Overcoming the Investment Gap: A Multiple Case Study of Strategy Development in Swedish Water & Wastewater Organisations

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Abstract

Sweden grapples with a critical issue: its extensive water infrastructure is nearing the end of its lifespan. While investment shortfalls increase this challenge, concerns linger about the potential mismanagement of existing assets. This research investigates how Swedish water utilities are strategically managing their ageing infrastructure. By exploring their utilisation strategies, the study aims to identify the challenges in managing the assets leading to the investment gap.

This study employs a multi-case study approach of five Swedish water and wastewater organisations to explore the strategic infrastructure challenges in the Swedish context. The research explores how strategy is conducted in practice to face the current challenge by analysing interview data from key stakeholders, managers and experts. The approach combines infrastructure asset management and the resource-based view in the organisation's context to analyse the current state.

Utilising the four different strategy lenses of design, variety, experience, and discourse, we conclude that even though organisations have different local conditions and prioritisation, water systems have similar strategic challenges. Organisations require increased economic control to get political support. National discourse has a widespread effect on this as well. General discourse on IAM is not widespread or utilised by practitioners. Organisations must establish focus by breaking down the challenge with clear guiding policies.

Smaller organisations have a better focus but face the threat of not having enough resources to face the increased requirements. Municipalities with more urgent needs have better cohesion and less misalignment regarding finance and prioritisation but lack the resources and capabilities to strategise.

Opportunities in organisations are that past truths are challenged with new expertise entering the sector. A holistic approach to asset control fosters synergy and system efficiency. However, human resources remain a significant challenge, with a universal need for increased capacity. This calls for better cohesion between all actors, which is lacking in the sector. This suggests that the system is in need of a holistic approach in approaching strategic work within municipalities, the water and wastewater system could benefit from clearer asset requirements.

Keywords: infrastructure asset management, water utilities, investment gap, public sector strategy

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Glossary

HBI *Hållbarhetsindex* en: Svenskt Vatten's Sustainability Index
LAV *Lag om allmänna vattentjänster* en: Water Services Act
SKR *Sveriges kommuner och regioner* en: Swedish Association of Local Authorities and Regions
SV *Svenskt Vatten* en: Swedish Water and Wastewater Association
Kommunallag en: The Municipality Act
W&WW Water and Wastewater
KPI Key Performance Indicators
RBV Resource Based View
AM Asset Management
AMS Asset Management System
IAM Infrastructure Asset Management
SAMP Strategic Asset Management Plan

Chapter 1

Introduction

1.1 Background & context

Water is a fundamental part of human lives. Compared to other parts of the world, Sweden has a lot of fresh water with a working water infrastructure. However - much of Sweden's water infrastructure is reaching its end-of-life cycle. This issue is not exclusive to Sweden, nor water utilities in particular, but can be seen in many other countries that had extensive societal progress in the second half of the 20th century. Likewise, other utilities and public infrastructure face similar issues regarding re-investments and maintenance, such as Sweden's rail network, where we frequently find a break in services.

The state of Swedish water and wastewater (W&WW) infrastructure is presented by the trade association Svenskt Vatten (en: Swedish Water and Wastewater Association) (Svenskt Vatten 2023c). Svenskt Vatten estimates the yearly need for investments to be 31 billion SEK. Still, the yearly investments are at 20 billion SEK, i.e., a yearly investment debt of 10 billion SEK—meaning a growing backlog and increasing investment debt for each passing year.

To simplify, if the water infrastructure is built to last for 100 years, it implies that 1% needs to be renewed or replaced every year. But any part of the infrastructure that isn't renewed adds up to a growing pile of needed renewals. This pile keeps growing each year since more parts become overdue

for renewal, meaning the investment gap is getting bigger and bigger.

Svenskt Vatten states that organisations need to strengthen their ability to make investments to decrease their investment debt. They suggest that increased organisational capacity in terms of competence, planning, investing, and implementation is needed. (Svenskt Vatten 2023c)

The municipalities administrate Swedish water utilities. Funding is through water tariffs, which can be partly fixed and partly variable. These tariffs are decided by the municipal council and are separate from municipal tax. Water utilities are not allowed to make a profit, which, for instance, means they have to borrow money to make new or re-investments. This means a large upcoming cost increase since much of the existing assets have already been depreciated. (Svenskt Vatten 2023a)

However, the problems cannot simply be solved by raising the grants since the issue is more complex than that. Like other assets, these existing ones must be used smarter and more efficiently. A topic that has gotten more attention in academia concerning the existing infrastructure is infrastructure asset management (IAM). This begs the question, **how are Swedish W&WW utilities organising and strategising for better utilisation of these assets, and is this done at all?**

1.2 Problem formulation

Water utilities worldwide face multifaceted challenges in ensuring sustainable management and distribution of water resources. Among these are the strategic considerations of Swedish water utilities of various sizes. Despite the increasing emphasis on strategic frameworks for optimising asset performance, the extent to which Swedish water utilities of different sizes integrate these frameworks into their strategic approaches remains unclear. This strategy knowledge needs further investigation.

1.3 Purpose

This thesis aims to research how Swedish W&WW organisations conduct strategic work to address the increasing investment challenge with ageing infrastructure. We aim to understand the W&WW organisational environment and analyse the challenges and opportunities of forming a strategy within the top organisational management. This research aims to examine the strategic landscape of the W&WW sector, with a focus on investigating the investment gap.

1.4 Focus and delimitations

In this project, we have only examined the Swedish context. Research and evidence have been gathered from international sources, but this thesis focuses on Sweden's W&WW infrastructure. Another delimitation is that we have not emphasised politics. While politicians are a big stakeholder in this area, the emphasis is on the civil servant part. We have not explored the operational and environmental procedures of the sector's core activity of purifying and distributing water.

1.5 Project objectives

The initial objective was to conduct a current situation analysis of the W&WW sector, including a review of the current business environment. This involved investigating regulatory constraints, financial barriers, and institutional limitations that limit adequate investment in W&WW infrastructure. This analysis should give the reader a greater understanding of the W&WW sector and its present and future difficulties.

Secondly, we wanted to know how organisations choose strategies and how information is integrated. We interviewed managers from five different organisations, asking them about their current needs and how they are addressing them, their methods, and how information is integrated into this process. We have tried answering this by relating their answers to theory and

analysing strategy development through four lenses, highlighting the value of viewing strategy in the sector from different perspectives.

Lastly, we wanted to know if organisations are facing similar difficulties.

1.6 Research questions

The research questions:

- **RQ1**: What are the different organisational constellations in the Swedish water utility sector, and how do these constellations impact the efficiency and effectiveness of water utility management?
- **RQ2**: How are organisations using information to manage large infrastructures effectively?
- **RQ3**: Do water utility organisations face similar difficulties when trying to overcome the investment gap?

1.7 Relevancy of the thesis subject

In a publication from Kommuninvest by Thomasson and Jonsson (2022, p.11), we learnt that there have only been a few studies about how municipalities work strategically with maintenance and also a few examples of actual municipalities working strategically with maintenance.

Similarly, Gavrikova et al. (2020) did a meta-analysis and systematically reviewed over 700 articles on asset management with a focus on strategic aspects. Their conclusions include a demonstration that 'strategic asset management is important, while still underdeveloped, area of research'.

Ugarelli and Sægrov (2022) argues in 'Infrastructure Asset Management' that technical students are in need of a multi-disciplinary curriculum: 'the educational programs' requirements for students of urban water systems have to move from purely technical to a multi-disciplinary curriculum'. This confirms the relevance of taking an interest in this subject as industrial engineering and management students.

1.8 Target group

The target group is fellow master students interested in managing utilities and other large infrastructure. Academically, this study is of interest to researchers in utilities management and targets decision-making within the utility sector.

1.9 Report structure

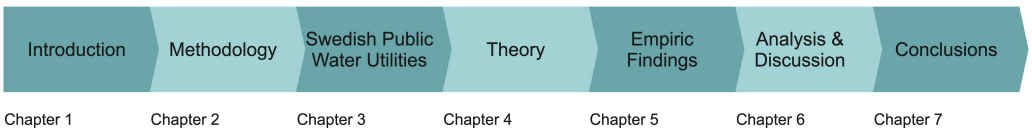

Figure 1.1: The chapter structure of this thesis.

The thesis structure is shown in Figure 1.1. The thesis begins by providing an overview of the study's significance within the research area, outlining the key questions to address. Then, a more detailed methodology was employed in conducting the research, including the rationale behind the chosen research techniques and their application. This methodology lays the foundation upon which the subsequent theoretical exploration is built.

The third chapter provides essential insights into the organisational structure of Swedish W&WW utilities. Chapter four explores the theoretical frameworks necessary for systematically analysing the multi-case study. This includes exploring Infrastructure Asset Management (IAM) principles and different views on Strategy. It also includes an introduction to the four strategic lenses to be used for the analysis in chapter six.

Chapter five presents the empirical findings obtained through interviews, document analysis, and observational data triangulation. Subsequently, these findings are analysed and discussed in chapter six, exploring their implications concerning the theoretical frameworks established earlier. This analysis also identifies potential routes for further research.

Finally, the thesis is concluded by answering the research questions. Thereafter: the references and appendices.

Chapter 2

Methodology

This chapter aims to explain how the research was done and to establish the reliability and trustability of the research result. First, the section on Research choice, and secondly, Research design, thirdly, Research quality.

2.1 Research choice

According to Höst et al. (2006) a master thesis is a 'temporary investment to create a unique product, service, or another outcome'. To accomplish this, a qualitative multi-case study has been conducted. Robert Yin (2018) suggests that a case study is a well-suited research methodology for answering 'How' and 'Why' questions. Yin and Höst et al. have been the main sources when choosing a methodology for this thesis. Our research is set out to explore the process of strategising in Swedish water utilities. Hence, a qualitative approach is to be chosen above a quantitative one. This section will further explain how we have chosen to conduct our research. A summary illustration of research choices is seen in figure 2.1

By examining the strategies utilised by Swedish water utilities to address the pressing challenge of ageing infrastructure, we had the opportunity to understand further how strategy unfolds in practice. This finding allowed us to get initial insights into the differences and similarities water utilities face when practising strategy. The intention was to understand potential

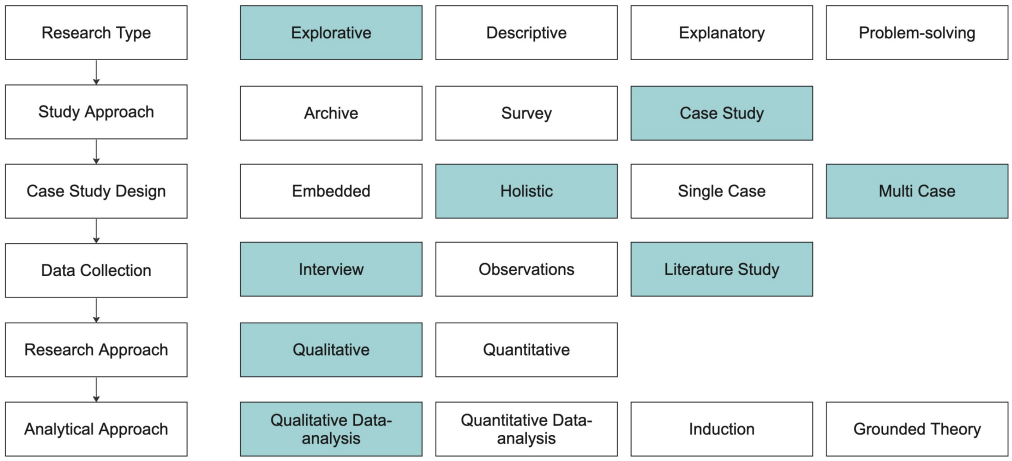

Figure 2.1: Summarised illustration of research choices

relationships and identify further research questions. This is well suited for an exploratory study. However, for research that covers a broad topic, such as our research questions, we note that the research design may intersect with other research types (Yin 2018).

The most common methods used when conducting an exploratory study are interviews of a certain focus group combined with a literature study. A case study method is recommended by Höst et al. (2006) for studies relying on open-ended interviews. For our research, a multi-case study was conducted. We will evaluate each case separately and then analyse cross-case findings to answer our research questions. As the topic of strategy is very broad, we intend to apply a holistic design focusing on how different aspects of strategy are interconnected instead of focusing on any single aspect of strategy.

A different approach to our research could be a single case study where we delve deeper into the inner parts of the strategy process. The Swedish water utilities are public and have many organisational forms and sizes. In this study, we used several organisations to answer the research questions. The number of cases selected was set out to be no more than ten because of the time limitations of the project. Ten interviewees participated in seven interviews involving five water organisations and two industry experts. Further discussion on this can be seen on page 15. We should acknowledge

that the primary focus of the case study is the organisations rather than the interviewees.

Yin suggests it's important to align the analytical approach with the research goals (Yin 2018). Our research aims to understand how organisations approach and choose strategy. This is based on qualitative primary information, and a well-suited analytical approach to this is a qualitative analytical approach. One way to perform this type of analysis is to establish a 'chain of evidence' (ibid.). Data triangulation is a preferred method where a researcher finds evidence from three different sources to strengthen the trustability of the evidence.(ibid.)

2.2 Research design

We formed a research design from the research choices, as seen in figure 2.2. This section describes the different parts of the project process. The design is divided into four segments. *Problematisation*: where we developed the research questions, *literature study & design*: where the theoretical and previous research groundwork was built, which led to the creation of the case design, followed by *interviews and data collection*: setting out collecting evidence and sorting it into data, and finally *interpretation*: analysis of the multi-case study. It's important to note that the literature review was an iterative process. As the research questions evolved slightly throughout the project, key new literature was incorporated as it became available. This ongoing engagement with the latest research ensured a comprehensive and up-to-date understanding of the field.

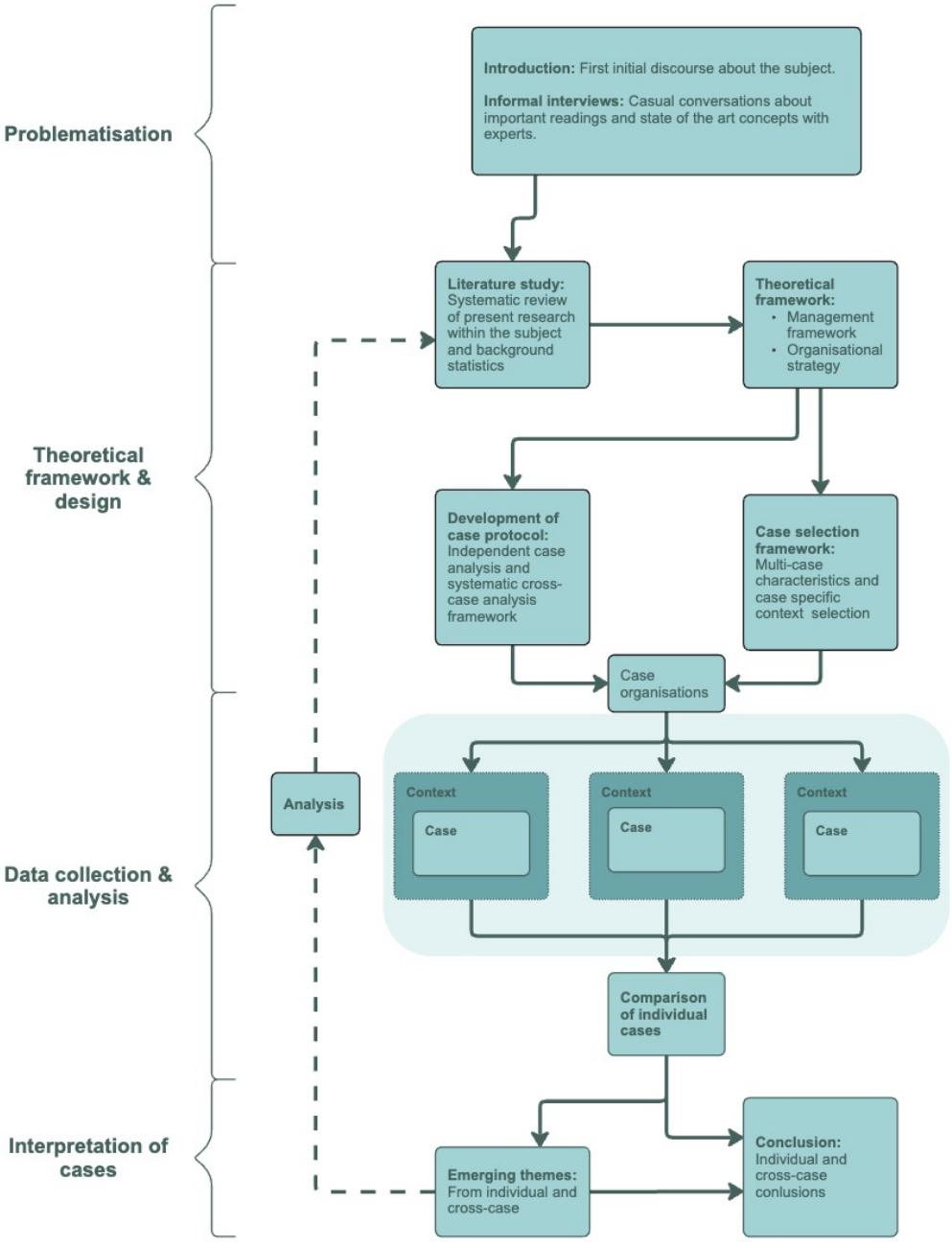

Figure 2.2: The workprocess

2.2.1 Problematisation

'Problemising reality is the first step on the path to knowledge, which cannot be skipped' – Persson (2022). Problematisation is a way to break down a research topic. It should answer questions of:

1. What do we want to know?
2. Why do we want to know it?
3. What does previous research say about the topic?
4. Are there any established theories to relate to?
5. Which method could be used to collect data for this matter? (ibid.)

The research used problematisation as a key step in refining the research question and developing the project. Initial conversations were established with research experts to understand the history of research on the subject and where research is heading. Further informal conversations with supervisors discussing the challenge and possible outcomes to understand the research scope further.

Initially, the research sought to investigate the topic of iam in Swedish water utilities. After the problematisation, a multi-case study exploring the challenges with the strategic process to tackle the investment debt in Swedish water utilities was a more feasible study for the time frame of this project.

2.2.2 Literature study

After problematising the research topic, formulating research questions, and defining the project scope, a literature review was conducted to identify key sources and establish a theoretical foundation for the interview questions. This included a study of published research and publicly available reports and documents from each of the case organisations.

Published research study

Höst et al. (2006) suggest that the initial search is best to be wide. Therefore, probing digital databases and physical libraries was the initial approach. As for the character of our research questions, peer-reviewed research within asset management and water utilities was of great interest. Research pointed us in this direction. A supplementary source of inspiration was through both our supervisors, sharing literature to widen our perspectives. The search for published literature was conducted using SCOPUS, Google Scholar, and LUB-Search databases. The main priority was on peer-reviewed research from the past decade.

As for the strategy research, the initial strategic literature was found in *Exploring Strategy* by Whittington et al. (2023). The book is an extensive collection of strategies and contains references and further readings on the topic.

Further suggested by Höst et al. (2006), from the initial search, a handful of interesting literature was selected to be analysed. During this process, a further literature search was performed to find interesting literature that suited our research within the bibliography of the most relevant literature. The results of this literature study are found throughout this project.

A summary of the literature search is found in Table 2.1 below

Documentation study

A desktop survey obtained several official reports from Swedish water utilities, such as annual reports, investment and maintenance plans, and sectoral

Table 2.1: The three main foci in the literature study.

Foci	**Sources**
Case Study Methodology	Yin (2018), Höst et al. (2006)
Strategy Research	Whittington et al. (2023), Rumelt (2011)
Asset Management & Public Sector	Keywords: asset management, water utility, public sector management, strategic asset management, infrastructure asset management

reports from the trade association SV. Due to the Swedish principle of public access to official records, most of these documents were easily accessed via the organisations' websites, while some more specific documents were attained through contact with said organisations.

2.2.3 Multi-case study design

Before conducting any interviews, a case study protocol was created following the guidelines of Yin (2018). The purpose was to clarify the thesis objectives, determine the relevant theoretical framework, identify key interviewees, outline the research questions, and structure the thesis. This pre-work ensured alignment between both researchers on data collection priorities. The initial interview guide was drafted based on this protocol, with ongoing refinement through iterative testing and feedback from peers and interviews. The interview guide, in Swedish, can be found in Appendix B, page 91.

In addition to the case protocol, we analysed each water utility organisation's latest published report. This helped us understand the organisations' challenges and ongoing projects and identify areas for further inquiry or clarification. It also streamlined our understanding of the organisations" local conditions and optimised interview preparation.

2.2.4 Interviews and data collection

To select interview organisations, we consulted with our supervisor and researched municipalities of varying sizes. We also gathered contact information from individuals in the W&WW community through published articles or sectoral reports. Our sample of organisations to contact was somewhat stochastic due to the contacts found. Our limitation was that no more than ten interviews were to be conducted, and each organisation received the same invitation email and opportunity to participate. The first to respond was the selected cases. Not all organisations responded. Due to having to fit the schedule of our interviewees, the interviews were conducted for eight weeks, which allowed us to analyse cases before interviewing the next case. As the questions were open-ended, this affected our interviews, as more light was

shed on the topic, and interview questions were tweaked a little bit along the way.

W&WW managers and organisation CEOs were targeted to understand top managerial challenges or perspectives in public water utilities. It is noted that targeting a single group of people creates biasedness in the data collection (Yin 2018). The views of politicians and operations employees most likely would differ. However, focusing on a specific group with insight into the strategic workings of the organisation generates more relevant data in answering the research questions. The interviews were conducted in Swedish using an open and semi-structured format. All interviewees and organizations remain anonymous, as our focus is on their responses and how they contribute to understanding the issue.

The interviews were conducted using a combination of digital and physical methods. This approach allowed us to reach organisations far away from our location and the ability to meet the people of the organisation face-to-face to get a better connection and more easily observe their strategic practices and administrative and operational facilities firsthand. It also facilitated informal conversations with employees beyond the interviewees, offering valuable insights into organisational dynamics. Furthermore, each interview was recorded and transcribed later for further analysis. See the description of which utilities we came in contact with in Table 2.2

2.2.5 Multi-case study analysis

We employed a detailed, iterative case study approach. After each interview, an initial analysis was made to identify key themes and recurring vocabulary. This analysis helped us refine our focus for subsequent interviews. Following this, we transcribed all the interviews, resulting in over 47,000 words of data. Later, the transcripts were revisited to highlight particularly insightful passages and memorable quotes. Following transcription, we coded the interviews according to Yin (ibid.), creating a comprehensive case study database. This involved identifying over 20 categories within each case and outlining seven broader themes that cut across all the cases. These cross-

Table 2.2: Table of interviewees with their respective roles and utility.

Organisation#	**Role**	**Type of organisation**
1	CEO of enterprise	Multi-utility enterprise
2	Head of W&WW	Municipal-owned collaborative organisation
3	Head of W&WW	Municipal form of administration
3	Engineer	Municipal form of administration
4	Head of W&WW department	Multi-utility enterprise
4	Projekt manager	Multi-utility enterprise
4	Strategist	Multi-utility enterprise
5	Permanent Secretary	Municipal form of administration
6	Strategist	Trade association
7	Senior Consultant	Consultant company

case themes formed the initial framework for our analysis, fostering a holistic understanding of the data.

Triangulation

In qualitative analysis, triangulation is used to increase the credibility of the collected empirical evidence. This study used triangulation by analysing interviews, public and internal documents, and observations of internal processes or solutions. Conducting a multi-case study by itself is also a form of triangulation (Yin 2018).

2.3 Research quality

Robert Yin (ibid.) expresses that credibility is important in case-study research as it may be less rigorous than quantitative experiments. The four criteria for highlighting credibility are validity, reliability, generalisability, and objectivity. Yin (ibid.) also highlights the importance of researchers being transparent with methodology to ensure credibility.

2.3.1 Validity

Validity measures the quality of the data used. Valid data is relevant to the case and has been confirmed by multiple sources. Yin argues that case studies can gain construct validity through triangulation and a strong chain of evidence on how your data collection, analysis, and interpretation support your conclusion (Yin 2018). Triangulation was established through interviews, document analysis and observations when constructing the multi-case study. In addition, interpretations are compared to the literature to increase accurate conclusions.

2.3.2 Reliability

Reliability is the ability of the research results to be consistent and repeatable. A similar study from a similar pool of cases should lead to the same results if reliable (ibid.). Ensuring the results from a case study are reliable is harder than for a quantitative experiment; however, creating a clear case-study protocol detailing data collection methods, theory groundwork, and member-checking (confirming insights with other interviewees) projects can establish good reliability.

In this study, a case study protocol was created and used throughout the project. Empirical evidence was also validated by frequent conversations with our supervisor, who could confirm similarities in their observations. Some validation between case study participants was performed through a network meeting where several project leaders from different utilities discussed project issues.

2.3.3 Generalisability

Generalisability is the possibility of generalising the results of the study. Case studies face the challenge of being very focused on a specific case and are oftentimes not representing a more general setting. Yin (ibid.) suggests some techniques to increase the generalisability of a case study. Theoretical replication suggests testing case study findings on different cases, and literal

replication, where researchers study multiple relevant cases. One limitation to the generalizability of the study is whether five water utilities are enough to represent the entire population of Swedish water utilities. The results of this study are hence limited by the research design, which could research more cases. However, establishing more generalisability would decrease the nuance of the phenomena studied.

2.3.4 Objectivity

Researchers strive for objectivity, which means maintaining a neutral and unbiased perspective throughout the project, minimising biased decisions which affect the project's credibility. Qualitative research is inherently subjective. However, Yin (2018) suggests some techniques to minimise the subjectivity of the study. Triangulation, member-checking, and audit trails could be established to ensure more objectivity.

In this study, triangulation was performed by adding some member-checking (ibid.). Decisions were mostly based on communication with the researchers' supervisors, and this study is therefore subject to being less objective. However, most empirical evidence is recorded and stored and could be played back, decreasing the study's subjectivity.

Chapter 3

Swedish Public Water Utilities

This chapter aims to give a general overview, or a State of the Art, of how Swedish public water utilities are organised and how they are regulated by governing bodies.

3.1 Chapter intro

The Swedish W&WW utility sector is a municipal affair and responsibility. They follow the legislation: Lag (2006:412) om allmänna vattentjänster (LAV) (en: Water Services Act), which states that municipalities are responsible for providing W&WW services. A key insight into the W&WW sector is that funding is through water tariffs and not through municipal taxes. Hence, there is a need to distinguish between the W&WW-subscribers, the here on called *W&WW-collective* and the taxpayers, the here on called *tax-collective*. Inspiration for this chapter has been the PESTEL framework. The letters of the acronym stand for Political, Economic, Social, Technological, Legal, and Environment. (Whittington et al. 2023).

3.1.1 Some statistics

The public W&WW utility systems serve the majority of the Swedish population: 88,5 % for drinking water and 87,9 % for wastewater for the year

2021 (SCB 2024). The rest of the sewage is non-collective and individual, mostly in the countryside.

- 290 municipalities
- 3000 W&WW plants in Sweden
- 200 000 km pipes
- The W&WW tariffs differs between the cheapest and most expensive municipality by 500 %

source: Svenskt Vatten (2023c)

3.2 Legislative impact on water utilities

LAV is the main regulation in regard to water utilities. Other important legislation are 'livsmedelslagen' (en: the food act) and 'miljöbalken' (en: the environmental code.) (SFS 2006:412 2006; SFS 2006:804 2006; SFS 1998:808 1998). Further, EU regulations also affect the sector. (Svenskt Vatten 2023b)

It is only a municipal (or by extension a municipal enterprise or a joint committee) that by law can own and hence be the accountable authority, i.e. it cannot be privatised (SFS 2006:412 2006). The municipalities have a monopoly on W&WW affairs, which by extension means people could be forced to join the communal W&WW collective.

3.2.1 The water and wastewater collective

It is essential to distinguish between the tax-collective and the W&WW-collective. The tax-collective consists of every municipal citizen with a taxable income, whereas the W&WW-collective consists of the ones paying water tariffs. The property owner pays the W&WW tariffs. This difference is important since not every taxpayer is required to pay the W&WW tariffs and vice versa.

The water tariff for each municipality is a political decision set by each municipal council. The tariff is split into a fixed rate and a variable rate.

The fixed rate is the same for all subscribers, and the variable rate depends on factors such as consumption and property size. Unlike municipal income taxation, it is not proportional to income.

3.2.2 Financials

Principle of self-cost

In regulation with LAV *it is the W&WW-collective that is to hold all the costs of the W&WW.*

A connection charge is charged when new properties connect to the W&WW-collective. In accordance with LAV, W&WW utilities are not permitted to generate profit, necessitating a redefinition of the competitive aspect of strategy away from traditional private sector market competition.

Funding of the water utilities

As mentioned, the tariffs are set by the municipal councils. In addition to tariffs, municipalities may add additional funding from the tax-collective. Financing the necessary investments in W&WW infrastructure is typically achieved through obtaining mortgages, with the municipality taking the role of borrower. In Swedish municipalities, the largest lenders are commercial banks and Kommun Invest AB (Riksgälden 2009; Kommuninvest AB 2024).

Reserving funds for the future

Funds can be reserved for future use in two main ways.

Firstly, §30 of LAV allows for creating an investment fund. According to Svenskt Vatten (2016a), such a fund can exist for ten years but only applies to new investments within the W&WW sector. For renewal projects, it is limited to specific improvements, such as adding a new filter to an existing water treatment plant.

Secondly, there is also an option to create a positive balance or overdraft over a three-year period. If a surplus occurs for three consecutive years, it

must be 'returned' to the collective. (Mohamud and Bashir 2020; Qvistrom 2008; Svenskt Vatten 2016b)

3.2.3 EU regulations

About 30% of new Swedish legislation is from the EU, and even more of environmental legislation–estimated to be 80%, according to IVA and Svenskt Vatten (2022; 2023b). The time span from initial work in the EU to implementation by W&WW organisations can be 10-20 years. However, failing to influence from the start can lead to costly or difficult requirements that must be implemented later. (Svenskt Vatten 2023b)

EU directives impose requirements on Swedish legislation. In addition to the directives, the EU regulations must be followed without being transposed into Swedish law (ibid.). One example is the EU's Drinking Water Directive, which became legal on 1 January 2023, regarding requirements for water intended for human consumption. The number of substances to be monitored has increased. This includes new limit values for PFAS, arsenic, and lead effective from 2026. Member states must also report drinking water leakage to the EU Commission and may need to develop action plans if leakage is too high. (Svenskt Vatten 2022; Svenskt Vatten 2023c)

3.2.4 Monitoring

Earlier, the many laws and regulations that W&WW is to follow were presented. The control, however, is fragmented, according to Haraldsson (2022), who writes 'There are many laws regulating the production of water and sewerage services, but there is no regulatory agency that assesses the performance.'

Legislation and regulatory bodies such as the EU and the Swedish government establish the legal requirements W&WW utilities must adhere to. Regulatory authorities, such as 'tillsynsmyndigheterna', oversee Swedish W&WW utilities to ensure compliance with these requirements. Their primary focus is ensuring that the services provided do not cause environmental harm, both currently and in the foreseeable future (Svenskt Vatten 2016c).

Grantors provide utilities with permits to use the country's natural resources. Obtaining permits for activities such as drinking water supply involves a lengthy process aimed at ensuring environmental safety. The grantor is usually Livsmedelsverket or Länsstyrelsen. (Svenskt Vatten 2016c).

3.2.5 Public procurement

All W&WW organisations need to follow the Laws of public procurement (SFS 2016:1146 2016; SFS 2016:1145 2016) with procedures being open to all of the EU. Tendering processes are conducted from smaller ongoing framework agreements, e.g. service or office supplies, to multi-million projects when building larger structures, e.g. a new water treatment plant.

3.3 W&WW utility organisational configurations and layouts

Managing W&WW is no simple task, and municipalities need to organise to manage this. Matejko and Crozier (1983) defines an organisation as 'a group of people who, together, produce a result that none of them could have obtained separately'. There are, therefore, many different ways to organise; however, there are two major ways this is done within the Swedish municipalities. The organisational form can be either a municipal administration or a municipal enterprise. According to Najar (2023), 65% of utilities are organised through the traditional municipal administration.

Furthermore, the W&WW organisation can be managed by a sole municipality or through cooperation with other municipalities. The organisation responsible for managing the W&WW within the municipality could also manage other utilities; hence, organisational forms are also divided into multi-utility and single utility, see Figure 3.1 and Table 3.1 (Svenskt Vatten and Lingsten 2010). Haraldsson further highlights the opportunities and challenges that municipalities face when choosing to be a public form of administration or a public enterprise:

> 'When an activity is in the form of public administration, politicians are ultimately responsible for the budget, goals and activities. Upon corporatisation, this responsibility is transferred to the corporation's board and CEO. The role of municipal politicians is reduced to governing the corporation through ownership directives. A distance between politics and management arises' – Haraldsson (2022)

Haraldsson also addresses that collaboration increases the ability of municipalities to carry out their services, but the trade-off is the increased complexity of organising this new entity. His findings emphasise the need for improved co-ordination and management within municipal conglomerates to achieve better integration and efficiency.(ibid.).

Table 3.1: The frequency of different organisational forms.Najar (2023)

Organisational form	**Share**
Own municipal administration	65 %
Own municipal enterprise	3 %
Multi-utility enterprise	13 %
Cooperation	19 %

3.3.1 Organisational forms

Here we will present five different forms of organising in the Swedish W&WW utility sector.

Organisation in the form of public/municipal administration

This is the traditional way of organising, where the W&WW is included with the rest of the municipal administration. It is administrated by the municipality directly through, e.g. the technical office. In general, these organisations could be seen as single utilities where there is a W&WW department in the municipal technical office or similar. However, smaller municipalities may have personnel who also work for, e.g., the street office, and could hence

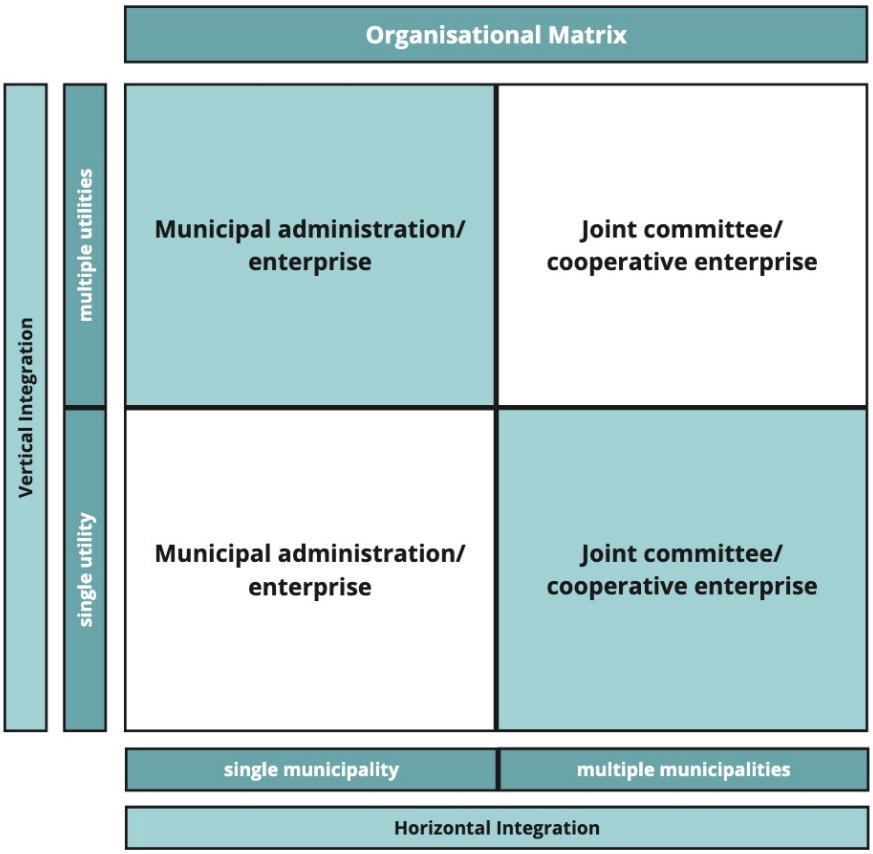

Figure 3.1: Illustration of the vertical and horizontal integrations, as well as the legal forms adopted by Swedish W&WW organisations

rather be seen as multi-utility organisations. Other municipal offices could be seen as within the same organisation. (Svenskt Vatten and Lingsten 2010)

Example: Tekniska förvaltningen i Hudiksvall, Heby - Vatten och Avlopp, Göteborg Kretslopp och Vatten

Organisation as a W&WW enterprise/LTD

A municipal-owned W&WW enterprise dedicated solely to managing W&WW operations. They can be horizontally integrated within a single or multiple municipalities. However, the organisation as an enterprise increase the distance from the municipal council, which can negatively affect collaboration between inter-municipal services.

In addition, they can create new services more easily as collaboration within the organisation is more defined. (Svenskt Vatten and Lingsten 2010) Example: NSVA, Sydvatten

Organisation in the form of a multi-utility enterprise

A multi-utility enterprise is a municipal-owned entity characterised by the vertical integration of public utilities. As such, the enterprise could manage various utilities, including W&WW, district heating, electricity grid, and waste management. The multi-utility enterprise has the ability to draw synergy effects by having a closer collaboration potential with other commercialised utilities within the enterprise. (ibid.)

The multi-utility is usually owned by one municipality, though exceptions exist (ibid.). Example: Umeå Vatten och Avfall AB, Tekniska Verken i Linköping AB

Organisation as a Collaborative organisation

A collaborative organisation represents a vertically and horizontally integrated organisational form, either a municipal-owned enterprise or a municipal association/joint committee. This type of organisation manages W&WW operations across multiple municipalities but can also manage other utilities across municipality borders. Municipalities can have their own control or joint control over investments and finances depending on how the collaboration is constructed. Municipalities can own an enterprise together or establish a joint committee, where the cost is split relatively between the municipalities, or they can agree on shares and have shared investments and finances. Furthermore, the municipalities could have their own W&WW services, operated individually or joint W&WW services operated jointly. (ibid.) Example: VA SYD, NSVA, Sydvatten

Collaborative organisation for parts of the W&WW operations

This organisation shares ownership of certain components of the W&WW operations, such as water plants or sewage treatment plants, among multiple

stakeholders. This is a more basic form of collaboration and can be utilised when collaboration is being initiated without the drawn-out and complex process of creating a public enterprise or a joint committee. (Svenskt Vatten and Lingsten 2010) Example: Sydvatten

3.3.2 Organisational examples

To demonstrate some of the different forms of organisation we have conducted three example organisations.

Lund municipality

An example of how a W&WW utility can be organised can be shown by Lund. In Lund VA SYD, a joint committee, handles the delivery of water and takes care of wastewater. However, the drinking water is produced by Sydvatten AB, an enterprise owned by circa 20 municipalities, including Lund. Sydvatten delivers the water to VA SYD, which distributes it to the customers. Furthermore, VA SYD is also a multi-utility since they're responsible for waste management in Malmö and Burlöv. The waste service in Lund is in the municipal administration. VA SYD employs 450 people. (VA SYD 2022; Sydvatten 2015)

Helsingborg municipality

In Helsingborg municipality, NSVA is the responsible water organisation. NSVA delivers drinking water and takes care of wastewater and is a municipal enterprise owned by eight different municipalities in Skåne. However, the drinking water, like in Lund, is produced by Sydvatten. Even though Helsingborg is a part of NSVA, Helsingborg's municipal council decides on the water tariffs and investments needed in Helsingborg. NSVA employs 230 people and serves 45,000 subscribers. (NSVA 2024)

Heby municipality

In Heby municipality, the W&WW is part of the municipal administration's technical office. The work place is located in near proximity to the municipal council. Heby's W&WW administration employs 20 people and serves 8,000 subscribers. (Heby kommun 2023)

Conclusion: W&WW Utility organisational configurations and layouts

We have shown that the organisation for W&WW services in Sweden is plentiful and that each model offers distinct benefits and challenges. Hence, municipalities should carefully consider which organisational forms best suit their specific needs, resources, capabilities and governance structures. By understanding these factors, municipalities can better navigate the complexities of W&WW management and strive for efficient, effective, and sustainable service delivery

3.4 Stakeholder mapping and analysis

This is a brief overview of the stakeholders in a Swedish W&WW utility organisation. This demonstrates to whom the organisation's strategy needs to cater, see figure 3.2. The stakeholder analysis has been heavily inspired by Almeida et al. (2021) and further adapted to better fit the Swedish case. The main adjustment is the view of municipal politicians as both internal and external stakeholders, since they also are the utility owner. For more detail on Almeida, see Appendix A.

Much of the stakeholder analysis have already been touched upon earlier in this chapter.

3.4.1 Internal & external stakeholders

Drawing on Haraldsson (2022), quoted in 3.3, politicians could be seen as both internal and external stakeholders; they are the asset owners and rep-

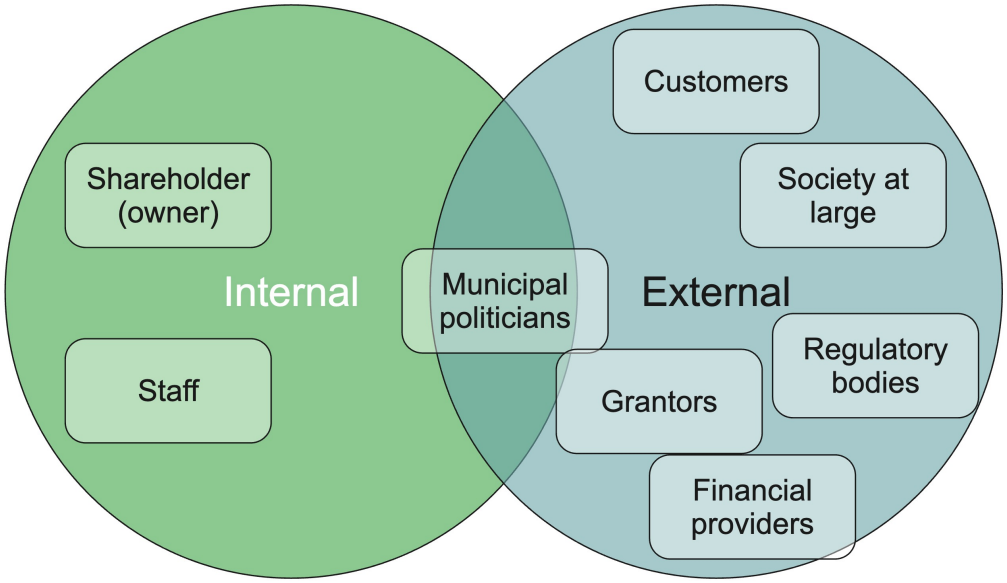

Figure 3.2: Stakeholder map of Swedish W&WW, inspired by Almeida et al. (2021), Hughes and Moore (2017) and Trindade et al. (2018).

resentatives for customers and society at large.

A shorter text on each stakeholder present in figure 3.2 will be provided.

Municipal politicians

As elected representatives, their primary focus is on managing the resources of the municipality while adhering to client demands and regulatory legislation. Additionally, they bear the responsibility of minimizing environmental exploitation. Their decisions are also influenced by the nature of Swedish politics, needing to secure their term of office, typically every four years. Politicians have an interest in the success of utility services in meeting the needs of the W&WW-collective, most often being stakeholders as private citizens as well.(Haraldsson 2022)

Shareholder (owner)

By LAV, the municipality serves as the owner of the utility (SFS 2006:412 2006). The owner is tasked with operating the utility on behalf of the mu-

nicipality's residents. As discussed earlier, the W&WW sector is a zero-sum game, and the dynamics differ vastly from a publicly listed company, but also from other municipal services. The utility owner, hence, wants to ensure population satisfaction in both cost-effectivity and service availability and quality, all while balancing this with the rest of the municipal utilities.

Financial providers

A part from the water tariffs, larger financing of necessary investments in W&WW infrastructure is typically achieved through obtaining mortgages. In Swedish municipalities, the largest lenders are commercial banks and Kommun Invest AB. (Riksgälden 2009; Kommuninvest AB 2024)

Regulatory bodies

Legislation and regulatory bodies such as the EU and the Swedish government establish the legal requirements W&WW utilities must adhere to. Regulatory authorities, such as 'tillsynsmyndigheterna', oversee Swedish W&WW utilities to ensure compliance with these requirements. Their primary focus is ensuring that the services provided do not cause environmental harm, both currently and in the foreseeable future (Svenskt Vatten 2016c).

Grantor

Grantors provide utilities with permits to use natural resources, for example, to extract water from the surface or the ground to produce drinking water. The grantor is usually Livsmedelsverket, in relation to hygiene, or Länsstyrelsen. (ibid.).

Customers – Receivers of services

The customers are the W&WW-collective, the population and the industries that pay for the services. Their needs must be central to strategic decision-making regarding the utility. The recipients of these services are indirectly connected to the utility's shareholders since the population, through election, determines who will govern the municipality.

Employees

Employee satisfaction and a sense of purpose are central to organisational success. When management demonstrates an understanding of their needs and provides a safe work environment, employees are motivated to remain with the company, strengthening knowledge capital. Employees seek opportunities for learning and challenge, and the longer they stay, the greater their potential for evolving their capabilities within the organisation.

Society at large

The societal impact of any infrastructure failure is significant, with potential consequences affecting various aspects of daily life. Failures in W&WW infrastructure can lead to flooding and unpleasant odours, highlighting the importance of its proper functioning. Additionally, infrastructure plays a pivotal role in fostering social and economic growth, offering job opportunities and contributing positively to the well-being of the population. Therefore, the effects of infrastructure extend beyond those directly paying for the services, impacting society as a whole.

Chapter 4

Theory

This chapter aims to lay the groundwork for the analyses and how we will answer our research questions.

4.1 Formulating strategy

4.1.1 Defining strategy

For this thesis, the task of defining strategy is in the context of public, non-profit organisations. Whittington et al. (2023) define strategy, in *Exploring Strategy*, generically as 'the long-term direction of an organisation'.

Furthermore, Richard P. Rumelt, a prominent researcher in the strategy theory field, defines strategy in a more nuanced way as, 'a strategy is a coherent mix of analyses, concepts, policies, arguments, and action that respond to high-stakes challenges' (Rumelt 2011). Rumelt writes that strategy is a process consisting of activities addressing the high-stake challenges an organisation faces and ultimately communicating a set of actions to respond to the same challenges. When presenting his 'kernel of strategy' (diagnosis, guiding policy and action) further emphasises that strategising without action is not a strategy.

Lastly, Knutsson et al. (2008), researchers in Swedish municipal management, extend our understanding of strategy in the municipal context by stating that 'municipal strategy is not about any single major decision, but

Table 4.1: Three definitions of strategy.

Definition	**Source**
'The long-term direction of an organisation'	Whittington et al. (2023)
'A strategy is a coherent mix of analyses, concepts, policies, arguments, and action that respond to high-stakes challenges'	Rumelt (2011)
'Municipal strategy is not about any single major decision, but rather about a series of many small decisions which, together, create a pattern of good municipal resource management'	Knutsson et al. (2008)

rather about a series of many small decisions which, together, create a pattern of good municipal resource management'. Knutsson et al. (2008) hence address the complex environment of strategising in the municipal context. See all the definitions in Table 4.1.

Thus, strategy is understood as a process with many small decisions that require a good understanding of the organisation's present context, challenges, and internal resources. The process culminates in developing clear action plans that propel the organisation towards a well-defined direction.

4.1.2 Strategic horizons

In regard to strategising, it is common to discuss long-term planning concerning different time horizons. Whittington et al. (2023) refer to this as three horizons, whereas Alegre and Coelho (2012) call these same levels strategic, tactical and operational. Compare the terminology per table 4.2.

Table 4.2: Strategic planning time horizons

Whittington et al. (2023)	**Alegre and Coelho (2012)**	**Definition**
Horizon 3	strategic	10 years or more
Horizon 2	tactical	between 2-5 years
Horizon 1	operational	1-2 years

4.1.3 Creating the basis for decisions

Whittington et al. (2023) present an *Exploring Strategy Model* consisting of three parts, *strategic position*, *strategic choice*, and *strategy in action*. These three parts must be considered by any organisation working with strategy.

Strategic position is introduced in Chapter 3, looking at organisations' macro-environment, purpose, culture, resources, and industry. This is further touched upon when introducing the philosophies in a strategic position and the resource-based view.

The strategic choice is affected by where in the organisation it is focused. There are three levels of strategy presented by Whittington et al. (ibid.): corporate level strategy, competitive level strategy, and functional level strategy. In the context of asset management Gavrikova et al. (2020) adds a last level of operational. In this thesis we are interested in the two top levels of corporate and competitive level strategy.

Lastly, strategy in action is interested in how strategies are developed in organisations and how organisational structures and systems affect strategic success.

Drawing on the work of Karlsson et al. (1983), who investigated how decision-makers can make better long-term choices, they introduce three philosophies for using strategic positioning in well-informed strategic analysis. These philosophies view the process as analytical, a set of scenarios, or stochastical.

Analytical – strategy through causality

Analytically, organisations try to understand the causality of decisions. Resources are used to understand the system and how it is connected and affected by changing parameters and studying the effect. Mathematical models could be utilised to try different solutions and study which benefits most. This way of thinking is most commonly used in long-term surveying. (ibid.)

Scenarios – strategy through future scenarios

A different way of understanding what information is needed for decision-making is to look at different future scenarios and what needs to be covered in each scenario. This method is most useful when the scenarios are not directly controllable. Organisations can then try to understand how to act in different future outcomes and how to plan around them. (Karlsson et al. 1983)

Stochastical – strategy through capacity

Lastly, an organisation could study its capacity – its internal resources and external environment – to understand its needs today and in the future. This way of thinking supports the organisation in determining the most optimal direction to pursue, conditioned on its strengths and weaknesses. (ibid.)

Choosing strategic philosphie

Karlsson et al. (ibid.) conclude that, most often, a mixture of all three philosophies is needed in all decision processes; however, in utilising these philosophies in creating the basis for decisions, one can see that there are many ways of approaching strategy. Knutsson et al. (2008) suggest that strategic decisions within the municipality need to focus on the available resources within the municipality. Municipal leaders must promote both cost and revenue control in different departments and still have a holistic approach to aligning them to the overall goals of the municipality Knutsson et al. (ibid.).

Moving on from the philosophies of strategic decision-making, the next step is to explore how resources and capabilities within the organisation can be analysed to understand further how organisations can identify feasible strategic directions.

4.1.4 Resource-based view

In the research of strategic asset management, there tend to be two ways of viewing competitive advantage, either by adapting an industry-conditioned

strategy, like Porter's five forces (Whittington et al. 2023), or a more inward-looking approach as the resource-based view (RBV) (Gavrikova et al. 2020). The industry-specific strategy urges organisations to consider the contextual determinants of competitiveness as location, regulatory factors and technical compatibility. In contrast, the RBV practitioners view the organisation's endogenous resources as critical to competitive performance (Wernerfelt 1995; E. Too and L. Too 2010). However, as E. Too and L. Too (2010) suggest, 'the challenge for infrastructure organisations is the optimal allocation of the scarce resources among competing initiatives to acquire the relevant capabilities'.

Similarly, Knutsson et al. (2008), who examines whether strategy and management affect Swedish municipal financial performance, redefined the RBV framework from the private sector view to a public sector view. In the public sector, competitive advantage is not the primary focus. Instead, the focus is on how the set goals in each local municipality address the available or feasible resources and capabilities within the scarcity of the municipality to create better economic management.

Knutsson et al. (ibid.) showed that it is crucial for municipalities to gain legitimacy to get financial support by utilising strategy to explicitly show stakeholders that they're working towards and following up long-term goals. They suggest that the responsibility for municipal success comes from within and that a holistic view of managing public utilities, with departments being dependent on each other is a key success factor. This result is transferred to the context of municipality-owned W&WW infrastructure, who also need to gain public legitimacy to secure funding in the competitive landscape of financial resources.

Resources can be defined as *the things we have* and can be divided into many different subgroups, e.g. *threshold resources*, the resources that are needed to meet necessary requirements to compete and *unique resources* to gain a competitive advantage (Whittington et al. 2023). They can also be divided into physical, human and financial as seen in Table 4.3.

Capabilities can be defined as *what we do* with what we have. They are closely related to *competence* with the slight difference that competence is a

skill that exists, while a capability is how that competence is being utilised to create competitive advantage (Whittington et al. 2023). Capabilities can be divided into similar groups as resources and examples can be seen in Table 4.3.

Table 4.3: Examples of resources and capabilities from Exploring Strategy Whittington et al. (2023)

Resources: what we have (nouns)		**Capabilities: what we do (verbs)**
Machines, buildings, raw materials, databases, computer systems	Physical	Ways of achieving utilisation of plant, efficiency, productivity, flexibility, marketing
Managers, employees, partners, suppliers, customers	Human	How people gain and use experience, skills, knowledge, build relationships, motivate others and innovate
Balance sheet, cash flow, suppliers of funds	Financial	Ability to raise funds and manage cash flows, debtors, creditors, etc

The point of departure for organisations is then how they analyse their resources and capabilities or how they can acquire the needed resources and capabilities to fulfil their goals. They need to analyse the condition of the physical assets, what technologies are available (such as automation, leakage detection systems and data analytics platforms), and how the organisation is structured and administrated. They also need to understand the internal resources: the infrastructure components, the people managing it, from operators to top managers, and the financial resources (available funds). (ibid.)

Furthermore, the system has a set of capabilities: the processes in which the utilities are being managed. It's the set of internal structures, organisational decisions, and work processes that define strategy. It could be external, such as cooperating with other actors to fulfil the organisational and departmental goals, or internal, such as educational systems, knowledge management and policy-making to align the organisations' resources and capabilities. These two factors are interconnected and work together with the local conditions of the municipality in order to create higher utility. (ibid.)

The local conditions are the set of historical decisions affecting the current state and the scarcity of resources within the large system of a municipality (Knutsson et al. 2008). The geographic location also presents tangible and intangible challenges in how easy it is to source and manage water infrastructure and access human capital. By understanding their capabilities, municipalities can develop a strategy to fulfil their W&WW goals.

Therefore, it seems that RBV is a well-suited theory for acquiring competitive advantage in the local context of any municipality trying to create strategies for its W&WW utilities.

4.1.5 Exploring strategy through strategic lenses

Using our previous definition of the purpose of strategy, the philosophies of how to view the decision-making process and the theoretical way to analyse resources and capabilities as the foundation of building strategy, we broaden our view by introducing the four strategic lenses.

When studying strategy, it's essential to understand the issues are typically complex (Whittington et al. 2023). Strategy is, therefore, best observed from more than one viewpoint. *Exploring Strategy* presents the *four strategic lenses*: strategy as design, strategy as experience, strategy as variety, and strategy as discourse (ibid.) see Table 4.4. This approach aims to identify why strategic initiatives, good or bad, are blocked in specific organisations. This approach will help us explore strategic planning in a better way, as strategy is bound to be different in different organisations.

The lenses are illustrated in Figure 4.1 and are graded from high to low in the level of rationality, legitimacy and innovation. We proceed to describe the four strategic lenses in more detail below.

Design

The design lens views strategy development as a logical analysis and evaluation process. Therefore, strategy development through the design lens provides high rationality and legitimate strategies. Theoretical frameworks, e.g., Porter's 5 Forces, are utilised to evaluate strategic options, which con-

tribute to a highly rational and legitimate strategy. The trade-off is the limited room for 'unproved' concepts and innovative ideas as strategic planning is deliberate with a clear course of action. Further, the need for a thorough analysis of specific challenges puts pressure on personnel and consultants are required to provide tools and methodologies for strategic planning.(Whittington et al. 2023)

The limitations of strategy development through the design lens are the inflexibility of strategies in complex situations and the limited ability to adhere to social contexts like political, historical and cultural factors. Rumelt (2011) explains that the market has a misconception that there are magical tools and fill-in-the-blank schemes that organisations can use to succeed in strategy.

In the context of W&WW organisations, the AM tools in the ISO55000 series can be signed as generating a highly design-focused strategy. It's, therefore, important to consider the local conditions in evaluating if it is feasible to implement high-design type strategies.

Experience

The experience lens views strategy development as shaped by people's assumptions and past experiences. It recognises that individual and collective experiences influence decision-making and can lead to standard responses or strategic drift – a strategic misalignment when a strategy fails to adjust to

Table 4.4: The four strategic lenses from *Exploring Strategy*, Whittington et al. (2023)

Lens	**Description**
Strategy as *design*	systematic, analytical and logical
Strategy as *experience*	taken-for-granted assumptions and ways of doing things, biases and routines will influence strategy
Strategy as *a variety*	unpredictable new ideas and innovative thinking from within the organisation
Strategy as *discourse*	the use of language by managers to influence strategy making

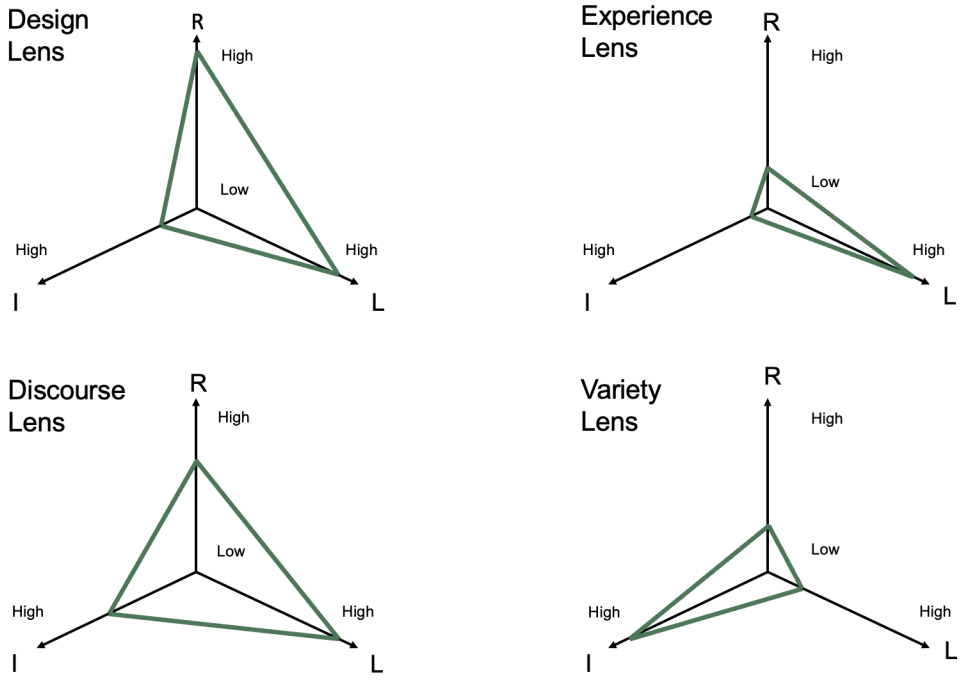

Figure 4.1: The four strategy lenses (Whittington et al. 2023). The three axes: R - Rationality, L - Legitimacy, and I - Innovation.

environmental changes. According to Whittington et al. (2023) 'Contemporary researchers into "Behavioural Strategy" underline two kinds of problems for rational analysis in practice': the impact of external constraints, like information gathering and analysis costs temporal and monetary resources, and internal psychological limitations, as the intellectual capacity of the human leads to 'cognitive bias'. Individual and collective experiences in decision-making affect cognitive bias, either slowing down decision-making or failing to anticipate emerging problems. This can be hard to overcome as it would mean criticising the status quo, in other words, the organisation's culture.

Viewing strategy through the experience lens in the public sector could be highly important as municipalities are affected by historical events and likely risk-averse and will focus on what has worked before. Cook and Tõnurist (2020) talks about the challenges of breaking out established practices in the public sector.

Additionally, Whittington et al. (2023) highlights that solely relying on

objective analysis may not be persuasive enough in the public sector. Sometimes, quick responses are preferable to extensive analysis. Challenging consensus can therefore drive strategic change.(Whittington et al. 2023)

Variety

The variety lens views strategy as emerging from diverse inputs within and outside organisations, referred to as 'distributed intelligence' by complexity theorist Mckelvey (2000), rather than being created deliberately by top management. The variety perspective provides highly innovative strategic development through evolutionary theory. Key points in shaping strategy according to evolutionary theory realise the variety in organisations, that selection is *blind*, 'determined by environmental fit rather than deliberate intervention' (Whittington et al. 2023), and that retention is the simple repetition of certain routine behaviour. It emphasises that new ideas emerge from questioning top management views and recognising the value of diverse perspectives.

Mowles and Norman (2022) suggests that complexity theory is relevant to public sector organisations as their problems are dynamic and interconnected. They suggest that managing complexity requires a holistic and adaptive approach rather than traditional linear thinking. Managers should be facilitators of strategy rather than dictators to allow ideas to emerge from the bottom up (Stacey and Mowles 2016). This includes incentivising experimentation and change, suggesting a balance between structure and chaos and setting simple rules to guide decision-making, promoting innovative thinking. (Whittington et al. 2023)

Discourse

The discourse lens views strategy as being affected by using written and spoken words. According to Whittington et al. (ibid.), the French philosopher Michel Foucault has greatly impacted the discourse lens by showing the 'subtle effect language can have on understanding power and personal identities'. He explains how the 'insane' found a new identity by being called

'mentally ill' and how the 'financialisation' discourse in late 1990 and early 2000 redefined the purpose of firms to maximise shareholder value rather than long-term strategic investments.

The discourse lens can potentially provide strategies with high legitimacy, medium rationality, and innovation, see Figure 4.1. The lens doesn't necessarily need to promote analysis but rather draws power from established models or rational ways of thinking, e.g. Porter's five forces or ISO standards. Strategies focused on discourse can define identities in all parts of the organisation and might give more support to decision-makers than pure rational analysis does.

On the other hand, the discourse perspective also has limitations. Organisations should know *how* managers talk and *what* their motifs are. Self-interest, as a personal promotion, can affect what discourse managers choose. Having the knowledge of how issues are to be solved induces power and can suppress innovation and rational analysis. Therefore, managers must consider how strategy is communicated to different audiences (owners, decision-makers, employees) and realise that discourse flows both ways, encouraging feedback and involvement in strategic work from the bottom up.(Whittington et al. 2023)

Summarising formulating strategy

In this thesis, strategy is viewed as a directional path with supporting actions that focus an organisation on addressing its core long-term challenges. We see the strategic process as iterative, involving a series of small decisions made over time. Building strategic options begins with an analytical approach, where available resources and capabilities are assessed in relation to the organisation's unique local context. Furthermore, we advocate for a critical perspective on strategy, acknowledging the importance of considering different viewpoints to understand its impact within each municipality's specific circumstances fully. The next section will integrate this understanding of strategy with the topic of asset management (AM).

Moving on from the topic of strategy theory, we'll try to understand

the theory behind the management model that has picked up an interest in infrastructure management, Infrastructure Asset Management (IAM), and its certifications like the ISO55000 series.

4.2 Infrastructure Asset Management

Managing assets is vital to an organisation, and this practice has been ongoing for as long as humans have owned assets. During the last 25 years, the discipline of Asset Management (AM) has emerged (Ugarelli and Sægrov 2022). We define AM as stated in the ISO55000-standard pamphlet ISO/TC 251 (2017) as *the management of assets within the context of organisational purpose and strategy, guiding activities to gain more value*. Thus, AM aims to assure stakeholders that the core activities are focused on deriving value for the organisation.

By defining AM as stated above, we can now *differentiate the term from managing assets*. Purely managing assets through all levels of an organisation includes a focus on asset data, asset location and condition assessments, department budgets, current performance, and short-term gain/loss, along with short-term contracts. This is crucial for organisational survival but does not constitute AM. However, the ability to manage assets has led AM's management tool to evolve in response to emerging challenges.

AM provides a broad framework for managing various types of assets, and IAM is a specialised application of AM focused on *managing physical infrastructure* assets. Concerning this, we will explore the IAM with the help of the international management standard of the ISO55000 series. See figure 4.2 for asset management framework. The blue and green highlights are the foci of this thesis. The terminology can be confusing; please compare to table 4.5

4.2.1 ISO55000 series

The AM ISO55000 series is mainly intended for those 'who would like to improve the realisation of the value of their organisation from their asset base.'

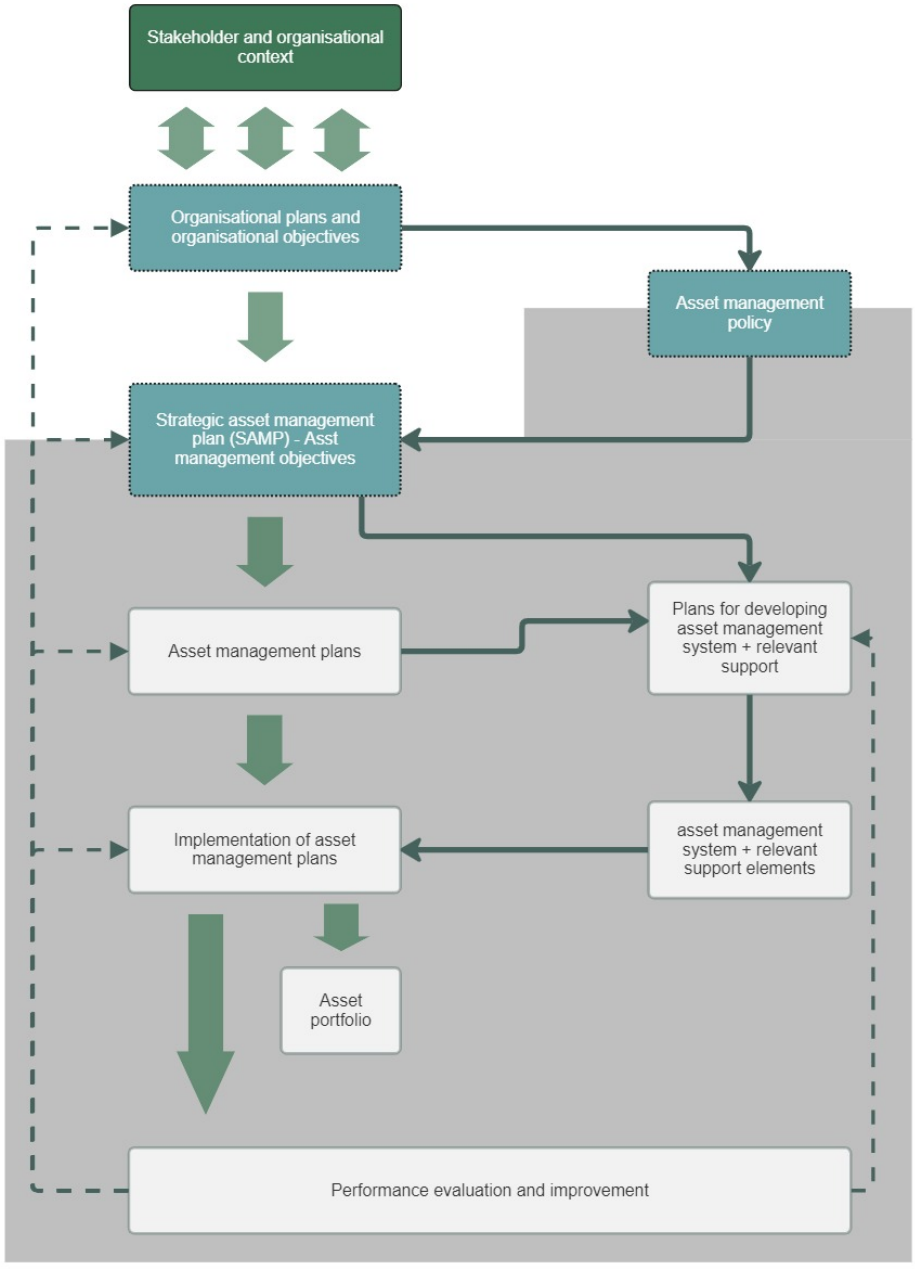

Figure 4.2: The asset management framework. The grey box indicates the boundary of the AMS (asset management system). The blue highlights represent the organisation of the W&WW utility, while the green represents the context of the municipality, including stakeholders and external factors beyond the control of the AMS, compare to table 4.5. (ISO 55000 2014)

Table 4.5: Abbreviations in regard to AM & IAM, compare figure 4.2. Source: ISO/TC 251 (2017) and ISO 55000 (2014)

AM	Asset Management (AM) involves managing assets within the context of organisational purpose and strategy to increase their value.
IAM	Infrastructure Asset Management (IAM) is founded on the principles of AM and focuses on efficiently managing physical infrastructure assets to achieve service delivery goals while addressing costs and risks.
AMS	The Asset Management System (AMS) is used to control, direct, and coordinate asset management (AM) activities, as described in the ISO 55000 series. It comprises the AM policy, AM objectives, Strategic Asset Management Plan (SAMP), and AM plans.
AM Policy	The Asset Management Policy provides high-level principles and objectives for asset management, guiding activities to align with organisational goals and governance frameworks.
AM Objectives	AM objectives define specific targets and goals that guide asset management activities, such as improving asset performance, minimising lifecycle costs, enhancing reliability, and aligning with organisational strategies and stakeholder expectations.
SAMP	The Strategic Asset Management Plan (SAMP) outlines the challenges faced by the organisation. It specifies the actions required to achieve its objectives, serving as a focused framework for asset management activities and resource allocation.
AM Plans	AM Plans (AMPs) are detailed operational documents that translate strategic asset management principles into actionable strategies and activities for specific asset types or portfolios.

In addition, it is a support tool for those who work with the Asset Management System (AMS) and those who are interested in the AM activities (ISO 55000 2014).

4.2.2 Defining Infrastructure Asset Management in a urban water context

AM and IAM encompass the strategic and systematic approach to managing assets throughout their lifecycle to ensure the delivery of safe and reliable water services while optimising costs and minimising risks. This includes activities such as asset planning, maintenance, renewal, and risk management.

In the context of urban water management, according to Ugarelli and Sægrov (2022), IAM emerged from the need to collect digital data, including statistical modelling, that is used for information management. Its development continued with the introduction of risk analysis. Sources of hazards need to be identified, and their risk of negative consequences mitigated. Continuing the trend in an ever more regulated environment, the current state of IAM is based on a more holistic sustainable perspective, covering governance, social and economic aspects, environmental impacts, and the condition of physical assets (ibid.).

History and development of IAM

Ugarelli and Sægrov (ibid.) have written about the evolution of IAM and characterises the development as three periods of increased complexity. These are

- 1st generation IAM centred on asset information (the late 1990s to around 2005)
- 2nd generation IAM concentrated on asset strategies incorporating risk (around 2005 to 2010)
- 3rd generation IAM prioritises total integration with an emphasis on governance and stakeholders' involvement (2010 to 2021)

4.2.3 The asset management system of W&WW utilities

The asset management system (AMS), described in the ISO 55000 series, controls, directs and coordinates AM activities (ISO 55000 2014), see Figure 4.2. The system dictates how top management steers the AM process and how the bottom-up information is used to further decision-making. In our thesis, we focus on the coloured highlighted parts in Figure 4.2. The blue highlights represent the organisation of the W&WW utility, while the green represents the context of the municipality, including stakeholders and external factors beyond the control of the AMS.

Stakeholder and organisational context of the municipality

The Swedish Municipality Act (sv: kommunallagen) (SFS 2017:725 2017) states that the municipal and regional councils shall decide on guidelines for 'good economic management' (sv: god ekonomisk hushållning). SKR (2020) states that the Swedish Municipality Act (SFS 2017:725 2017) implies that the municipality should agree on guidelines with a longer horizon than the one-year budget perspective or the running three-year budget plan suggested by the Municipality Act. The strategy set by the municipality council is then the starting point for the organisational manager of the W&WW utility.

Illustrated in mapping the stakeholders of the W&WW utility in Sweden, see Figure 3.2, on page 28, it's apparent that the goals of the W&WW organisation are set in the context of all the other utilities, people and political colour. These goals adhere to the stakeholders' requirements and should be related to the priority of each stakeholder according to SKR (2021).

This means that the W&WW utilities are dependent on how the municipal council manages the economic resources. The civil servants are, therefore, responsible for informing the municipal council of the appropriate plans so that each party can fulfil its duties according to the laws and regulations that are in place. In the asset management view, these plans are to adhere to the value of each asset.

Organisational plans and objectives

These plans and objectives aim to prioritise activities in the AM plan based on the expected service outcomes of all assets (ISO 55000 2014). This means identifying Key Performance Indicators (KPIs) for utility performance, which are of interest to organisational managers tasked with aligning them with municipality goals. The objectives, in the form of KPIs, are determined based on the organisation's needs and may be established for individual assets, groups of assets, or the entire AM portfolio (Mårtensson and Rumman 2019).

Asset Management Policy

The AM Policy is a concise statement that articulates the organisation's commitments and expectations regarding decisions, activities, and behaviour related to AM (ISO 55000 2014). It aims to outline the key principles guiding the organisation in achieving its objectives and set expectations for decision-makers to demonstrate commitment to these goals.

Strategic Asset Management Plan

The SAMP outlines the organisation's challenges and presents the specific actions required to achieve its objectives. Thus, the SAMP becomes the framework for activities and resources. It is the culmination of the strategic process.

Strategic horizons in regard to AM

A SAMP is a bridge between an organisation's strategy and the management of its assets. The strategising is done in all four levels of the organisation: corporate level, competitive level, functional level, and operational level (Gavrikova et al. 2020). Each level is responsible for different decisions with different time horizons in mind. These three horizons are used to organise the outlook of strategy and compare table 4.2.

4.2.4 Summarising Infrastructure Asset Management

To summarise, IAM evokes information-supported decisions within a strategic context, strategies to select and exploit assets over their life cycle to support business aims, clarity of the organisation's purpose, long-term value for the organisation, and long-term contracts and/or partnering relationships in support of client value and objectives (ISO/TC 251 2017; Ugarelli and Sægrov 2022).

This chapter set out to further develop the understanding of strategy and AM. This knowledge was used to get the most out of the interviewed organisations. The findings from the case study will be presented in the next chapter.

Chapter 5

Empiric Findings

The empirical findings are sourced from interviews and publicly available company documents. The aim is to present them holistically so the reader can build their own understanding.

5.1 Intro

In the interviews, 27 topics and eight categories were discovered. In this empirical presentation, we continue the work by dividing them into three themes: change process & organisational modernisation, building strategic competence, and technological systems implementation, see figure 5.1. For additional information about the open-ended interview questions, see Appendix B. The empirical findings begin with the Change process.

5.2 Change process & Organisational modernisation

A recurring theme among the interviewed organisations was recent re-organising; the majority had just recently implemented some type of restructuring. While reorganisation can improve efficiency, it doesn't necessarily ensure that the organisation can deliver a better service. Moving around staff or functions could look good on paper, but the question remains if it has a significant

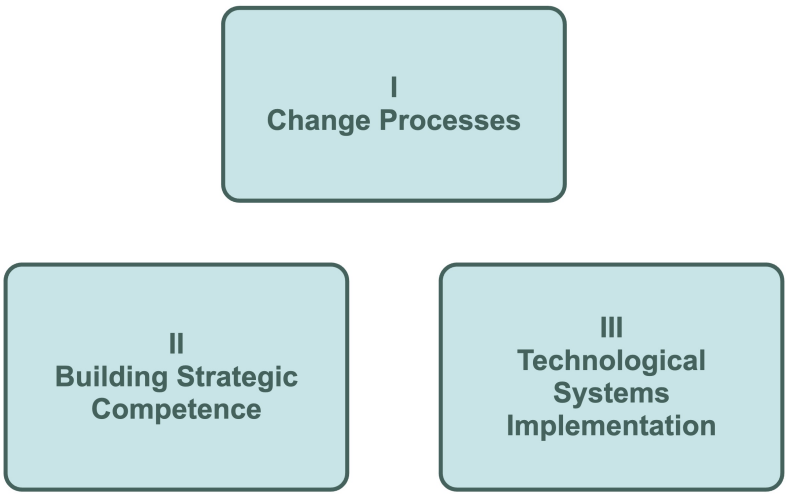

Figure 5.1: The three themes found in the empirical findings.

impact on the organisations' ability to focus resources in order to tackle the high-stake challenges.

5.2.1 Changing organisational forms

In section 3.3 W&WW utility organisational configurations and layouts, the diverse variations of organisational forms is seen. The organisational combinations are plenty, considering municipalities frequently have joint companies for parts of the W&WW utilities.

Further, our findings suggest that the sector is undergoing a change process, with municipalities re-evaluating how they organise W&WW utilities. In recent years, a significant shift has occurred in the interviewed organisations, with four out of five experiencing a change in leadership, and three out of five organisations performing any form of reorganisation. These reorganisations have either been forming a new organisation with another municipality or forming a multi-utility with other municipal services.

Interestingly, the single organisation that hadn't undergone a recent reorganisation or management change didn't perceive this as a disadvantage. They embraced the philosophy of 'what is not under development is in decline', suggesting that continuous adaptation and improvement, rather than

restructuring alone, are key to addressing demands.

Demands

The physical state of the streets is vastly different from 50 years ago. More utilities are placed together underground. This includes underground electricity, internet cables, and district heating, to name a few; comparatively, the main disappearance is the telephone copper line and, in some cities, a removed gas network.

Legislative requirements, e.g. thresholds for chemicals, PFAs, safe working environments etc., are also affecting the demands on the systems' requirements. As an example, when organisations are updating a section of the pipe network, they'll need the newly installed pipes to be up to date with modern-day technology solutions. Many interviewees talked about the need to separate day water from wastewater in order to increase the efficiency of their water treatment plants.

With the increased demand on requirements and higher technology solutions under ground, compared to 50-years ago, makes interventions significantly more expensive and time consuming. Organisations are therefore in need of prioritising these types of projects of renewal of already existing urban water infrastructure.

5.2.2 Co-operation with other organisations and stakeholders

Several interviewees stated that it was easy to contact other organisations when they needed advice or consultation. They explicitly attributed this openness to the water utilities' non-competitive nature.

Large organisations vs smaller ones and their synergies

Larger municipalities have access to more resources than smaller ones. It is known across organisations that there is said that a minimum of around 50,000 users is optimal for a W&WW organisation, suggesting that smaller

organisations have a lot to gain by co-operating in order to get the full potential of a W&WW system. However, this number was also questioned by some interviewees wondering how this number was calculated, and further data would be needed in regard to these numbers.

Yet, this highlights the challenge smaller municipalities face with being too small for efficient W&WW solutions. The strategist of the trade association expressed that everyone ought to be favoured by 'having a friend', claiming that smaller municipalities especially have much to gain upon joining a nearby, larger water organisation. This is the same finding as Thomasson and Jonsson (2022) discuss. The downside, according to the strategist, is the threat of declined professional pride when an organisation gets too large.

Building on the argument of having a friend, it doesn't have to be through a legal W&WW co-operation, organisations can also serve as a role model. One organisation talks about a big regional organisation as their 'big brother' expressing that they take a lot of strategic inspiration from this larger organisation as they themselves will never have the same ability to strategise in their own organisation. However, this same interviewee also says their size is about the size where you can start to work more strategically. This organisation serve a municipality with 50,000 inhabitants.

Communication with politicians

Friction between organisations and politicians was a reoccurring issue. Communication with politicians is mainly to discuss future investment plans and secure financial support in the budget. Several organisations expressed that politicians seldom gave them the financial resources needed to succeed with the challenges at hand.

One leader from a W&WW company explains that they personally had many meetings with politicians from the municipal council in the municipal office, putting a lot of effort into talking to politicians one-on-one to explain the current need and that the tariffs needed to increase to meet present demand. The discussion went back and forth highlighting the ability to also listen to the politicians.

An exception was a smaller organisation that told us that it hasn't been an issue to demand increased tariffs from politicians, thanking Svenskt Vatten for changing the public attitude towards W&WW solutions through their activity and lobbying in mass media.

Likewise, all cases unanimously share the same opinion about Svesnkt Vatten's positive influence on politicians.

Interestingly enough, politicians were both a source of friction and a source of where strategy emerged. The different perspectives of stakeholder needs politicians possessed was in some cases a great input for organisations. One example includes where the suggested tariff construction wasn't adaptable on some specific user cases, in this case a large warehouse. Here a new common ground were formed between organisation and decision makers in order to increase stakeholder satisfaction while meeting the financial requirments.

External guidance

As discussed in chapter 3, the size of W&WW organisations varies significantly, affecting their strategic capabilities–their ability to put together strategies adhering to the local high-stake challenges. Therefore smaller organisations believe that SV's guiding documents help them with many issues. Several interviewees mentioned they were waiting for guidance on specific processes from central organisations like SKR and SV in order to carry out better planning.

Larger organisations can handle their own strategising better, but they recognise how HBI (hållbarhetsindex) is used as a benchmark by other organisations and thus choose to participate. The HBI tool, developed by SV, is a mixture of quantitative and qualitative measurements used nationally by Swedish W&WW utilities. It's a self-evaluating system based on three colours (red, yellow, and green). Once again, the sector's non-compete nature is evident.

Svenskt Vatten is generally appreciated by organisations. In the case study, a smaller organisation depends heavily on SV's guidelines, viewing SV

almost as a beacon of light.

Organisational forms and collaborations between stakeholders are important to the sector's change process. However, this process also demands financial support to be completed.

5.2.3 Finances and investments

This section will explore empirical findings regarding tariff strategies, the need for long-term investment plans, and the challenge of depreciation.

Tariffs

W&WW tariffs have been increasing in the past couple of years, according to data from Nils Holgersson. In 2023, the W&WW tariffs increased by 7.9% in total. This was lower than inflation (CPI, Consumer Price Index) which was 10.6%. Stockholm and Malmö municipality both had a 25% increase – Gothenburg's increase was close to the mean with 7.6%. The highest tariff increase was in Herrljunga with 38.1% (Nils Holgerssongruppen 2024).

From the interviews, we have found that municipalities have long been interested in keeping tariffs very low, with politicians seeing a low tariff as their pride.

However, the recent trend shows that more municipalities have taken a more proactive approach to increasing tariffs. As one case organisation puts it, they had to convince their municipality board to change the tariff plan from following the Swedish CPI to meeting the organisation's investment needs. They now have a proactive tariff plan for the following 10 years, in which they reflect the tariff with the forecasted financial needs.

As stated in chapter 4 the Municipality Act states that municipalities should have the conditions to have long-term 'good economic management'. Increasing tariffs too drastically for urgent needs could be seen as unfair; this was discussed by several organisations. The unfairness lies in the fundamental principle of self-cost, where today's W&WW collective should hold the costs of today and not of yesterday or tomorrow. Retroactive charging, however, is not a practical solution. Discussions with the organisations have instead

focused on exploring possibilities for future solutions. The organisations desire more possibilities to reserve funds and/or do overdrafts for longer than three years.

The attitude towards proactive tariff changes differed between municipalities that were in more need of urgent investments and those that were less urgent. We also saw that municipalities in the urgent state had a better response from politicians on looking over the tariff question than those in less urgent municipalities, which met a higher resistance.

This showcases the need for sound financial plans, as they allow municipalities to choose the right tariff strategy to meet the local conditions. However, if tariffs don't match long-term financial needs, then this fails to acquire 'good economic management'.

Financing investments

As explained in chapter 3, the W&WW-collective bears the full cost of the utility. There is also an opportunity to establish reserve funds for the future. However, this financial tool is limited to very specific projects. To finance large investments, securing loans from external lenders is a common solution. However, the willingness to take external loans in the W&WW is competing with other municipal needs even if they are financed from two different financial pools. The amount a municipality can borrow competes with funding for essential services like roads, schools, and buildings.

Having external funding means higher capital costs, in turn affecting the W&WW tariff. However, an increased W&WW tariff doesn't mean increased costs for the tax collective. The lack of understanding of the differences between the W&WW and tax collective among municipal politicians seems prevailing, judging by the undertaken interviews. Municipalities that are not in urgent need of investing in their water utilities have a worse understanding of the differences, whereas municipalities with an urgent need for investments are more likely to grant these external financial assets (Jonsson et al. 2022).

Grants relating to R&D

Subsidies from, e.g. Länsstyrelsen and Vinnova for R&D are also possible. However, these funds are only available to municipalities with the capacity to perform R&D, which is reserved for larger organisations or larger municipalities with more human resources. The key lies in discovering more effective or innovative ways to work within the existing system, regardless of organisational size. Developing new, cost-effective tools can ultimately support investments and reinvestments.

One organisation interviewed managed to get grants to finance its AI-powered W&WW system. Such funding opportunities can be crucial for accelerating the development and implementation of groundbreaking solutions, as one purpose of the project is to later provide this solution to other Swedish municipalities when it's finished.

Investment need

While the investment needs of each municipality are unique, the relative scale of the required investment is surprisingly consistent across the board. The unique needs can differ in costs as they could be geographical, demographical, or environmental, to name a few.

Our findings highlight a growing trend in the W&WW sector: a recognition of the need for improved financial control to manage investment debt. Currently, organisations heavily rely on reports from the trade association, SV, to quantify investment needs. However, these reports have shown a steady rise in investment debt over the past three iterations. This has spurred organisations, either due to regulatory pressure or self-initiative, to invest significant effort in gathering local data for more precise investment need quantification. The resulting investment plans serve as supporting documents for municipal council budget decisions.

Despite this focus, a standardised method for calculating investment needs is not apparent. Municipalities are left to rely on self-assessment, often employing various approaches based on the expected lifespan of different infrastructure components. The SV guidance document exemplifies this,

offering a specific method for creating renewal and investment plans for pipe networks (Malm et al. 2011; Svenskt Vatten 2021). However, a broader range of standardised methods is clearly needed to address the wider infrastructure landscape.

Further compounding the challenges, our interviews revealed a lack of long-term financial planning among the organisations. Only a few have economic plans reaching 10 years, and investment plans typically extend only five years. This limited foresight is further worsened by a significant increase in annual investments, often exceeding previously normal rates by three to five times.

However, the senior consultant, drawing on their experience, emphasised the value of 10-year economic plans for W&WW organisations in Sweden. They noted that many municipalities struggle to develop long-term plans, making a 10-year horizon particularly advantageous for achieving better financial control and positioning organisations for better preparedness compared to their peers

Depreciation

The depreciation strategy of different assets varies between different organisations. The difficulty lies in applying control as the actual durability of different physical parts of the infrastructure is uncertain, and the nature of the assets being hidden makes the inspection process time-consuming.

We've come across organisations that have come to realise that they need a more detailed way of depreciating. There is a tendency to rely on using depreciation recommendations from SKR and SV. Organisations are facing the challenge that general models for depreciation might not reflect the geographic factors that impact the actual cost of an asset over time. We have learned that for example, historically, certain PVC pipes put in place in the early 80-s and have already degraded. This asset has served its lifespan much faster than calculated. One interviewee tells us '80% of the cost is from re-investing in existing pipe networks'. Therefore, keeping track of what materials are placed in the ground and sourcing the right materials are

both important in managing assets. This requires both capabilities of good knowledge management and skills in material sourcing.

Summarising the Change Process

The empirical evidence shows that managing the sector is undergoing a change. Organisations want to achieve more focus in their management of the W&WW utilities and are in the process of tackling the investment debt but need more support in the long-term view. Securing financial support from asset owners requires clear communication, alongside prioritisation of projects to enhance cost-effectiveness. This approach is reinforced by organisations' efforts to strengthen their strategic competence across the sector, which is presented in the next section.

5.3 Building strategic competences

5.3.1 Competency and staffing

The interviews, including those with the trade association and a senior consultant, revealed a historical trend in W&WW organisations: managers were primarily industry veterans who spent their entire careers within the sector.

However, this is changing. Interviews with managers highlighted the influence of diverse backgrounds. We encountered individuals with backgrounds in communication and leadership, as well as mechanical and electronic engineering. These varied backgrounds contribute to a more commercially driven approach to W&WW utility management. This shift prioritises cost-efficiency while seeking adaptable solutions that extend asset life and value. The introduction of new commercial competencies is more in line with the AM thinking.

New skills and capabilities needed

Many of the interviewed organisations were in need of investigative engineers. They have the ability to evaluate projects and construct the requirements. As

one organisation puts it, they are important because 'a good investigation engineer could pressure the procurement process to negotiate the correct price'. Smaller organisations had a large need for investigative engineers to initiate projects and evaluate current status.

Another organisation approaches the same problem differently: Their strategy is to develop resources and capabilities to support AI-driven analysis of their system, providing the investigative engineer (or purchaser) with better metrics. This approach strives to lower the competence threshold in initiating projects and diagnosing the current infrastructure.

One organisation further highlights the need to have resources and capabilities that make sure projects are completed,

> 'The municipality needs project leaders that can take this from procurements to completion and make sure it is completed' – one organisational leader

Recruiting new personnel

The majority of the interviewed organisations have recruited new staff within top management and strategic planning, compare 5.2.1. However, organisation size prohibits the roles from focusing solely on strategy. Larger organisations can take the strategic responsibility, but it's much more difficult for smaller organisations. In smaller organisations, each person has a multitude of responsibilities. Yet, smaller organisations have a much shorter communication distance.

Input from the industry organisation strategist is that the job environment of W&WW isn't attractive to students, both civil engineers and those in other fields. Students are leaving for more exciting sectors where the salary is better, furthering the shortage in human resources in the W&WW sector. On top of that, the older generations are leaving the sector as they retire. The knowledge capital in the sector is decreasing.

Every interviewee was happy to hear that more disciplines are showing interest in the W&WW sector. They were happy to hear that we, as industrial engineering and management students, were interested in the water

sector and had decided to write our thesis on the subject.

5.4 Technological system implementation

5.4.1 Strategic direction and implementation

As shown in the empirical findings in section 5.3, there is a need for strategic competence. The need is horizontal from top management to divisional managers; this also stretches up to the ability to educate political leaders in strategy in the W&WW sector. A very prominent call for action from consultants and AM promoters is that the sector needs to have higher economic control of its assets

> 'A challenge lies in the lack of standardised requirements, making it difficult to translate overarching strategy into more asset-specific strategies, particularly for complex assets like water treatment plants' – Consultant

Organisations must set clearer asset requirements to manage risk successfully. Industry leaders are calling on organisations to price their asset requirements to manage asset risks better. The risks include system disruptions, such as pipe leakage, bottlenecks, and changes in legal requirements.

Requirements and risk management

It's found in the interviews that larger organisations have a greater capacity to perform strategic tasks such as identifying risks, evaluating options, and pricing them. Organisations that closely cooperate with universities and colleges are better equipped to gather data, manage risks, and utilise advanced methods for measuring and analysing systems. In contrast, smaller organisations struggle to keep up with their workload and often focus on the next disruption, whether it be system-related or due to new legislation.

The trade association SV offers support with models for renewal and reinvestment plans, and standards like the ISO55000 series provide additional guidance. However, many organisations lack the time and capacity to

fully adapt to these ISO standards and, therefore, require further assistance tailored to their specific conditions.

Incentives

One interviewed organisation has had a crisis with undrinkable water in the last few years, and Livsmedelsverket has been knocking on their door. They have received an injunction, with the risk of not being allowed to continue operating. The actual implication, if that were to happen, was not discussed.

In another organisation, an interviewee jokingly said there could be things to gain from a crisis, highlighting how survival bias can lead asset owners to underestimate the risks where previous disruptions haven't happened.

Evaluating strategy

Political cycles can pose challenges for long-term planning, particularly when asset owners change frequently. One organisation, for instance, highlighted the difficulty of developing a strategy in a political environment with ownership turnover every four years. Shifting political ideologies jeopardised their long-term plan, causing a two-year delay when new municipal leadership emerged mid-term. This experience emphasised their need for better systems to educate and onboard asset owners faster.

In contrast, another organisation faced urgent circumstances requiring fast decisions and frequent communication with asset owners. This improved communication fostered better understanding and knowledge among the asset owners.

However, not all organisations experience the same level of impact from political cycles. A larger organisation reported that mandate periods did not significantly affect their long-term planning. Nevertheless, they emphasised the importance of frequent discussions with asset owners about project costs to secure strategy buy-in within the municipality.

> 'If they [the politicians] make bad decisions, then we [the civil servants] have failed' – a larger organisation

Origin of strategy

When asked about the optimal organisational structure, the industry expert stated it must be tailored to local resources and capabilities. Effective leadership is crucial in managing these aspects, which shape the strategy. Each organisation achieves its objectives in unique ways, making a universal model impractical.

For example, an innovative municipality leveraged its unique resources to implement an innovative strategy. Another organisation reorganised into a multi-utility to focus resources and utilise existing capabilities in its district heating into the W&WW organisation. Some organisations experiencing less change held workshops to align organisational goals and identify strategic options. A central leadership group then analysed this information to create a strategic plan.

5.4.2 Technological systems

Diagnosing

Interviews highlighted significant data gaps regarding W&WW systems. Specifically, a lack of historical data was identified–making it hard to quickly diagnose the current state of the physical assets of the system. As IAM suggests, good asset management is fully understanding the characteristics and economic value of each component in the system so that it can be used in an organisational aspect better. We've seen that organisations are utilising this information when communicating strategic options with asset owners. Researchers call on organisations to focus on assigning value to their assets in as much detail as possible. However, the interviewees gave the impression that this is a difficult task.

A small-to-medium-sized organisation estimated a full system diagnosis would take 35 years. They argued that by the time they finished diagnosing, most functioning components would've already likely failed, rendering the diagnosis pointless. They emphasised the need for methods to prioritise resources and improve departmental efficiency.

Municipality infrastructures weren't designed to be connected. As municipalities' borders expand as smaller villages connect to larger cities, it leads to infrastructure being retrofitted. This is sub-optimal. However, only one organisation explicitly discussed strategising resources to address this issue. They focused on making the system more efficient while assessing the existing infrastructure in these areas. To read the discussion on this, see 6.1.

In a municipality facing urgent regulatory demands, this diagnostic process was expedited over a nine-month period, involving engineers, technicians, operators, and accountants. They collaborated to value their assets and determine opportunity costs. Although the scale of this internal diagnosis is hard to measure, it formed the basis for communication with municipal decision-makers.

The diagnosis is important in making information-based decisions, and when incorporated in an AMS, it can help organisations create more value for their assets.

Infrastructure Asset Management

While the concept of IAM is gaining traction in the W&WW sector, Swedish utilities currently lack a cohesive understanding of how to integrate risk management principles into their decision-making processes. Despite acknowledging the importance of IAM and the need for better risk assessments, none of the interviewed organisations have adopted the ISO55000 series standards for IAM.

Instead, they rely on their own established methods for asset value creation, which often fall short of comprehensively addressing risk perspectives. This has led to a desire among some organisations to acquire the necessary resources and capabilities to conduct more thorough risk assessments. One organisation even expressed a specific goal of achieving ISO31000 certification for risk management.

This trend highlights how managers are realising that they lack the capability to fully create risk-based decisions. Hence, the lack of a standardised approach to incorporating risk management remains a significant chal-

lenge. Additionally, the perceived complexity of implementing a full AMS discourages widespread adoption within the interviewed organisations. Only a few organisations utilise parts of the guiding models and documents of the ISO55000 series. As an alternative, the HBI benchmarking system is currently used as somewhat of a risk assessment tool.

HBI Benchmarking

We asked the organisations how they use the HBI from SV to help them prioritise their actions. The organisations know the limitations of the HBI as it is a self-evaluation. However, it has made conversations with their municipal leaders, asset owners and municipal politicians, much easier.

When evaluating infrastructure assets organisations face the challenge of acquiring the needed information. This is affected by how organisations choose to implement their systems.

5.4.3 Common needs in system implementation

Across all cases, there is a clear need for resources capable of evaluating systems to enhance economic efficiency in maintenance and procurement. Organisations must also set precise requirements for their assets. The lack of economic control and vague asset performance requirements complicate good budgeting and pricing. A more rigorous approach, such as AMS, could greatly benefit organisations. However, implementing such a system requires capacity that some organisations may lack, indicating a need for an alternative systematic approach to achieve adequate strategic planning.

5.5 The empirical model

To prepare the empirical chapter for the analysis we can expand on Figure 5.1. The purpose of this is to connect the three boxes in Figure 5.1 and explain how the content of each section relates to each other. The result is three blocks that can be shown in Figure 5.2. The horizontal integration is

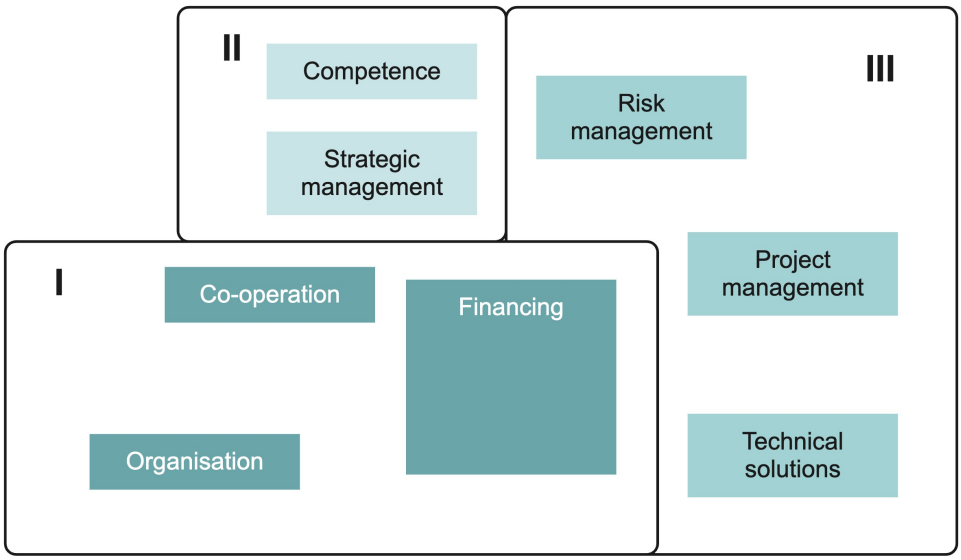

Figure 5.2: A figure illustrating the relationship of the three themes in Figure 5.1.

the prevalence of the themes and the vertical integration is from foundational to strategical.

Starting from section 5.2, we have the three categories of organisation, cooperation and finances. As we have defined organisations according to Matejko and Crozier (1983), they lay the foundation for what strategic work can be done. However, as the empirical findings suggest, there is no optimal organisational form and it is more of a reaction to local conditions. Co-operation is a sought-out strategy, and organisations utilise it to create leverage in their strategic work, which is closely related to section 5.3 where we find the strategic management and strategic competencies.

The finance category is spread out to have a large horizontal integration located in the centre showing it is related to both section 5.3 and section 5.4. Financial control impacts planning, which affects strategic work, how projects are managed, and what technologies can be utilised.

Lastly, the relationship between strategic competence and strategic management in section 5.3 and the risk management of section 5.4 is closely

related both in what competencies, resources, human and technical, and capabilities are needed to carry out risk assessments. It's a strategic level that not all organisations can reach due to limitations.

We can now analyse the empirical findings in the next chapter.

Chapter 6

Analysis & Discussion

6.1 Interpretation of findings through strategic lenses

Exploring the empirical findings with the analytical tool of the four strategic lenses presented by Whittington et al. (2023), we will shine a light on the necessity of including different perspectives when discussing the topic of strategy, be it organisational, assets, or operations, to name a few. In our case, we are interested in analysing the organisation's overarching strategy and its relationship to strategies covering assets. According to Whittington et al. (ibid.), it's also important to note that looking at strategy through the lenses requires the researcher to be critical, recognising that each lens has its value and limitations. See a visual in figure 6.1

6.1.1 Through the design lens

Throughout the multi-case study, organisations were waiting for guiding documents from central organisations such as SKR and SV, e.g. handbooks on 'how to' perform different types of plans. Organisations also extensively utilise consultants to perform this planning work. In these projects, the most required factor was more fine-grained information (more data points) of the system. To make a better analysis, it becomes clear that organisations that

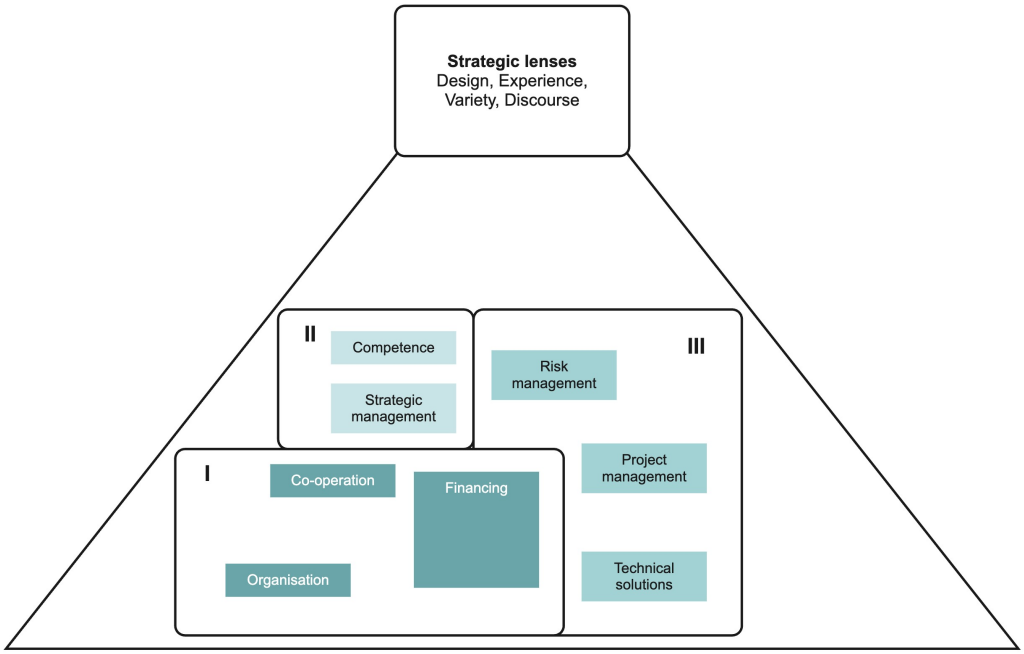

Figure 6.1: Analytical framework: Grouping the discovered themes according to how the content relates to each other. Categories are the important content of each of the three themes presented in Figure 5.2. The strategic lenses are shined on top of the empirical findings.

don't fully have clarity of their physical system base their plans on many assumptions. The same applies to using the HBI tool even though it's based on self-evaluated, variable data. However, these two approaches create a high-design strategy, putting analysis before action.

In the context of this case study, some organisations possess the resources and capabilities to find more exact information, leading them to base their strategy on rational decisions with the help of AI and large data models. This is done by collaborating with technical universities. A pondering question is how large an organisation must be to utilise such a capability and form a high-design strategy.

The implication of *strategy as a design* is to increase legitimacy and rationality in strategy. With the design perspective, organisations can simplify the challenge of managing ageing infrastructure by logically and rationally identifying proximate objectives to progress in strategising. However, ana-

lysing forecasts for long-term trends (third horizon) has proven challenging due to the limited control organisations have over system components. This decreased forecast precision hinders a heavy design approach, as thorough analysis is both time-consuming and expensive.

A limitation of a design strategy is it doesn't leave much room for people's experiences. In the public sector, many people are involved, all with different experiences and values. A highly objective strategy might be met with a lot of resistance. The key factor is suggested to be legitimacy. We can view this when using the HBI to find prioritisation. It is based a lot on self-evaluation rather than quantitative measurements, so it has a reduced rationale. However, it contributes to legitimacy as it is used nationally and breaks down complexity by creating benchmarking. This can be used to rally support and finance from asset owners.

IAM and the ISO55000 series are both methodologies with a heavy design aspect. The trade-off of extensive work in finding dependant activities and establishing economic control of the assets is heavy documentation. Only larger organisations have access to enough human resources to implement these designs, leaving the smaller majority of organisations disadvantaged. Instead, there is a possibility of adapting parts of the design strategies that smaller organisations can utilise.

6.1.2 Through the experience lens

The experience lens puts people, culture, and history centre stage in strategy development (Whittington et al. 2023). Therefore, this special strategy depends on what people are involved in forging it and how stakeholders receive it. Taken-for-granted processes can make change difficult, which has characterised strategy development in the Swedish W&WW utilities for a long time. Stakeholders has been happy as this strategy development has high legitimacy, however it has not been challenged and therefore not adapted after the needs of the local municipalities. This is evident in the attitude towards W&WW tariffs over the years and the poor strategic plans of asset performance, causing the large investment debt.

It's important to approach strategy focusing on what truly matters, viewed through the lens of experience: undue conservatism, biased analysis, and the rejection of objectivity.

Looking at the organisations that have gone through a reorganisation, joined a multi-utility or municipal enterprise, or just cooperated between municipalities, there has been an increased focus on attacking the increasing pressure on the system. The strategy to reorganise to increase focus has not been fully based on design and heavy analysis but rather on the need to question the status quo of how things are done.

New experiences apart from W&WW civil engineers have entered the sector, which has changed the sector's attitude. The strategies developed through the introduction of new experiences have managed to find pivot points by questioning how things have always been done. These pivot points have changed the conception of what needs to be done, and resources have been focused on ensuring the longevity of assets. There is a shift from short-term economic satisfaction to long-term value.

Analysis that proceeds action often involves relying on consultants for a long time. The results are mixed; sometimes, it just states what is already known, though, the approach is highly rational. In some of the interviewed cases, the same analysis was performed over and over again, as the analysis never concluded enough evidence to act upon it. Through the experience lens, this process is challenged as it is too expensive and time-consuming. A mostly correct and fast decision can sometimes be better than a slightly more correct but slow decision.

Experience is not only based internally as it can also come from external sources. However, it needs to cater to the people, history and culture of any given organisation. Organisations, especially smaller ones, heavily rely on Svenskt Vatten's influence. Svenskt Vatten is active in both sector discourse, facilitating networking and creating guiding documents.

However, they are bound to be biased in their analysis of what measures they think the Swedish W&WW utilities should choose. However, it doesn't decidedly reduce the objectivity of their work. Through the experience lens, SV has approached strategy by challenging the nature of the association and

pivoting into assisting organisations more, which has had an important effect on organisations' ability to challenge their taken-for-granted processes.

6.1.3 Through the variety lens

According to the variety lens, strategy emerges from all levels of the organisation. It highlights the importance of challenging top management's views and how they might be skewed. Management needs to realise the value of ideas and strategies emerging from all parts of the organisation. The variety view is very innovative. Realising that strategy emerges, organisations must have supporting policies when choosing these emerging ideas. Management needs to become facilitators making sure that ideas turn into strategy.

The challenges facing Swedish W&WW organisations demand solutions that work within the constraints of their resource and capability limitations. It's known that human and financial resources are scarce. This requires a higher degree of cohesion between multiple people to generate efficiency (do more with less).

Creating strategic capabilities in this scarce environment and with an uncertain third horizon can be challenging for central management. Innovative ideas, however, utilise the power of engagement. This, in turn, requires experimenting with different solutions. The potential value of innovations is high as innovative solutions have the opportunity to be shared between all organisations throughout Sweden.

Legislation pressures organisations, especially smaller ones, to introduce new requirements and asset standards to secure healthy W&WW. From the long-term perspective of the third horizon, organisations face a troublesome challenge when introducing new solutions and processes they have never implemented before.

According to Mowles and Norman (2022), wherever there is human relating, there exists complexity. He highlights that modern management models might fail to incorporate complexity. In complex environments Stacey and Mowles (2016) highlight the importance of focusing on communication and relationships and that managers should rather be facilitators than dictators.

In the multi-case study, this strategy development tool was seen as driving strategy differently in both large and small organisations.

We saw this clearly in a municipality with a wide variety of strategy development. An initiative from the periphery of people within the municipal administration caught wind, and they managed to get financial support from Vinova to develop a more fine-grained digital system to create an AI-powered solution to manage the performance of its W&WW system. Facing the complex challenge of managing the W&WW system, they let municipal employees test it and collaborate with it. The organisation organised around the initiative. This tool drew power from the collaboration with the technical university, other areas of the municipality that benefited from the system, and stakeholders to increase the fine-grained data and communication channels. This strategy, as a variety, emerged and was possible due to this municipality's unique resources and capabilities. The tool also created proximate objectives, which amplify the ability to create strategies by changing the conditions of strategy.

Another lower-tech innovation is when the organisation realised that the scarcity of resources put a lot of pressure on centralised management to create a strategy and manage deviations. They created an idiosyncratic policy where strategy was let to emerge from the periphery, and then, if enough evidence for this project was found, the organisation rethought its prioritisation.

From the multi-case study, it was also evident that politicians were a main source of friction, and they seldom gave the organisations the financial resources to succeed with the challenges at hand. Despite this, politicians were also a source of where strategy emerged. Their thoughts and ideas are channelled from other stakeholders as customers and are an important asset to organisations. The challenge is for the organisations to have the resources to act upon the ideas, leading to innovative and idiosyncratic solutions.

Workshops were a tool to increase collaboration between departments. Leaders said they worked well in sharing knowledge and aligning employees' views on how to reach the organisational goals.

However, there is a need in the sector to continue breaking down silos;

communicate within the municipality and across municipalities to find synergy effects. This will improve the conditions for strategising assets in a W&WW utility organisation.

6.1.4 Through the discourse lens

The discourse lens highlights the power of spoken and written language in developing strategy. There are several communication channels, and all have their own set of chosen discourses.

As previously shown, it's challenging to secure the needed amount of financial resources from politicians. Lack of discourse is a large contributor to failed long-term strategies. Earlier discourse in the sector was about being proud of having low tariffs. The modern W&WW sector has been introduced to the discourse of AM, but this discourse is not used throughout the sector. Managers are aware of it and its implications, however, it is not extensively used and our conception is that it is not frequently used further down in organisations.

The discourse in ensuring stakeholders that organisations are focused on maximising the value of the physical assets of the system is up for interpretation. The ISO55000 panflip (ISO/TC 251 2017) suggests how to identify if an organisation is talking about AM, and our understanding by interviewing top managers in organisations is that it is recognised but not in full use. This leaves the discourse focused on detailed planning, such as investment plans, re-investment plans, and asset performance. The issue is that this discourse is mostly unknown to stakeholders who take these services for granted. Through the discourse lens, the threat of not having a discourse between organisations and stakeholders is seen as threatening strategy success.

We noticed that in the sector, the changed discourse from the Svenskt Vatten in the past years has increased the potential of rallying support in initiatives tackling the investment gap. With the change in talking about the lowest water tariffs, municipality politicians now understand that everyone needs to invest in their W&WW infrastructure, and the communication between organisations and asset owners is focused on investment debt. This

has a leverage effect when seeking investments.

However, discourse can also show the intentions of the one delivering it. Just as SV hasn't been able to stay consistent in its effort to quantify the investment debt, leading to thoughts about them wanting to raise as much money as possible, politicians are vague, and their goals have a lot of 'fluff' in their discourse to gain support from as many voters as possible. In this narrative, discourse is the ability to get leverage from communicating efficiently. Communication decreased in cases where the organisations, through re-organisations, moved to new locations. The effect of newly elected officials was also a source of worsened communication. Educating the newcomers in the W&WW utility discourse was necessary to show the interconnectivity of discourse and legitimacy in the W&WW sector.

One example of this is seen in section 5.2.3; it has been easier to progressively increase the W&WW tariffs to meet the re-investment needs in situations where the discourse flows easier. A sudden water crisis had previously struck this municipality, and the stakeholders know the effect of degrading W&WW infrastructure. Hence, the stakeholders understood the new strategy over the coming years and formed a cohesive discourse. The common understanding of what is important in a W&WW utility made it easier for the progressive strategy to come into action than other municipalities. A similar case was shown in Skellefteå where a previous disaster with contaminated water gave the municipality an identity change, and in a short time, local politicians changed their perception of the importance of the health of W&WW facilities and assets (Jonsson et al. 2022).

6.2 Summary of lenses analysis

We have identified some of the critical points of viewing strategy development in the present Swedish W&WW sector.

Design lens

Strategic decisions are based on analysis and evaluation. Organisations rely on guiding documents from SV and SKR to perform analyses. This is more common in smaller organisations. Additionally, many organisations utilise consultants for in-depth analysis. While this approach aims to achieve high objectivity and legitimacy through standardised methods and external expertise, it can be limited by the availability and quality of the underlying data. This highlights the growing need for robust data collection and analysis capabilities within these organisations.

Experience lens

For a long time, the sector has been heavily influenced by the 'know hows' and has not changed much. The sector culture has now been changed with increased demand and new experiences questioning the status quo, resulting in change. Reorganisations are trying to break the old ways and increase focus towards the long-term goals. The implication is that decisions should balance rational analysis with experience and re-evaluating processes.

Variety lens

Strategy development in Swedish W&WW organisations benefits from a bottom-up approach that leverages the strengths of both peripheral and central actors. By acting as facilitators, management can decentralise decision-making, empowering these groups to contribute innovative solutions. This collaborative approach has the potential to break down silos between departments, increase employee engagement, and ultimately lead to a more efficient utilisation of resources and capabilities.

Discourse lens

Effective communication plays a crucial role in shaping strategy within Swedish W&WW organisations. Key examples include instances where open dialogue between organisations and politicians has facilitated informed strategic decisions. This collaborative discourse often focuses on communicating the long-term implications of debt and its impact on future service delivery. Regular communication ensures all stakeholders are well-informed, fostering a shared understanding that facilitates the cohesive implementation of the chosen strategy.

Chapter 7

Conclusions & Recommendations

7.1 Conclusions

To conclude this project, we will see if we have answered the research questions set out to be answered.

- **RQ1**: What are the different organisational constellations in the Swedish water utility sector, and how do these constellations impact the efficiency and effectiveness of water utility management?
- **RQ2**: How are organisations using information to manage large infrastructures effectively?
- **RQ3**: Do water utility organisations face similar difficulties when trying to overcome the investment gap?

7.1.1 RQ1

There are many organisational constellations in the Swedish water utility sector. The type of organisation is mainly specific to each municipality's historic management. Organisational change has been found in all municipalities we have been in contact with. However, no organisational form can be concluded to be the most optimal, and the emphasis should be on catering to the needs of each municipality.

A large challenge organisations face is increasing legislative pressure on performance and administration. In addition to trying to bridge the existing investment gap, this leads to an even higher demand for financial and human resources within the organisations. These demands force organisations to find cost-efficient solutions and reorganise accordingly.

Re-investing in infrastructure faces many challenges: when changing pipes or refurbishing facilities, disruption is not an option, and the cities' complex infrastructure leads to higher costs and slower processing than the original installation work. Synergy effects can be found by either organising with other services within the municipality or with W&WW services of other municipalities to reduce costs. Organisations communicate with municipal politicians, but the frequency varies depending on the local conditions. Common wishes from organisations are a need for clearer policies on how this communication is performed and how frequently it should be to facilitate an aligned view of the situation. Viewing the W&WW utility as a part of a complex system with other utilities can make it more cost-effective.

7.1.2 RQ2

Organisations try to use a more thought-out design and data-based decisions when strategising. This is evident when many organisations use more digital tools like simulation and modulation. There is also a need for investigative engineers to set project requirements, hinting at organisations wanting to base strategy on more analysis. This information is then utilised to prioritise and secure finances from the municipality.

However, this approach requires a lot of resources, and smaller organisations cannot perform the extensive analytical work. In some cases, the analysis doesn't conclude a definite answer, making it difficult to move forward.

This is evident in the use of the benchmarking tool HBI, which allows organisations to reduce ambiguity by comparing KPIs in asset performance and status with those of other municipalities. However, HBI has flaws, as it's based on self-evaluation and may lack the required detailed information

for the thought-out design strategies.

The other three strategy perspectives hide insights that can help understand how information is utilised compared to how the organisation wants to utilise it in a sector that simultaneously needs funding, staff, and technological systems.

Historical and cultural factors have affected how strategy is conducted, and in the present day, we see this effect. While organisations have been proficient in managing water and sewage systems, they have been less effective in anticipating future needs, resulting in a lagging investment rate. Municipalities have performed reorganisations and challenged old assumptions, prompting an increased focus on new investments and proactive tariff adjustments, allowing needs to dictate the pace of financing and new ways of managing.

In one municipality, we encountered plans to increase its tariffs by nearly 50% within a year to address urgent needs. This organisation also advocated for a proactive approach to tariff setting before it became too late.

Realising that operating in a municipality is complex and involves many human interactions, we've found it hard to create deliberate, thought-out strategies. Various strategies have emerged from the periphery of organisations because of better communication and collaboration between departments. These strategies benefit from being tailored to the available resources and capabilities

Finally, the choice of discourse greatly affects what strategies are adopted. The discourse from SV focusing on the investment debt in media, along with the development of reporting tools like HBI, has a beneficial effect on how leaders communicate objectives to stakeholders, including politicians making the final decisions. We found that organisations with a previous history in W&WW crises had it easier to make needed strategic adjustments, both regarding internal support and support from politicians, because the discourse was already set.

However, before one truly benefits from heavily analytical strategies, it is important to question old assumptions. It is also necessary to try to increase communication within and between municipalities to leverage diversity and

find the right language between organisations and stakeholders to expedite the strategy process.

7.1.3 RQ3

The five interviewed organisations have similar difficulties but prioritise and seek solutions independently. This could be explained by different pressing needs and prerequisites–in turn because of, e.g. historic administration, geology, and economics.

Based on this multi-case study, it seems likely that water utility organisations face similar difficulties.

However, our current research does not allow us to confirm this completely. Further qualitative and quantitative research is needed to provide a more comprehensive understanding of the situation and draw definitive conclusions.

7.2 Contributions to academia

This thesis contributes to the field of public utility strategy by providing empirical evidence on the challenges and opportunities faced by W&WW organisations when developing strategies within their local municipal context. It examines both municipal administrations and municipal-owned enterprises across a range of sizes. The thesis identifies the information needs of these organisations and explores novel approaches for navigating local challenges. By analysing challenges and opportunities through various strategic perspectives, this thesis emphasises the importance of achieving balance in strategic work within complex environments.

This research provides valuable insights for researchers who can utilise the different aspects of strategic work in Swedish W&WW organisations to develop improved systems and models that assist organisations in crafting effective strategies tailored to their specific local conditions.

Lastly, it is interesting that we are engaging in the topic of Swedish W&WW strategy for our Master of Science thesis in Industrial Engineer-

ing and Management, as the sector needs more people from diverse fields. This is important because the challenges in the public context are significant and numerous. By shining a light on this topic, we hope to inspire more students with our background to become involved in the water management sector.

7.3 Recommendations for future research

This study explored how Swedish water utilities can be organised and how this affects their management. We've also explored how these organisations utilise information to manage their large infrastructure effectively and how this differs between organisations. In this endeavour, we have identified some interesting topics for further research to continue exploring strategising in the Swedish W&WW sector. See Figure 7.1 how the further research suggestions are related to the research questions.

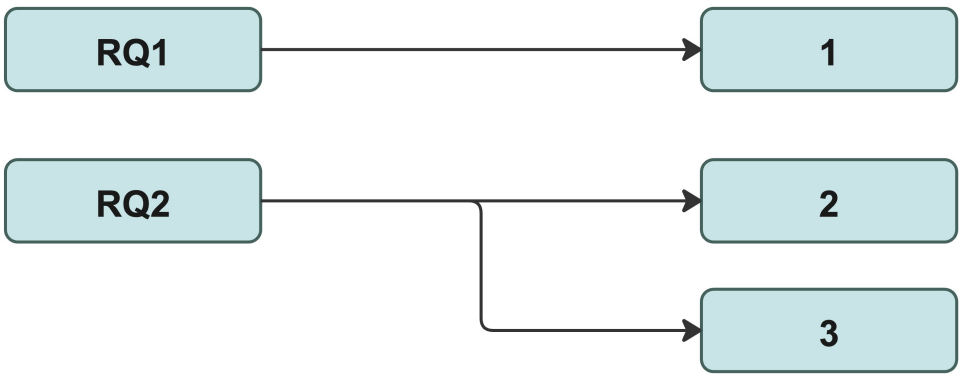

Figure 7.1: Illustration of how the research questions are related to the further research suggestions.

1. In the Swedish context, we've seen that organisations have reorganised to increase their focus towards completing a specific high-stakes challenge. This thesis explored how the resulting organisational form handles the present situation. However, it would also be interesting

to research the strategies that caused a reorganisation. How are these developed, and are they strategies through a design, experience, variety or discourse perspective, or a combination?

2. In our analysis, it was argued that organisations seek designed strategies through analysis; however, it was also discovered that discourse greatly affected the attitude asset owners had to support strategies with the right amount of funding. Organisations are often too small to apply extensive systems like AMS. Therefore, we suggest that further research could explore how designed strategies affect W&WW organisation's ability to collaborate and get financial support from asset owners.

3. In our endeavour, it was also discovered that there is a lack of clear guidelines on asset requirements. However, the W&WW sector is not the only sector with many assets to manage. Therefore, we suggest that further research in a cross-sectional comparison between different asset-heavy sectors could be performed. Particular interest would be to interview individuals who have moved sectors, e.g. from nuclear energy to W&WW. Can the sectors learn from each other in the trade-offs of having low/high asset requirement control to find an appropriate level for the W&WW sector?

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Appendix A

Stakeholder Mapping

Stakeholders		Value drivers	Requirements
External	Population/ companies recieveing services	Availability (of service) Reliability (of service) Cost Health Adaptability Perception	24/7 services Uninterupted service Service quality Affordable cost Updated information Quick respons
	Society at large	Safety Well-being Social and economic growth Cooperation	Security, cybersecurity No odor, noice or inconvenience Updated information Environmental impact mitigation Job creation
	Municipal politicians	Availability (of service) Social and economical growth Well-being Environmental protection	24/7 service Environmental impact mitigation Job creation Satisfaction of client needs
	Financial providers	Economic sustainability Access to reliable information	Asset value knowledge
	Regulatory bodies (myndigheter)	User interface suitablity Sustainability of service management Environmental sustainability	Environmental impact mitigation CAPEX and OPEX, efficient management
	Grantor (tillstånd)	Service sustainability Environmental sustainability	Long-term infrastructure functional fitness
Internal	Shareholder (Owner)	Revenue Appropriate investment Cost Compliance Reputation Service sustainability Innovation Risk-mitigation	Satisfaction of client needs Net profit Financial availability None or few complaints Transmissible tariff saving Regulatory compliance Long-term sustained or improved service
	Staff	Safety Well-begin Satisfaction	Safe working environment Internal cooperation Continuous qualification Capabilities development

Figure A: Our suggestion on how to view the stakeholder map of Swedish W&WW utility. Inspired by Almeida et al. (2021), Hughes and Moore (2017), & Trindade et al. (2018)

Appendix B

Interview Guide (Swedish)

Reminder: Individuals were interviewed, but organisations were investigated. This means that the individual was representing the organisation in the interview. Therefore it was important to separate personal opinions from organisational opinions.

The purpose of the interview was restated before each interview in setting the context. The aim was to analyse how strategic (long-term) planning is practically carried out, the challenges and opportunities decision-makers face, and the strategies in place to ensure a healthy and sustainable W&WW system.

The interviews were open ended and the interview guide was only a support in trying to holisitcally cover the topic. The local context and answers guided which questions was most interesting in asking. This is just a smorgasbord of questions that were asked.

Bakgrund och erfarenhet:

- Kan du dela med dig av din bakgrund och dina nuvarande arbetsuppgifter?
- Hur lång erfarenhet har du inom branschen och på din nuvarande position?
- Hur har organisationen tidigare arbetat strategiskt, särskilt innan din tid?

Behovsanalys:

- Berätta om organisationens behov. Process att ta fram dess
  - Vad är status på befintlig infrastruktur?
  - Kopplas till strategiska må och aktiviteter?
- Vad är det viktigaste utmaning enligt dig nu att ta tag I?
- Vad täcks i er vattentjänstplan och hur graderas behoven? Vem är involverad i planens framtagning och vilka beslut krävs? Hur återbesöks och uppdateras plane?
- Hur långt fram arbetar ni strategiskt?

VA-taxa och bokföring:

- Har ni höjt taxan? - i reala tal. Hur ser ni på det? jämfört med annan kommunal verksamhet
- Hur ställs detta till relation till annan infrastruktur?
  - Hur bemöts ett sådant här beslut av intressenter?
- Hur planerar ni utbyte av ledningsnätet för att uppnå strategiska mål och hur påverkar det er budget och VA-taxan?
- Hur togs den långsiktiga handlingsplanen för VA-försörjning fram med tillsynsmyndigheter? Var det den som ledde till den kraftigt ökade investeringstakten?
- Hur ser ert arbete med avskrivningar ut och hur påverkar det er årsredovisning?

Strategiskt arbete och kommunikation:

- Hur viktig anser du att en tydlig strategi är i organisationen?
- På vilket sätt tror du att en sådan strategi bör utformas och kommuniceras?
- Kan du ge exempel på strategiska dokument eller metoder som har använts?
- Hur ofta återkopplar ni till hur strategin fungerar och är anpassad till tillgångarna

- Energikartläggningen? Är energikartläggningen viktigare än att byta ut åldrande ledningar?
- Är Svenskt Vatten till stöd?

Utmaningar och förbättringspotential:

- Hur bedömer du organisationens framgång i att utforma och implementera (långsiktiga) strategier?
  - Vad är ni dåliga på?
  - Vad är ni bra på?
- Hur hanterar ni utmaningar med återinvestering i befintliga tillgångar som ledningsnät och reningsverk?
- Hur fastställs de strategiska prioriteringarna och medföljande aktiviteter?
  - Vad är de stora utmaningarna i detta arbetet?
- Vilka nyckeltal är viktigast för er?
- Är ni generellt överens med era intressenter? Eller finns det en felställning (missalignment)?
  - Vilka är era största intressenter?
- Varför sätts projekt som är budgeterade på väntelistan?

Intressentengagemang och planeringsprocess:

- Hur involveras intressenterna (internt/externt) i den strategiska planeringsprocessen och vilka metoder används?
  - Har ni några särskilda beslutsmoddeller? För stora och/eller långsiktiga investeringar.
- Var sker långsiktig planering och vilka personer/roller är involverade?
- Hur utvecklas strategin? Är den deliberate intent eller emergent eller en blandning?
- Vilka nyckelindikatorer används för att mäta framgång i strategiimplementeringen?

Avslutande frågor:

- Finns det ett specifikt dokument för strategiska beslut som du skulle vilja nämna och dela med dig av?
- Har du några framtida strategiska mål för organisationen?
- Hur ser du organisationens strategiska utveckling de kommande åren?
- Vilka kompetenser värderas vid anställning inom management och VA-branschen?
- Vad är ledningsnätets förnyelsetakt?
- Hur tar ni fram era beslutsunderlag för vattenförsörjning, och hur relateras dessa till ert övergripande strategiarbete? Vem är inblandad i denna processen?