make a change in the citizens’ behaviour regarding water use, C. Johansson thinks the solution is to increase the price since drinking water today has low price in Sweden.

5.5.1 Intervention strategies for reducing the citizens’ water use

C. Johansson says that they do not have any *commitment* or *goal* set between the municipality and its citizens that aims to change the citizens’ behaviour regarding their water use. However, Mullsjö Energi & Miljö strive for internal goals. Two of them are to deliver water of good quality and to keep the systems efficient and well-functioning. “We do not have any goals set; our goals are to make sure we deliver water of good quality according to the existing directives.” (C. Johansson)

The only way Mullsjö Energi & Miljö spread *information* and communicate with their citizens is through the municipality’s website. They do not use any special campaigns or tailored information, but the citizens can contact the company’s customer support for specific inquiries. (C. Johansson)

C. Johansson says that they do not use any *modelling* that aims to change the citizens’ behaviour regarding their water use.

Feedback, rewards and prompts that aims to change the citizens' behaviour regarding their water use is not used by the municipality. This is because there is no need for this due to good groundwater levels. (C. Johansson)

5.6 Table of the municipalities' use of intervention strategies

	Värnamo municipality	Eksjö municipality	Habo municipality	Mullsjö municipality	Jönköping municipality
Commitment	✘	✘	✘	✘	✘
Goal setting	✘	✘	✘	✘	✘
Information	●	●	●	●	●
Modeling	●	●	✘	✘	✘
Feedback	✘	●	✘	✘	✘
Reward	✘	✘	✘	✘	✘
Prompts	✘	✘	✘	✘	✘

Table 1: The table shows an overview of which intervention strategies the municipalities use in their communication work regarding drinking water. The circle means the intervention strategy is being used, and the cross means the municipality does not use the intervention strategy.

6. Discussion

In this section, the result from the interviews will be compared to analyse the similarities and differences the municipalities have regarding the communication of their drinking water. The discussion starts with a comparison of the municipalities' situation and possibilities regarding their groundwater sources and previous work of communication of drinking water. With that in mind, a discussion of how the municipalities work is compared to the intervention strategies.

What can be shown in the result, the municipalities have had different experiences of the low groundwater levels during the past years. Because of this, they have focused on different areas, depending on how they were affected.

Even though Jönköping municipality can see a decrease in the water levels, it is not so severe they felt the need of implementing water restrictions for the citizens. The municipality's vast amount of water has made them able to focus on the quality of the water in Vättern. Both

Jönköping and Habo are working with efficient use of water and a sustainable rules of conduct to water. The result indicates that Habo neither has experienced a lack of water in recent years nor implemented water restrictions for the citizens. Instead, Habo municipality focuses on decreasing leaking of pipes and expanding the municipality's water system as the community grows. Even though Habo was not as affected as other municipalities, they published a request to the citizens to decrease their use of water, of the purpose of loyalty to the other municipalities.

Mullsjö municipality's primary focus is, as well as Habo, to work with improvement of the pipes and quality of the water. Mullsjö municipality has not been affected by water scarcity. Instead, the water level has been seen as sustainable. They introduced an irrigation ban in spring 2018, which lasted four weeks before it was removed.

Compared to the previous municipalities, Eksjö has been the municipality experiencing scarcity of water the most during the past three years. As the result shows, Eksjö municipality introduced water restrictions in 2018 that lasted until spring 2019. The decision was made to withdraw the restrictions to retain the citizens' trust towards the municipality and to receive a greater response if a water crisis would occur during 2019. In combination with Eksjö municipality's high geographical location and the lack of rainfall during the past years, the spring flood flows away fast and gets split between both vegetation, evaporation and human activity. Eksjö municipality obtains water from two smaller water catchments and is considering building a third.

As the result indicates, Värnamo introduced water restrictions for the citizens in 2018, but the reason was not mainly because of water scarcity. Instead, the municipality had difficulties producing enough water for the citizens. A decrease in the use of water could be seen after the restrictions were introduced.

None of the five municipalities has any specific *commitment* with their citizens that aims to change their behaviour regarding their water use. Although some of the municipalities did have significant problems with their groundwater levels and to produce enough water, this intervention strategy was not part of their plan. T. Johansson from Eksjö Energi & Miljö argues that implementing this kind of system would demand more resources and a new administration, which would be challenging to supervise with the current system. Vähäkari from Värnamo municipality mentions that the earlier irrigation bans can be seen as a commitment, albeit this is more of a ban than a commitment. Eng from Habo municipality argumentation for defaulted commitment is that the municipality has to sell water to be able to maintain their business and its systems.

As T. Johansson argues, an implementation of this kind of system would require extensive resources and development in administration. Since several municipalities in the study have smaller administration and few workers, an investment in this kind of expansion did not seem to be prevailing in the majority of cases. Since several municipalities have not experienced significant issues with the groundwater level, they seem to have prioritized water quality and advancement in current systems.

The municipalities do neither work with *goal setting* to change the citizens' behaviour regarding their water use. A recurrent matter of fact is that the municipalities mention that they do have internal goals to strive for, which all municipalities except Jönköping municipality are bringing up. However, Rohdin from Jönköping municipality says that he thinks that the working force does have the knowledge to change the citizens' behaviour, but not enough resources.

Goal setting is often used in combination with other interventions, for example, commitment (Abrahamse et al., 2005). Since many of the municipalities do not use commitment as an intervention strategy to change behaviour, it can be a reason why goal setting is not used either. Due to lack of commitments, there are no goals set to reach these commitments.

The most commonly used intervention strategy used by the municipalities is *information*, although it is clear that the municipalities spread information in different ways. Eksjö municipality, for instance, is a small municipality, but due to low levels in groundwater, they have maintained a substantial work to reach its citizens. Jönköping municipality does also spread information, although they have high quantities of water. However, the water and sewage department consist of 700 employees, which indicates the amount of resources within the department. Värnamo municipality does also spread information in several ways, which probably depends on low groundwater levels and sufficient resources. As Vähäkari mention, an Open Day was organized in association with the newly built water treatment plant, which can be a reason for supplemental information was spread. Habo and Mullsjö do not spread information in the same matter as the remaining municipalities. This, due to acceptable groundwater levels, but also because of smaller administrations and fewer resources.

Since *modelling* entails to provide examples of recommended behaviours, this can be successful in creating awareness among the citizens. A pattern in Jönköping county shows that the municipalities with groundwater issues are also the ones that have used modelling as a method to reach the citizens. One assumption could be that the municipalities with the most resources are also the ones using modelling to change behaviour. Although, this assumption does not cohere with the result. Eksjö municipality has presented models or demonstrations in movies and brochures on how to use the water in a sustainable way, which can be seen as a way of modelling. In Värnamo municipality modelling is being used by the energy director.

When interpreting the result, it is explicit that the municipality with the biggest complex of problems is the one that has been using *feedback* as an intervention. Eksjö municipality is the only municipality that use feedback in their communication work. In 2017 the municipality published a graph of the citizens water consumption and in 2019 they have spread positive feedback on social media. The four remaining municipalities do not use feedback. One reason why the municipalities do not use it even though experiencing low levels of groundwater can be lack of resources, which Vähäkari from Värnamo municipality mentions.

None of the municipality is using *rewards* that aim to change the citizens' behaviour regarding their water use. Rewards may serve as an extrinsic motivator to save or reduce the water use.

Still, none of the municipalities is using this intervention strategy. A reason for this can be a lack of resources, but also insufficient knowledge about this kind of intervention strategy and its advantages.

Prompts can be useful when a certain behaviour needs to be activated, although only Eksjö municipality used this kind of intervention strategy. It is clear that the municipality with the most significant issues is also the one that has used prompts. The reasons why the other municipality does not use prompts is due to good quantity of water resources.

To answer the first question at issue *How do the municipalities work with the communication to the citizens with the purpose to reduce the households' use of water?*, the result shows that all the municipalities are working with some sort of communication, but the ways vary depending on their prerequisites. When comparing the intervention strategies with the municipalities' ways of communicating, one can see all municipalities use information, but the extension varies. Jönköping municipality has been spreading information through different channels, including movie commercials, billing and brochures to all households with tailored information. Eksjö municipality has spread information by sending out brochures, talking in radio, newspaper, website and movies made from the brochures was played in different stores. Värnamo municipality spread information through website, media, newspaper, study visits, open day and Värnamodagarna (Värnamo days). Habo municipality used websites and social media as channels to spread information. Mullsjö municipality has only been using the website to spread information.

To answer the second question at issue, *Do the municipalities communicate in different ways? If so, why?*, the result shows that the municipalities do communicate in different ways. It appears that the chosen method to communicate varies among the municipalities, which depends on several reasons. There is a clear pattern between the communication work and the municipalities water situation. Eksjö municipality is the one with the most developed communication work aiming to reduce the citizens' use of water, although Eksjö is the third smallest municipality of the five interviewed. Manageable levels of water resources can be a reason why Mullsjö and Habo municipality do not have any communication work, to reduce the citizens' use of water. Another possible reason could be the fact that they have fewer resources, which is the case for Mullsjö and Habo municipalities. However, this assumption does not correlate to this hypothesis. If it had been according to the hypothesis, the largest municipalities would have been the ones with the most developed communication program, which is not the case. Instead, it is Eksjö municipality, which is the third smallest municipality of the five interviewed.

To answer the third question at issue, *Do the municipalities have an ambition to create a behavioural change through their communication work among the citizens, regarding the use of household water? If so, how?*. The result shows that the majority of the municipalities interviewed do not have the ambition to create a behavioural change among the citizens. The only municipality that deliberately aimed to change behaviour through their ways of communicating was Eksjö municipality. Eksjö municipality's comprehensive communication

aims to change the citizens behaviour. The way Eksjö municipality used modelling as a strategy is a demonstration of this. Värnamo municipality did also use modelling as a strategy. But, since the model aims to reduce the use of water without changing citizens' behaviour, it is not possible to state that they intentionally use behavioural change.

7. Conclusion

As Abrahamse et al. (2005) mention, a combination of different interventions is a successful way of reaching out to the target group. Thereby, the municipalities would benefit by using several intervention strategies in combination to achieve a better communication outcome. It can be related to how Eksjö municipality combines feedback, information and modelling to reach greater penetrating power.

To return to the social dilemma Tragedy by the Commons. The study contributed to a mapping of the municipalities' communication to its citizens, aimed to prevent problems caused by the dilemma. Thereby this mapping can be used as a basis for future investigation and improvements of communication for the municipalities.

In summary, there is an ongoing communication process within all the municipalities, although, actions are being taken first when the problem occurs. There is no ongoing prevention work to change the citizens' behaviour that aims to reduce their use of water. In the result, a request for a national communication plan was mentioned. The request implicated to create greater awareness among the citizens regarding the sustainable use of drinking water. Therefore, it would be of interest to investigate and compare other counties and their municipalities' communication work as future research. The research could contribute to the process of a regional plan and, in the future, a national plan of how to reach out to the citizens and create greater awareness of sustainable use of water.

References

- Abrahamse, W., Steg, L., & Rothengatter, T. (2005). A review of intervention studies aimed at household energy conservation. *Journal of Environmental Psychology, 25*, 273–291. doi: 10.1016/j.jenvp.2005.08.002
- A, E. E., & Hoekstra, A. Y. (2016). European water footprint scenarios for 2050. *Water, 8*(6), 226. doi: <http://dx.doi.org/10.3390/w8060226>
- Becker, L. J. (1978). Joint effect of feedback and goal setting on performance: A field study of residential energy conservation. *Journal of Applied Psychology, 63*(4), 428–433.
- Bryman, A. (2008). *Samhällsvetenskapliga metoder*. Liber: Stockholm.
- Gardner, G.T. & Stern, P.C. (2002). *ENVIRONMENTAL PROBLEMS and HUMAN BEHAVIOR*. Pearson Custom Publishing, Boston.
- Globala målen. (2015). *Mål 6. Rent vatten och sanitet*. Retrieved 3rd of April from: <https://www.globalamalen.se/om-globala-malen/mal-6-rent-vatten-och-sanitet/>.
- Hardin, G. (1968). Tragedy of the Commons. *Science, 162*(3859), 1243–1248. doi: 10.1126/science.162.3859.1243
- Havs- och Vattenmyndigheten. (2016). Sammanställning av länsstyrelsernas erfarenheter och konsekvenser för vattenresurser och vattenmiljön av vädersituationen under 2016. Retrieved from 4th of May from: <https://www.havochvatten.se/download/18.5114cf181604c603d488f467/1513775779883/sam>
- Hayes, S. C., & Cone, J. D. (1977). Reducing residential electrical energy use: Payments, information, and feedback. *Journal of Applied Behavior Analysis, 10*, 425–435.
- Hjerm, M. et. al. (2014). *Introduktion till samhällsvetenskaplig analys*. Gleerups Utbildning AB: Malmö.
- Krisinformation. (2017). *Vattenbrist hotar stora delar av landet*. Retrieved on the 13th of April from: <https://www.krisinformation.se/nyheter/2017/maj/vattenbrist-hotar-stora-delar-av-landet>
- Lindahl, T., B. Stikvoort. (2015). *Nudging: The new black in environmental policy*. Fores Study 2015:3. Stockholm, Sweden.

- McClelland, L., & Cook, S. W. (1979–1980). Energy conservation effects of continuous in-home feedback in all-electric homes. *Journal of Environmental Systems*, 9, 169–173.
- Pallak, M. S., & Cummings, N. (1976). Commitment and voluntary energy conservation. *Personality and Social Psychology Bulletin*, 2(1), 27–31.
- Regeringskansliet. (2018). *Vattennivåer och vattenförsörjning*. Retrieved on the 5th of April from: <https://www.regeringen.se/regeringens-politik/torkan-och-varmen-2018/vattennivaer-oc>
- Rosengren, K & Arvidson, P. (2005). *Sociologisk metodik*. Liber: Malmö. Upplaga 5:2
- Sveriges meteorologiska och hydrologiska institut. (2016). *Grundvatten*. Retrieved 10th of May from: <https://www.smhi.se/kunskapsbanken/hydrologi/grundvatten-1.6857>
- Sveriges Geologiska undersökning. (n.d). *Klimatförändringar – så påverkar de mark och grundvatten*. Retrieved 4th of April from: <https://www.sgu.se/samhallsplanering/planering-och-markanvandning/grundvatten-i-planeringen/klimatforandringar/>
- Sveriges Geologiska Undersökning. (n.d). *Så påverkar klimatförändringar grundvattnet*. Retrieved 4th of April from: <https://www.sgu.se/samhallsplanering/planering-och-markanvandning/grundvatten-i-planeringen/klimatforandringar/paverkan/>
- Svenskt Vatten. (2016a). *Om vattentjänstlagen*. Retrieved on the 28th of May from: <https://www.svensktvatten.se/vattentjanster/juridik/vattentjanster-regler-fragor-och-praxis/>
- Svenskt Vatten. (2016b). *VA-organisationen*. Retrieved 4th of April from: <http://www.svensktvatten.se/vattentjanster/organisation-och-juridik/va-organisationen/>
- Svenskt Vatten. (2019). *Drinking Water Facts*. Retrieved 4th of April from: <http://www.svensktvatten.se/fakta-om-vatten/dricksvattenfakta/>
- Unicef. (2016). *Climate Change*. Retrieved 3rd of April from: https://www.unicef.org/wash/3942_4472.html
- United Nations. (2018) *Sustainable development goals. Goal 6: Ensure access to water and sanitation for all*. Retrieved 3rd of April from: <https://www.un.org/sustainabledevelopment/water-and-sanitation/>.
- United Nations. (n.d). *Water*. Retrieved 3rd of April from: <https://www.un.org/en/sections/issues-depth/water/>.
- Winett, R. A., Leckliter, I. N., Chinn, D. E., Stahl, B., & Love, S. Q. (1985). Effects of television modeling on residential energy conservation. *Journal of Applied Behavior Analysis*, 18, 33–44.

Appendices

Appendix I: Interview guide Swedish

Inledande frågor:

- Är det okej om vi spelar in intervjun för att kunna senare transkribera?
- Önskar du att vara anonym?

Organisation och ansvarsområden

- Vad är din roll på kommunen?
- Vad är dina huvuduppgifter?
- Hur är organisationen kring VA-arbetet uppbyggt? / Hur är organisationen kring kommunikationsarbetet uppbyggt?
- Hur arbetar ni med vattenfrågan i relation till miljö och hållbar utveckling? / Hur kommunicerar ni ut vattenfrågan i relation till miljö och hållbar utveckling?

Vattensituation och kommunikation 2018

- Hur påverkades ni som kommun av de låga grundvattennivåerna i samband med den varma sommaren 2018?
- Infördes några vattenrestriktioner av dricksvatten för medborgarna i er kommun?
 - Om ja, hur såg de ut och hur kommuniceras detta ut till medborgarna?

Vattensituation och kommunikation idag

- Hur ser grundvattennivåerna ut i er kommun idag?
- Finns några restriktioner?
- Finns något snitt på hur mycket dricksvatten en medborgare använder per dag i er kommun?
- Kan ni se någon trend för vattenanvändningen i kommunen?

Beteende och kommunikation

- Hur arbetar ni för att nå ut till kommunens invånare när det kommer till dricksvattenanvändning och hur man ska minska sin användning?
- Vad tror du krävs för att det ska ske en förändring hos medborgarna och deras minskning av dricksvattenanvändning?
- Hur arbetar ni idag för att uppmuntra medborgarna till ett mer hållbart användande av dricksvattnet?
- Anser du att ni har resurser och kunskap för att påverka beteende hos medborgarna?

- Enligt Svenskt Vatten bör varje individ inte konsumera mer än 140 L dricksvatten om dagen. Finns det någon överenskommelse mellan kommunen och dess medborgare om hur dricksvattenanvändningen ska se ut i er Kommun?

- Finns det någon målsättning med hur medborgarnas vattenanvändning ska se ut?

- Sprider kommunen ut någon typ av information om kommunens vattenresurser?
 - Är det skraddarsydd information? Workshops? Massmedia?
- Sprider kommunen ut någon kunskap om alternativa metoder för att minska vattenanvändningen?
- Att presentera en modell som är användbart eller relevant kan va ett vinnande koncept för att få människor att efterlikna modellen och dess syfte.
- Har ni använt er av modellering med syfte att minska vattenanvändningen hos medborgarna? T.ex. genom effektiva bevattningssystem.
- Får medborgarna någon typ av feedback vid kring deras vattenanvändning? I både positiv och negativ bemärkelse.
- Finns några fokusgrupper med kommunens medborgare som arbetar för minskad vattenanvändning?
- Det har visat sig att belöningar kan fungera som en morot om man vill främja vissa beteenden, är det något som ni använder er av i er Kommun när det kommer till minskning av dricksvattenanvändning?
- Det har visat sig att små påminnelser i hushållen kan bidra till en beteendeförändring, t.ex. klistermärken. Är det något ni i någon form ger kommunens medborgare?
- Vad tror ni som kommun är lösningen för att minska hushållens vattenanvändningen så att den blir mer hållbar?

Avslutande frågor

- Slutligen, vad har ni för framtidsplaner när det kommer till hur kommunen ska hantera sina vattenresurser och hur ni ska nå ut till medborgarna kring dricksvattenhanteringen?
- Har ni något som ni vill tillägga innan vi avslutar?
- Skulle det vara okej om vi eventuellt kontakta er för kompletterande frågor?

Tack för ditt deltagande!

Appendix II: Interview guide English

Initial questions:

- Would it be okay if we record the interview?
- Would you wish to be anonymous?

Organization and responsibility

- What is your role within the municipality?
- What are your main tasks?
- How is the organization built-up around the water and sewage department? / How is the organization built-up around the communication department?
- How do the municipality work with water in relation to sustainable development? / How does the municipality communicate on the water in relation to sustainable development?

Water situation and communication 2018

- How did the municipality get affected by the low groundwater levels in relation to the heat wave during summer 2018?
- Did the municipality implement any water restrictions for the citizens?
 - If yes, how did you communicate this to the citizens?

Water situation and communication today

- What is the current groundwater situation in the municipality today?
- Are there any restrictions implemented?
- What is the water cut per person and day within the municipality?
- Is there any clear trend for the municipality's use of water?

Behaviour and communication

- How do the municipalities work to reach its citizens regarding their use of drinking water and the reduction of it?
- What do you think is the solution to create a change among the citizens and their reduction of drinking water?
- How does the municipality work today to encourage the citizens to a sustainable use of drinking water?
- Do you think the municipality do have enough resources and knowledge to influence the citizens' behaviour?

- According to the Svenskt Vatten, every individual should not consume more than 140 litres of drinking water per day. Is there any commitment among the municipality and its citizens regarding the use of drinking water and how the use of water should look like?
- Does the municipality have any goals set aimed at reducing the citizens' water use?
- Do the municipality spread any kind of information about its water resources?

- Tailored information? Workshops? Mass media?
- Do the municipality spread any knowledge about alternative methods to reduce the use of drinking water?
- To present a relevant or usable model can be a good idea to make people imitate or copy the models and their purpose. Has the municipality used any kind of modelling with the purpose to reduce the citizens' water use?
- Do the citizens receive any kind of feedback on their water use? In both positive and negative sense?
- Are there any focus groups within the municipality that work on reducing the use of drinking water?
- Rewards can be used as a method to encourage certain behaviours. Do the municipality use rewards that aims to reduce the citizens' use of water?
- Prompts is another method that can be used to encourage a behavioural change, e.g. stickers. Do the municipality use this kind of method?
- What do you think is the municipality's solution to reduce the households' water use and make it more sustainable?

Concluding questions

- Finally, what are the future plans for the municipality considering the management of water resources and communication towards the citizens?
- Is there any information you would like to add?
- Would it be okay if we contact you for further information?

Thank you for participating!