UNIVERSITEIT TWENTE.

ARCADIS Design & Consultancy for natural and built assets

INTERNAL STRATEGIC ALIGNMENT WITHIN THE SETTING OF ASSET MANAGEMENT

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Master Thesis

AUGUST 18, 2017

UNIVERSITY OF TWENTE.

ARCADIS

Internal strategic alignment within the setting of asset management

Master Thesis
Master Business Administration
Faculty of Behavioral, Management and Social sciences
University of Twente

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18/08/2017

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Preface

This Thesis concludes the Master Business Administration at the University of Twente. The Thesis was conducted at Arcadis Nederland (Advisory groups Water Management & Landscape North-East and South-West Netherlands), in collaboration with the regional water authorities Vechtstromen and Zuiderzeeland.

Researching the topic of strategic alignment within the setting of asset management has been very educational. After years of following courses at the university, it has been a valuable opportunity to apply my knowledge and skills during an in-depth research. Moreover, by studying the regional water authorities Vechtstromen and Zuiderzeeland, I have gathered a better understanding about how the Dutch regional water management is organized. Finally, during my time at Arcadis, I got a good impression what working at a design, engineering and management consulting company encompasses. The experiences and knowledge I gained during this Thesis will be useful for my working career.

I would like to thank all members and former members of my graduation committee for their commitment and valuable feedback during the processes. Thank you Dick van Pijkeren, Ilse Verbeek, Esther Both-Pols and Paul Copier for your time, patience, enthusiasm, knowledge and sympathy. Thank you Raymond Loohuis and Andreas Hartman, for the valuable meetings and advice, as well as the time you invested in me. Next, I am greatly thankful to Arcadis for providing me all the resources, knowledge and expertise to conduct the graduation project. I would also like to express my sincere gratitude towards the regional water authorities Vechtstromen and Zuiderzeeland for the time and resources they invested in the research.

I would like to thank my parents for providing me the possibility to study, the encouragements and the unconditional support. Lastly, I would like to thank Lotte for her love, inspiration, support and motivational talks during my graduation assignment.

Stefan de Vries

Abstract

The management (e.g. building, maintaining and utilizing) of physical assets can be conceptualized as a strategy process. This process is affected by contextual variables such as human resources and cultural values. Internal strategic alignment is essential for this as its helps to effectively and efficiently utilize the assets and create maximum value. Internal alignment is the consistency within the strategy process (top-down and bottom-up) between the objectives, strategies, performance measures, plans and operational actions that are spread across an organization and the consistency with contextual variables that should support this strategy process. The concept of asset management (AM) can help organizations to develop internal alignment in the management of assets. In other words, organizations that have not yet fully reached internal alignment could be triggered to improve themselves and adopt the principles of AM within their operations. However, also the deployment of AM itself can be considered as a (change) strategy process that is affected by several contextual variables. Again, also here, internal alignment is a vital element.

These two types of alignment form the basis of this study. This study aims to gather more insights: about the necessary conditions for the internal alignments in the management of assets and in the deployment of AM; about how these conditions manifest themselves in real-life; and about how these conditions can be developed if they are not yet present. Until now, literature has paid scant attention to these topics.

This study combined literature findings from the fields of strategic management and asset management. By doing this, this study identified 9 conditions (divided into 24 sub-conditions) that have to be met by an organization in order to reach internal alignment in the management of assets. For the alignment in deployment of AM, this study identified 9 necessary conditions (divided into 18 sub-conditions).

To investigate how each of these conditions manifest themselves within real-life, this research conducted two case studies. The two cases were the regional water authorities Vechtstromen and Zuiderzeeland. Both authorities are responsible for managing the water system and the wastewater treatment chain in their area of responsibility. For this study, data was gathered with 32 semi-structured interviews and this was supplemented by a desk study of various policy documents and strategic plans.

For both cases, this study concluded that internal alignment within the management of physical assets is not reached because not all necessary conditions are fully present yet. A lot of similarities were found between the two cases. These similarities were attributed to the fact that two organizations operate in similar institutional contexts. Furthermore, for both cases, this study found a lot of similarities between internal alignments for the water system and the wastewater treatment chain. However, the study also revealed the management of wastewater treatment chain is often somewhat more advanced because characteristics of the physical assets are more favorable.

In total, this study identified 13 major constraining factors that obstruct the organizations from meeting all the necessary conditions. Some of these factors are quite visible and specific (e.g. the absence of a clear strategic frame of reference), while others are more difficult to identify as they are embedded within the organizational cultures (e.g. a tendency to focus on the *'do'* phase of the plan-do-check-act cycle). This study proposed 4 main pillars of solutions that that can directly help the organizations to tackle the constraining factors that are currently most serious. These solutions are for a large part based on the concept of AM.

Nonetheless, already before this study was conducted, the two authorities initiated a change process and started to deploy some principles of AM within their existing operations. This research also studied these existing change processes. Likewise, also for the alignment within the AM deployments, this study concluded that not all necessary conditions are fully present yet. Again, a lot of similarities were found between the two cases and differences were detected between their two asset systems. For this type of alignment, this study revealed 9 major constraints. The two organizations are for example obstructed because: there is no full and shared understanding about AM; some members of the organizations are somewhat reserved about AM; there is no clear guiding coalition; and the relations between the AM deployment and other organizational developments are not well managed. Based on these findings, this study proposed 6 pillars of solutions that be conducted by the two organizations to improve the alignments within their AM deployments.

All in all, this study is one of the first that provides deeper insights into the concept of internal alignment within the setting of AM. Future studies could use this to further close the existing research gap. They could for example critically review and further develop the existing analytical framework and/or conduct more case studies. Other organizations could wait for these future studies. Nevertheless, in order to get a head start and acquire quick wins in the short-term, other organizations could also already learn lessons from this Thesis. They could adopt those findings and recommendations that are most valuable to them.

Contents

1 INTRODUCTION 9

1.1 Background 9
1.2 Research objective and research questions 9
1.3 Method 10
1.4 Contribution 11
1.5 Report outline 11

2 LITERATURE REVIEW 12

2.1 Conceptual framework 12
2.2 Asset management and its deployment 13
2.3 Internal strategic alignment 22
2.4 Conclusion 28

3 RESEARCH METHODOLOGY 31

3.1 Introduction 31
3.2 Cases 31
3.3 Collection of data 31
3.4 Interpretation and reporting 32

4 INTERNAL ALIGNMENT IN THE MANAGEMENT OF PHYSICAL ASSETS 33

4.1 The Dutch regional water authorities 33
4.2 Vechtstromen and Zuiderzeeland 34
4.3 The existing internal strategic alignments 38
4.4 Improving the existing internal strategic alignment 55
4.5 Conclusion 62

5 INTERNAL ALIGNMENT IN THE DEPLOYMENT OF ASSET MANAGEMENT 63

5.1 The existing internal strategic alignments 63
5.2 Improving the existing internal strategic alignments 71
5.3 Conclusion 76

6 CONCLUSION 77

7 DISCUSSION 78

8 LIMITATIONS AND RECOMMENDATIONS 79

REFERENCES 80

APPENDIX A: CHAPTER 2 85

APPENDIX B: CHAPTERS 3 & 4 86

1 INTRODUCTION

1.1 Background

To effectively and efficiently manage their assets, an increasing number of organizations nowadays apply the principles of asset management (AM). There is also a growing body of practice and research-related literature that studies AM and that develops models and tools for AM (Schraven, Hartmann, & Dewulf, 2011; Wijnia, 2016). AM can be defined as the "systematic and coordinated activities and practices through which an organization optimally and sustainably manages its assets and asset systems, their associated expenditures, performances and risks over their life cycles for the purpose of achieving its organizational strategic plan" (IAM, 2008a, p. 6). AM involves interdisciplinary and life-cycle approaches that require the collaboration between organizational units and the integration of short-term and long-term decisions (Amadi-Echendu et al., 2010). Although AM can be applied to various types of assets, this study specifically focuses on physical assets.

When properly applied, AM helps to acquire insights about the expenditures, performances and risks of the assets over their life cycles. These insights can be used by organizations to anticipate on future asset life cycle phases and find an optimum allocation of their limited resources (ISO, 2014; Moon et al., 2009). In this way, AM can result in improved financial performances (more value from the same budget), improved asset performances that meet the stakeholder expectations, informed management decisions, demonstrated social responsibilities and compliance and improved organizational sustainability (managing short and long-term effects) (IAM, 2008a; ISO, 2014; Moon et al., 2009; Schraven et al., 2011). These benefits can help organizations to cope with challenges such as budget cuts, more and higher stakeholder requirements, the public demand for higher transparency, managing aging assets and increasing utilizations of the asset systems (Schraven & Hartmann, 2010; van der Velde et al., 2013; Wijnia & Herder, 2010).

Internal strategic alignment in the management of assets is the backbone of a successful organization. AM is a concept that can help organizations to obtain this alignment (e.g. Austroads, 2013; IAM, 2008a; ISO, 2014; Moon et al., 2009; NEN, 2016). In this study, internal alignment[1] is defined as the consistency within the strategy process between the objectives, strategies, performance measures, plans and operational actions that are spread across an organization and the consistency with contextual variables such as human resources and the organizational culture. So, an organization that has not yet reached an internal alignment in the management assets can be triggered to deploy[2] AM in its operations. However, also the AM deployment itself is a strategy process that is affected by contextual variables. More importantly, also here, internal alignment is an essential element.

Existing literature does not make this above distinction between the two alignments. Nonetheless, in case of both types of alignment and also for the combination of the two, existing AM literature has paid scant attention to the conditions that have to be met by organizations in order to reach alignment and also scant attention has been paid to how these conditions manifest themselves in real-life organizations (Schraven et al., 2011; Wijnia & Herder, 2010). There are multiple studies in the field of strategic management that studied alignment in detail (Acur et al., 2012; Andrews et al., 2012; Avison et al., 2004; Beehr et al., 2009; Beer et al., 2005; Bergeron et al. 2004), but they did not focus on the setting of AM.

1.2 Research objective and research questions

Because strategic alignment is largely overlooked in the field of AM, the present study seeks to shed some more light on this. This Thesis aims to gather more insights about the necessary conditions for the internal strategic alignments in the management of physical assets and in deployment of AM. Moreover, it aims to study how these conditions manifest

[1] The research scope does not include external strategic alignment (the fit with the external environment). Future references such as "alignment" therefore always refer to the internal alignment

[2] To avoid confusion about the different uses of the word "implementation", the implementation of AM in an organization is hereafter referred to as the deployment or application of AM

themselves in real-life organizations and how these conditions can be developed if they are not present yet. The research question is: *How do the necessary conditions for internal strategic alignment in the management of physical assets and in the deployment of asset management manifest themselves in organizations and how can organizations develop these conditions if they are not present yet?*

To answer the main research question, 6 sub-questions are formulated:

1. What is asset management and what does the deployment of asset management look like?
2. What are the necessary conditions for the internal strategic alignments in the management of physical assets and in deployment of asset management?
3. How do the necessary conditions for the internal strategic alignment in the management of physical assets manifest themselves in organizations?
4. How could an organization develop the necessary conditions for the internal strategic alignment in the management of physical assets if they are not present?
5. How do the necessary conditions for the internal strategic alignment in the deployment of asset management manifest themselves in organizations?
6. How could an organization develop the necessary conditions for the internal strategic alignment in the deployment of asset management if they are not present?

1.3 Method

The relations between the sub-questions are visualized in Figure 1. As shown, this research constantly makes a distinction between 2 aspects: the management of assets (for which one could adopt the principles of AM) and the deployment of AM.

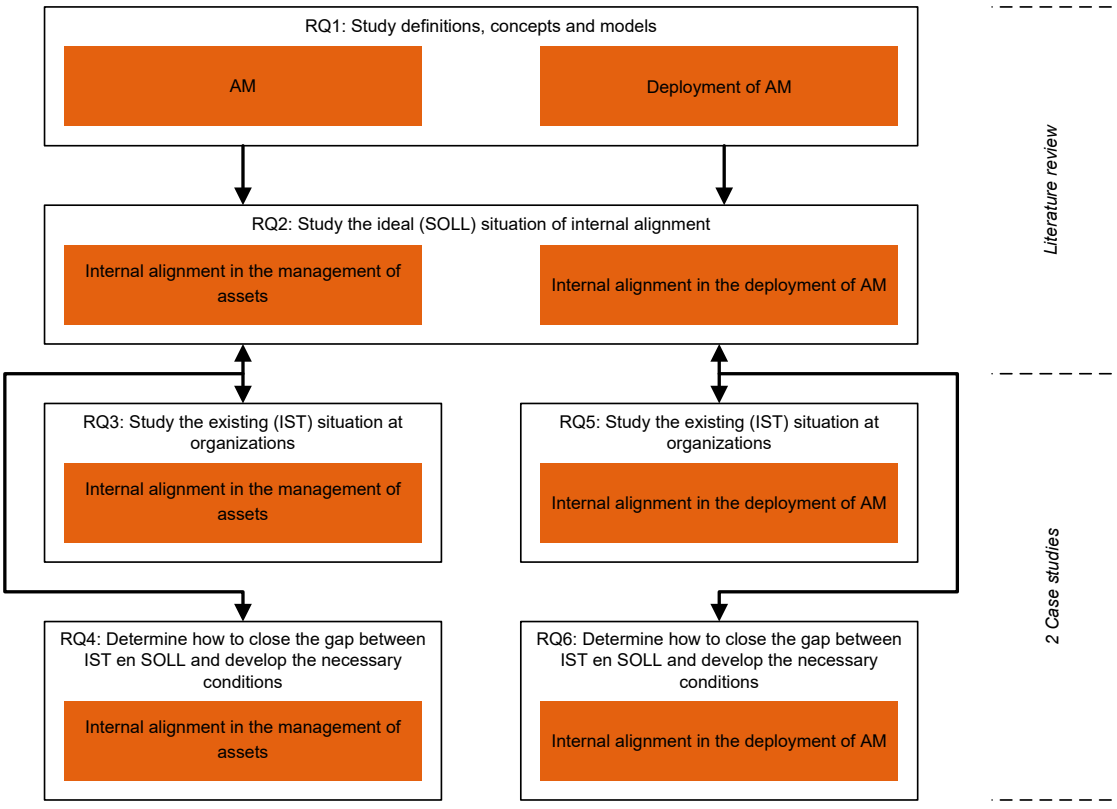

Figure 1 Visualization of the research (sub-)questions and their relations

As shown in Figure 1, research will start with a literature study. Existing AM literature will be reviewed and the missing insights will be acquired by reviewing strategic management literature. With sub-question 1, this research will describe AM and explain what process of an AM deployment looks like. By answering sub-question 2, this study will provide a definition for internal alignment and describe what conditions must be met by organizations if they want to reach an internal alignment in the management of assets and/or the AM

deployment. In other words, this second sub-question describes the desired/ideal (SOLL) states of the two types of internal alignment.

For sub-questions 3 till 6, this research will use these literature findings to study how the internal alignments are actually configured at real-life organizations (the IST situation) and how organizations could improve this (close the gap between IST and SOLL). This study will discuss to what extent organizations are meeting the necessary conditions for two types of internal alignment and how these organizations can develop the necessary conditions if they are not fully present yet. Whereas sub-questions 3 and 4 do this for '*the management of assets'*, sub-questions 5 and 6 focus on the *'deployment of AM'.*

To perform these above actions for sub-questions 3 till 6, this research conducts two cases studies and gathers data using semi-structured interviews and a desk study. The two cases are the Dutch regional water authorities Vechtstromen and Zuiderzeeland. This study focusses on the physical assets within their water systems and wastewater treatment chains. The research methodology and the two cases will be further described in Chapter 3.

It is important to note that the case study findings are based on observations from the summer and autumn of 2016. However, after cross-referencing this Thesis with the two authorities, it was concluded that the findings of this research are still valid.

1.4 Contribution

The findings of this study will contribute to the existing AM literature. It provides deeper insights about the necessary conditions for the two types of internal strategic alignment, how these conditions manifest themselves in real-life and how these conditions could be developed if they are not present yet. Although literature often acknowledges that alignment is an essential part of the AM philosophy, researchers have not paid much attention to this topic. The theoretical basis and the case-specific findings could be applied by researchers to study other organizations. Moreover, it could also be used by researchers to develop a more generalizable theoretical framework for strategic alignment in the setting of AM. Furthermore, the research findings can be used by the two selected authorities to identify the limitations in their alignments and develop a detailed action plan. Finally, also other public and private organizations can benefit from this study as the findings can to some extent be useful in other contexts.

1.5 Report outline

The visualization of the report outline is shown in Figure 2. Chapter 2 will contain the literature review and answer sub-questions 1 and 2. Chapter 3 will discuss the research methodology. Combined, Chapter 2 and 3 will form the input for Chapters 4 and 5. This research will compare the theoretical findings from Chapter 2 with the existing situations at organizations in order to discover gaps (RQ3 and RQ5) and provide solutions for this (RQ4 and RQ6). This was also shown in Figure 1. Chapter 4 will provide answers to sub-questions 3 and 4 (*the management of assets*). Chapter 5 will discuss sub-questions 5 and 6 (*the AM deployment*). Chapters 6 and 7 will discuss respectively the conclusion and discussion. The research limitations and recommendations will be mentioned in Chapter 8.

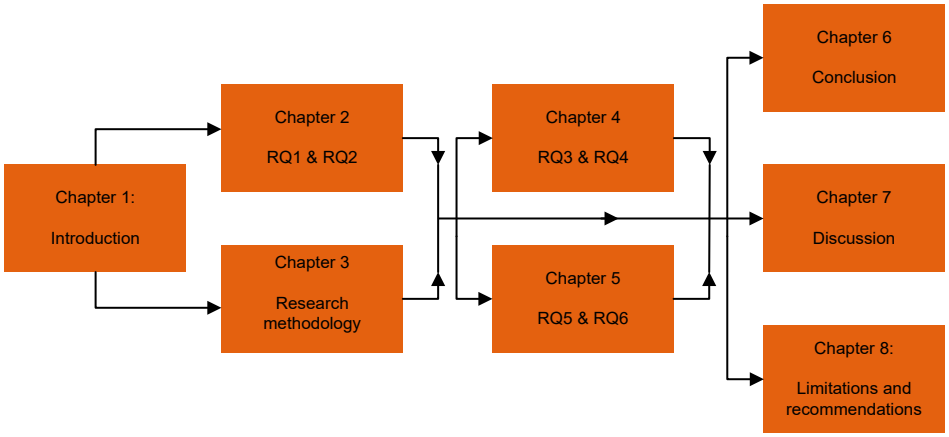

Figure 2 Visualization of the report outline

2 LITERATURE REVIEW

2.1 Conceptual framework

Chapter 1 already briefly discussed the two focus points: the management of assets and the deployment of assets. To further elaborate on this, a conceptual framework is made. This is shown in Figure 3. The framework includes two strategy processes (the white boxes). This Thesis simplifies the strategy processes and assumes that they contain 3 discrete phases: strategy formulation, implementation and control. During the first phase, the strategy and the accompanying long-term objectives are formulated by analyzing the internal and external contexts (Grünig & Kühn, 2005; Moon, 2013). With strategy implementation, the developed strategy is realized throughout the organization by translating the long-term strategic plans into clear short-term objectives and actions (Li et al., 2010; Roelfsema, 2014). During the strategic control, ones evaluates the previous steps and checks whether the assumptions made correspond with reality (Grünig & Kühn, 2005).

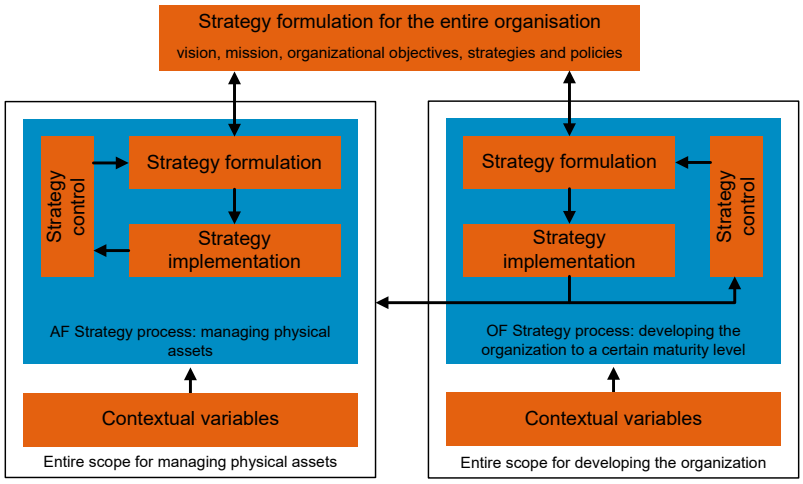

Figure 3 Conceptual framework of this study.

First of all, the conceptual framework recognizes the AF (asset focused) strategy process (left white box). This describes how physical assets are managed and how this creates value for the organization and its stakeholders. The AF strategy is particularly the concern of those employees (e.g. project managers, operators and engineers) that work with or have a specific interest in the assets. Usually, managing assets is only one of the many activities that an organization executes. Therefore, the AF strategy process is located below the higher-level organizational plans. As shown in Figure 3, the AF strategy process is also affected by contextual variables. These are aspects such as the organizational culture and the employees' competences that hinder the AF strategy process.

The conceptual framework also includes the OF (organization focused) strategy process. Whereas the AF strategy process focuses on the *management of physical assets*; the OF strategy process focusses on *developing the organization* to a desired level of maturity that is necessary to properly manage the assets. As shown in Figure 3, the OF strategy process aims to improve the AF strategy process (e.g. improve the AF strategy formulation) and/or its contextual variables (e.g. the employees' competencies). So, the OF strategy process is triggered when an organization wants to improve its AF strategy process and/or the related contextual variables. The coordination of the OF strategy is especially the job of those people involved in the organizational development (e.g. HRM, managers etc.). As shown in the figure, also the OF strategy process is part of the overarching organizational plan and is itself affected by contextual variables (e.g. leadership to promote organizational change).

2.1.1 The role of the conceptual framework in this Thesis

As stated, the first focus of this research is the alignment in the management of assets. Section 2.3 will prescribe which conditions are necessary to reach alignment in the management of assets (sub-question 2). As stated, this Thesis sees AM as reference point for this. In other words, an organization can develop the necessary conditions for internal

alignment in the management of assets by applying the concept of AM. Section 2.2.1 therefore first briefly describes what AM is and how this relates to the AF strategy process and its contextual variables (sub-question 1).

So, an organization that has yet no internal alignment within its management of assets may be triggered to deploy AM. The alignment in this (change) process of the AM deployment forms the second focus point of the research. When looking to the arrows in Figure 3, one can see that the AM deployment is a part of the OF strategy process. It focusses on improving the AF strategy process and its contextual variables. For this study, it is assumed that the scope of the OF strategy is limited to the AM. Other organizational developments (e.g. deployment of process management) are seen as contextual variables that can affect the success of the AM deployment. Section 2.2.2 will describe the strategy process and contextual variables of AM deployment (sub-question 1). The necessary conditions for alignment in the AM deployment are discussed in Section 2.3 (sub-question 2).

The observant reader may have noticed that existing AM literature usually does not make a strong distinction between the two approaches. The approaches are often discussed simultaneously or, in many other cases, the focus is only on the management of assets. This Thesis however deviates from this. In this Thesis, AM is seen as a way of organizing the management of assets. Developing the organization by deploying AM is left out of this and is perceived as a separate strategy process. The two approaches have different focus points (the assets vs. the organization itself). Moreover, the next Sections and Chapters will demonstrate that there are differences in the internal alignments for the two approaches.

2.2 Asset management and its deployment

This Section will discuss the existing literature about the concept AM and the AM deployment (sub-question 1). The structure of the Section is based on the conceptual framework (Figure 4). Sections 2.2.1 and 2.2.2 will discuss the strategy formulation and implementation for respectively AM and the AM deployment. Because of the many commonalities, strategy control is discussed only once and is included in Section 2.2.3. Section 2.2.4 presents the contextual variables of both strategy processes.

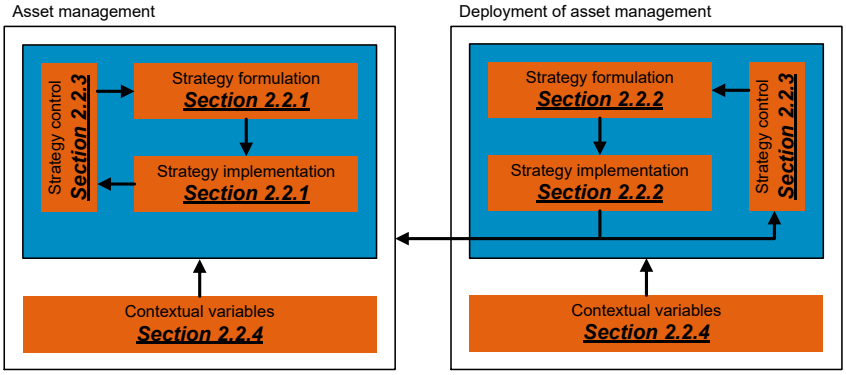

Figure 4 Using the conceptual framework to visualize how Sections 2.2.1 till 2.2.4 are structured.

It is important to stress out that the AM standards PAS55 (IAM, 2008a) and ISO55000 (ISO, 2014) form an important body of knowledge for the next Sections. The standards form a common understanding within the field of AM (Hodkiewicz, 2015; Moon et al., 2009) and there is an emerging consensus about key factors that are discussed (Hodkiewicz, 2015). However, this Thesis acknowledges that the scientific foundations are limited as the positive impact of apply the standards' requirements has yet not been extensively tested.

2.2.1 Asset management

2.2.1.1 Types of assets

For the remaining part of the Thesis, it is important to define what an asset is. According to ISO (2014), an asset is an item, thing or entity that has potential or actual value to an organization during its lifecycle. For this study, this is narrowed down to the physical assets that show characteristics of one two asset types: production facilities and infrastructure assets (Wijnia, de Croon, & Liyanage, 2014a).

Production facilities are confined physical locations in which active assets (e.g. machines) convert certain resources/raw materials into products. In many cases, these facilities are even operated for 24 hours a day and 7 days a week. Therefore, to ensure the continuity and to maximize performances, a lot of attention is paid to operating the assets (e.g. finding the right production speed) and the day-to-day maintenance for the wear and tear of the equipment. As such, professionalism and business temperance (rational thinking, process optimization etc.) are often well established for production facilities (Wijnia et al., 2014a).

Infrastructure assets (e.g. pipe lines, waterways and railways) are quite different. In general, these are passive assets (Wijnia & de Croon, 2015). They provide a route or control a flow of goods and services by their existence, not by their operation (Baldwin & Dixon, 2008). Compared to the production facilities, infrastructure managers pay relatively less attention to perfecting the operations. As infrastructure assets are generally costly and have long timespan, the focus is often more on investment and design decisions (Wijnia et al., 2014a). Other typical asset characteristics are: few substitutes in the short run, non-tradable, evolutionary systems, networked, dispersed and operated in the public domain, the owner is not the user and the user can be highly anonymous (Wijnia et al., 2014a). Finally, the asset performances are often difficult to measure because of the complex functions these assets have within the society (Baldwin & Dixon, 2008; Schraven et al., 2011).

2.2.1.2 Characteristics of asset management

This Thesis defines AM as: “The coordinated activity of an organization to realize value from assets” (ISO, 2014, p. 14). AM is about effectively and efficiently managing assets by explicitly creating a balance between the expenditures, performances and risks that occur over the asset life cycles with the aim to create maximum value (IAM, 2008a; Moon et al., 2009; Popović et al., 2010; Schraven et al., 2011; van der Velde et al., 2013). This process never stops as there should be a process of continuous learning and improving in the form of a plan-do-check-act (PDCA) cycle (IAM, 2008a; ISO, 2014; Moon et al., 2009). Value itself can be tangible, intangible, financial and/or non-financial and is determined by the organization and its stakeholders, in accordance with the organizational objectives.

AM should not be confused with maintenance management. AM is a holistic approach that considers all phases of the asset life cycle and also incorporates elements such as strategy, capital planning, safety, environment and human factors (Amadi-Echendu et al., 2010). AM follows an interdisciplinary approach in which collaboration and sharing of insights and expertise between diverse organizational disciplines (with different focusses and priorities) is essential (Amadi-Echendu et al., 2010; Wijnia & Croon, 2015).

With AM, value creation is the core principle. The desired value determines how many and which resources are needed and what, when, and how assets are managed (Hartsema, 2015; ISO, 2014). This may be mind-set shift for some organizations. The decision-making process is for example no longer primary driven by old habits, rules of thumb, the amount of resources available and the assets themselves. With AM, the decision-process is policy driven, goal oriented and performance based (Moon et al., 2009). It is based on well-defined objectives and metrics and relevant, qualitative and objective information that is correlated to these measures. This provides the rationale when evaluating asset performances, determining resource requirements, identifying trade-offs between investment options and choosing the best allocation of resources (Hartsema, 2015; Moon et al., 2009).

Section 2.2.1.4 will further detail out how the strategy process should like according to AM. Before doing this however, Section 2.2.1.3 first briefly introduces the concept of risk management and the usage of the business value matrix.

2.2.1.3 Risk management and the business value matrix

Risk management is integral part of AM (Wijnia, 2012; Wijnia & de Croon, 2015). It is the set of coordinated activities to direct and control an organization in order to limit the risk exposure (COSO, 2004; IRM et al., 2002; ISO, 2002). A risk is a threat with a potential undesired effect on the realization of objectives. Exposure refers to the expected bad fortune and equals impact times likelihood (Christensen et al., 2003; ISO, 2002; Wijnia, 2016). The risk management process consists out of several phases: establishing the context (e.g. defining the risk appetite), risk identification, risk analysis, risk evaluation

(judging exposure against the risk appetite) and (if necessary) risk treatment (ISO, 2009). The business value matrix can help during the risk management process of AM and can be a cornerstone within of internal alignment (e.g. link business values with risks).

Business value matrix

A value system for risks can be adequately represented by a business value matrix (Cox, 2008; Wijnia, 2016). An example of such a matrix shown in Figure 5. The business value matrix is a single risk matrix that expresses the risk tolerance on multiple business values. The business value matrix schematizes the spectrum of risks in several cells and assigns risk levels to them to indicate whether it contains tolerable or non-tolerable risks. The cells are formed by (often logarithmic) scales on the vertical (impact, for each business value) and horizontal (likelihood) axes. An impact scheme is defined for each value using some quantitative and/or performance indicators and the different impact schemes are aligned with each other (Cox, 2008; Wijnia, 2016). In case of Figure 5, a financial impact of 1-10 million euros is for example perceived as comparable to a single fatality or disability.

Potential consequences				Likelihood					
				Unlikely	Remote	Probable	Annually	Monthly	Weekly
Severity class	Finance	Safety	Reliability	<0,003	0,003-0,03	0,03-0,3	0,3-3	3-30	>=30
Extreme	> 10 M€	Several fatalities	> 20 M cml	M	H	VH	U	U	U
Serious	1-10 M€	Single fatality or disability	2-20 M cml	L	M	H	VH	U	U
Considerable	100k-1M €	Serious injuries and significant lost time	200k-2M cml	N	L	M	H	VH	U
Moderate	10k-100k €	Lost time incidents	20-200k cml	N	N	L	M	H	VH
Small	1k-10k€	Near misses, first aid	2-20k€ cml	N	N	N	L	M	H
Negligible	<1k€	Unsafe situations	<2k cml	N	N	N	N	L	M

Figure 5 Translated excerpt of the 2009 business value matrix of Enexis (2011) for the values finance, reliability and safety made by Wijnia (2016). The colors and letters indicate the risk levels.

Within the risk management process, the matrix and the risk appetite are defined during phase 1. After having identified and analyzed the risks (phases 2 and 3), the matrix can be used to evaluate all risks and determine whether they are tolerable or not (phase 4). For each risk event, the impacts on different business values are looked up in the matrix. Because the impact schemes of different business values are aligned, the matrix allows to translate the impacts on different business value into a single unit. As such, one can add them up and determine the total impact of a single risk event. By again plotting this total impact and its probability in the matrix, one can look up the risk level and use the matrix to determine whether the risk is tolerable. Usually, the impact schemes are aligned with a financial scale and it is therefore possible to translate all non-financial impacts into financial impacts. By adding these up, one can determine the monetary equivalent of the total impact for a single risk (e.g. the total monetary impact of an explosion in a factory that leads to injuries, repair costs, environmental impacts and reputational damage).

The matrix can also be a useful tool during the fifth phase: risk treatment. An organization that follows the previous phases usually ends up with a list of multiple non-tolerable risks but only has limited resources. The matrix can help in this determining the optimum portfolio of interventions: the set of interventions that realizes the largest risk exposure reduction with the limited amount of resources. To find this optimum portfolio, one selects the best treatment alternative for each non-tolerable risk and then prioritizes these interventions. The goal is to find those interventions with the highest benefit-cost ratios: the largest the risk exposure reduction per euro that is invested euro. The exposure reduction is the difference between the annually expected total financial impact (multiplication of the total monetary impact and the probability) before and after the implementation of an intervention.

***Example**: Let's assume an organization that faces 6 non-tolerable risks and has identified the best intervention for each them. By ranking the interventions based on their benefit-cost ratio, the organization can create the left graph of Figure 6. Here, the total risk exposure reduction is plotted as a function of the total investment. The graph consists out of multiple sections that each represent an intervention. The higher the benefit-cost ratio, the higher the rank and the steeper the line. As shown, the interventions can require different investments (horizontal distance) and can result in different risk reductions (vertical distance).*

In case of unlimited resources, the organization could invest in all interventions. However, the graph indicates that one can better not invest in the lowest ranked intervention (most right), as it is counter-productive and adds extra risk exposure. In this way, one can save €50k. Moreover, the second last intervention may not be selected because of its low benefit-cost ratio. As shown, this second last intervention costs €35k, but only lowers the total monetarized risk with €25k. So, if the organization has €75k, it can best conduct the 4 highest ranked interventions that reduce the total risk with €425k. If for example only €40k is available, the organization should execute 3 of them and reduce the total risk with €350k.

However, an organization may have reasons deviate from this prioritization. For example: because of political interests, because of practical considerations or because there is a demand to reduce a specific risk. Assume that the organization still has only €75k available, but the decision makers now want to exclude one intervention from the optimization process: the intervention that used to be ranked as second lowest. So, this intervention is executed anyway. After this manual adaptation of the ranks, one can again use the matrix to determine the optimum portfolio. As shown in the right graph, one can again conduct 4 interventions with the available €75k, but the risk reduction is now only €375k.

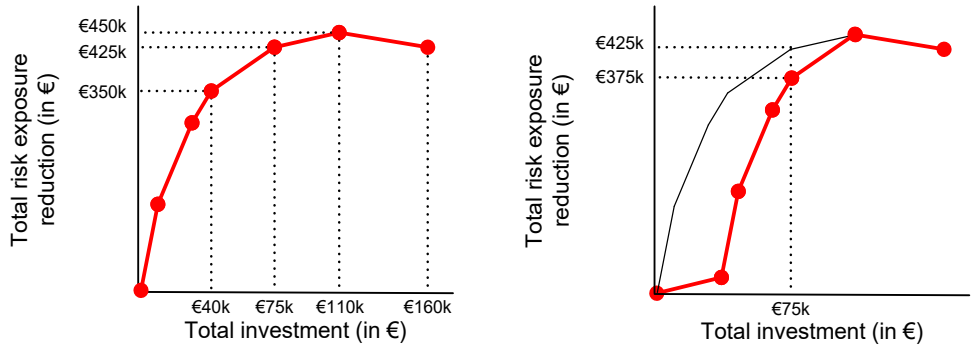

Figure 6 Graphs with the total risk reduction as function of the investments in risk treatment interventions. Each line section represents a single independent intervention. The left graph presents a situation without interventions that are being fixed. The right graph shows this original situation (black line) and what happens if 1 of the interventions is fixed.

So, the matrix can help to explicitly describe the current risk position and the risk appetite, to prioritize interventions and to show the impact of strategic decisions (e.g. increasing risks due to budget cuts)(Cox, 2008; Wijnia, 2016). The matrix helps to only invest resources in risks that are related to the organizational strategy, to reduce risks to the acceptable level and to allow risks to increase to the accepted level when there is an over performance (Wijnia, 2016). However, because the matrix has an order magnitude accuracy, it should not be applied too rigidly (Cox, 2008; Markowski & Mannan, 2008; Wijnia, 2016).

2.2.1.4 The strategy process of asset management

As stated, AM can be conceptualized as a process and presents an alternative way to organize the AF strategy process. The AM process model of this Thesis is shown in Figure 7. It is based on the models of Neumann & Markow (2004), IAM (IAM, 2008a), Moon et al. (2009), Amadi-Echendu et al. (2010), Schraven et al. (2011), Wijnia et al. (2014b), ISO (ISO, 2014), Hartsema (2015), Wijnia & Croon (2015) and Lub (2016). The blue area of the AM process model corresponds with the blue area of the conceptual framework (Figure 3) and visualizes the three AF strategy process phases. In order to better fit the setting of AM, the process model divides these phases into several activities. In line with other authors (e.g. NEN, 2016; van der Velde et al., 2013; Wijnia, 2016), the model distinguishes 3 roles: asset owner (strategic), asset manager (tactical) and service provider (operational). Strategy

formulation is mainly the responsibility of the asset owner. The asset manager and service provider are involved in the strategy implementation. In the AM process model, strategy control is framed as “information management and performance management” and requires the involvement of all AM roles. The text below will further describe the AM process.

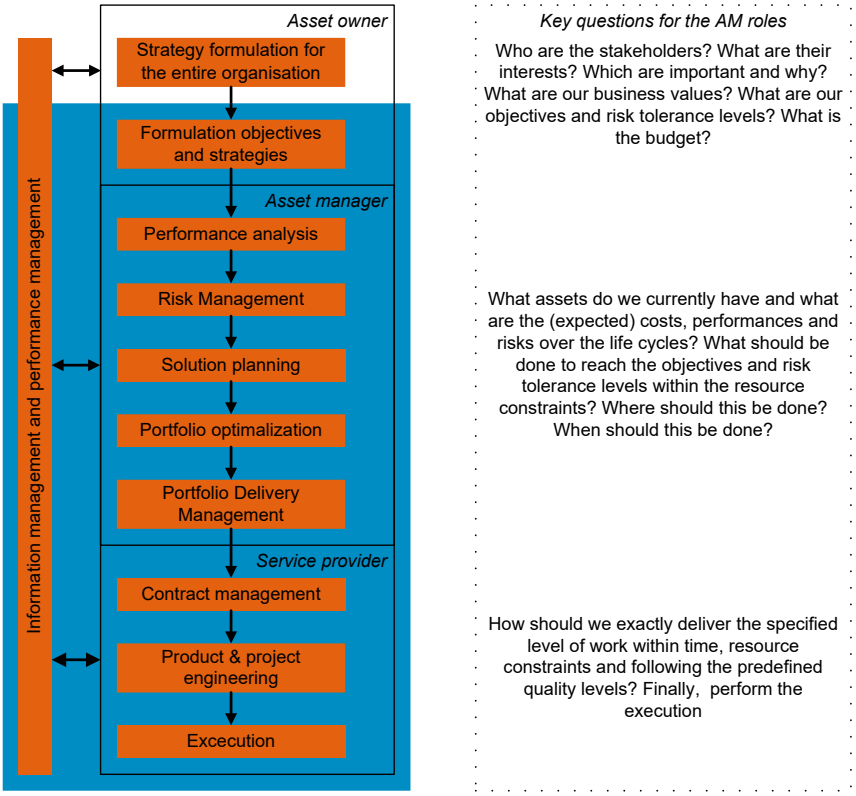

Figure 7 AM process model. The light blue area corresponds to the AF strategy process of the conceptual framework. The three boxes with dotted lines show the AM roles.

Strategy formulation: asset owner activities

The asset owner bears the ultimate accountability for the organization’s actions and decisions. The asset owner identifies and manages the stakeholder requirements and sets the business values, objectives and risk tolerance levels (Moon et al., 2009).

(1) Organizational strategy and objectives

First, the high-level organization’s vision, mission, strategy, objectives, policies are determined. These high-level strategic goals are stated as the fulfillment of certain improvement needs or achievement of expectations (e.g. safety, universal access and low social costs). As also shown with the conceptual framework, the formulation of these high-level plans is ignored in this Thesis. The plans are overarching and do not only apply to AM.

(2) Formulation of objectives and strategies for the management of assets

During the second activity, the organizational plans are made more applicable by translating them into objectives and strategies that focus on the physical assets (Schraven et al., 2011). These discuss what the agency attempts to accomplish with the assets and how to deliver these requirements. They form the rationale (a strategic frame of reference) for the asset manager and service provider when they asses the assets, identify trade-offs between intervention alternatives and prioritize them (Moon et al., 2009; Schraven et al., 2011).

According to Schraven et al. (2011) and Moon et al. (2009), the formulation of strategies and objectives for the asset base is challenging and perhaps the most fundamental and daunting impediment for a transition to AM. In case of public organizations (the focus of this study), the asset owner may find it difficult to indicate the contribution of public assets as the assets possess several functions and serve multiple public interests (Schraven et al., 2011). Defining objectives can also be difficult as the contribution of the public assets is often difficult to translate into SMART (Specific, Measurable, Achievable, Realistic and Time-

bound) indicators and thresholds (Schraven et al., 2011). Moreover, the asset owner may not have the right knowledge, experience and data (Brown, 2010). Finally, the task can be complicated by fragmentation across and within asset groups (Moon et al., 2009). Different types of assets and interventions often lead to different standards, philosophies and metrics which makes them difficult to compare. Moreover, also the variety of stakeholders often causes fragmentation in methods, standards, databases etc. (Moon et al., 2009).

To define the objectives and strategies, the asset owner could use the business value matrix. As explained, the matrix helps to makes the organization's value system rational, attainable and understandable. It demonstrates which values are important, how they should be compared with each other, how they should be measured and which risks are and are not acceptable. The matrix helps to provide some substantiation and structure in the asset owner's decisions and provides a frame of reference for the rest of the organization (Wijnia, 2016). In this, it is important that the business value matrix of the asset owner links with lower level matrices. The asset owner's matrix probably only focuses on those risk events that are of importance him/her: low probability and high impact risks. Small impact high likelihood risk events are somewhat outside the scope of the asset owner. These issues are tackled by the day-to-day actions of the service provider. This service provider has a certain autonomy and uses a lower level matrix.

Strategy implementation: asset manager activities

Based on 5 activities, the asset manager determines what, where and when interventions have to be executed in order to achieve the objectives of the asset owner (van der Velde et al., 2013). After this is documented in plans (called AM plans) and approved by the asset owner, the asset manager can instruct the service provider and agree upon a service level.

(3) Performance analysis

During this third activity, the asset manager analyzes the current and future asset performances to better understand the need for interventions (Neumann & Markow, 2004).

(4) Risk management

The risk management process was already introduced in Section 2.2.1.3. This fourth activity is used to identify, analyze and evaluate risks.

(5) Solution planning

During this activity, the asset manager generates alternative solutions that mitigate the non-tolerable risks and help to achieve the organizational objectives.

(6) Portfolio optimization

Briefly stated, optimization is about finding the best set of interventions that leads to the desired objectives and value creation (Hartsema, 2015). Section 2.2.1.3 already discussed how the business value matrix could be a useful tool for portfolio optimization.

(7) Portfolio delivery management

Finally, the asset manager translates the AM plans into work packages that are contracted out to internal and external service providers and monitored over time (Wolbers, 2012).

Strategy implementation: service provider activities

The service provider determines how interventions should be executed and finally also executes them. This is done by keeping the costs to a minimum for the specified level of work and quality as agreed upon with the asset manager (Hartsema, 2015).

(8) Contract management

The service provider applies contract management to monitor the processes and results in order to make sure that he/she can deliver what was agreed upon.

(9) Product and project engineering

Based on the work package that was provided by the asset manager, the service provider makes a detailed plan for the product that is delivered and the project that is executed (e.g. planning of equipment and employees, outage planning, inventory control etc.)

(10) Execution

The final phase is the execution of the interventions. Depending on the type of contract, this phase may include a single service provider that executes multiple interventions (e.g. inspection, maintenance and construction of assets) over a long-time span.

Strategy control: information and performance management

Information and performance management form an integral part of all phases and AM roles of the AM process model. This will be discussed in Section 2.2.3.

2.2.2 The deployment of asset management

Secondly, this Thesis focusses on the deployment of AM. Within such a deployment, organizations may choose to strictly follow the AM standards or to apply AM more loosely. Nevertheless, several authors agree that a cold certification should not be the goal (de Croon, 2012; Ruiter, 2015). According to them, certification should only be a stick behind the door and a milestone within the process of continuous improvements. Regardless of the accreditation, the benefits of AM can only be fully realized if the organization embraces AM (Azagra et al., 2016). Moreover, it is still uncertain whether certified organizations outperform non-certified organizations and the benefits of certification outweigh the costs (Boiral, 2003; Chow-Chua et al., 2003; Escanciano et al., 2001; Terziovski et al., 2003).

Applying the operating AM model and its roles, tools, technologies are certainly important steps within the AM deployment. Nevertheless, as emphasized by multiple authors, the real differentiators for a successful AM deployment are actually the engagement of the workforce, their knowledge and competencies, the clarity of leadership and the collaboration (Austroads, 2013; Azagra et al., 2016; IAM, 2014a; ISO, 2014; Moon et al., 2009; Woodhouse, 2007). Changing the human factors will even present greater challenges than changes in technical capabilities and IT systems. Therefore, the AM deployment is not an overnight transformation; but is a growth process that requires commitment over a sustained period (FHWA, 2007). This change process needs to be planned, have a clear vision down the road and manageable components in place that can be implemented a tracked on an regular basis (Azagra et al., 2016). Planning the change process makes it more likely that the goals and deadlines are successfully achieved (Brynjolfsson et al., 1997; Raineri, 2011).

2.2.2.1 The strategy process of the deployment of asset management

As shown, also the AM deployment can be conceptualized as a strategy process with three discrete phases. However, just like AM itself, the AM deployment can also be framed in alternative ways. Because the AM deployment is change process, it can also be captured with one of the frameworks from the field of change management (e.g. Fernandez & Rainey, 2006; Hayes, 2014; Kotter, 2007). An often cited study is for example Kotter (2007). He distinguishes eight steps to capture a successful change process: (1) establish a sense of urgency, (2) create a guiding coalition, (3) create a vision, (4) communicate the vision to convince others, (5) empower others to act, (6) generate short-term wins, (7) consolidate gains and produce more change and finally (8) anchor new approaches in the culture.

These frameworks from the field of change management have also been used by authors such as FHWA (2007), de Croon (2014), Hartsema (2015) and Azagra et al. (2016) to develop a framework specifically tailored to the AM deployment. Among them, there is consensus about the first step in the AM deployment: determining the usefulness and necessity of AM. As AM can be perceived differently across functional groups, it is crucial to be coherent about what AM means to the organization and the benefits are (e.g. savings, risk reductions and efficiency gain). The organization can communicate this to the stakeholders and ensure that each understands and supports the proposed AM deployment.

As a second step, de Croon (2014) and Hartsema (2015) propose to use one of the many available AM maturity models (e.g. IAM, 2014b; Mahmood et al., 2015; Volker et al., 2011) to analyze the current situation. An assessment helps to provide a normative description of good practices, identify the organization's strength and weaknesses, raise awareness, prioritize actions and it helps to build consensus regarding the organization's AM maturity (FHWA, 2007; Volker et al., 2011). As drawback however, Jugev & Thomas (2002) note that the prescriptive character of the models do not provide the organizations the know-how that

is needed for a good AM. Another drawback with maturity assessment models is that they examine the way in which the organization's AM activities, procedures and systems are organized; and not how AM contributes to organizational performance (Attwater et al., 2014). The need to assess the performance of good AM will be addressed in Section 2.2.3.

Subsequently, authors state that the change needs to be planned and designed (de Croon, 2014; FHWA, 2007; Hartsema, 2015). After generating the buy-in from key stakeholders, the organization can demonstrate its commitment by defining and formalizing the AM policy and business value matrix (Hartsema, 2015; IAM, 2014a). The AM policy states the high level principles and intentions by which the organization aims to apply AM and manages it assets (IAM, 2014a). As the AM policy is usually formally signed off by those working at the top of the organization, it demonstrates the organization's commitment to AM and can be an important catalyst (Austroads, 2013; IAM, 2008a; ISO, 2014; Ruiter, 2015; van Grunsven, 2012). Moreover, the change can be further planned by designing the AM operating model and defining the process outputs, tasks, responsibilities and information requirements. Finally, this step could be used to conduct some pilots to test everything and demonstrate the benefits of AM (de Croon, 2014; FHWA, 2007; Hartsema, 2015).

After the change is designed, the actual AM deployment can start with the full scale roll out of the operating AM model and employees that learn to work with it. Apart from the organizational, process, information system and architecture implementation; this phase is also characterized by the buildup of capabilities and changes in the organizational culture. When AM is embedded, the phase of continual improvements can start in which the change process can followed over and over (Azagra et al., 2016; de Croon, 2014; Hartsema, 2015).

2.2.3 Strategy control: information and performance management

Both AM and AM deployment consist a strategy process with a strategy control phase. Information and performance management are key aspects in this. They help to communicate, justify, promote, evaluate, control and learn from decisions, motivate people, celebrate achievements and eventually improve performances of the assets and the deployment of AM (Azagra et al., 2016; Behn, 2003). Information management is about using technology and techniques to collect, verify and consolidate data and to transform it into relevant information in the right format, at the right time and sent to the right person (Anand et al., 1998; Fairer-Wessels, 2014; IAM, 2008a; ISO, 2014; Rowley, 1998).

Performance management is used to measure and close the gap between the planned and realized objectives (IAM, 2008a; ISO, 2014). Performance management is relevant within this study because alignment between strategic decisions and operational actions can only exist if the performance measures dynamically linked (derived from) organizational objectives (Neely et al., 1994). After all, "What you measure is what you get" (Kaplan & Norton, 2005a, p. 172). Only with a balanced and limited set of measures, managers and employees can get a full overview of the performances, set meaningful targets and get the right signals for aligning and focusing their efforts (Kaplan & Norton, 2005a; Neely et al., 1994). The balanced set of measures could contain a mix of for example financial, non-financial, objective, subjective, quantitative and qualitative, short term and long term, lagging and leading measures (IAM, 2008b; Schraven & Hartmann, 2010). Otto & Ariaratnam (1999) define 4 other types: input, process, output and outcome measures. As their names say, input and process measures capture respectively the resources allocation and the performance of the actual daily operations (e.g. number of incidents). Output measures describe the result that is achieved directly after an action is executed (e.g. resources spent and number of constructed fish passages). The outcome measures capture the actual effects of actions. They are measured after tasks have been performed and the output has settled in (e.g. the fish population growth due to the fish passage)(Otto & Ariaratnam, 1999).

For the performance measurements, there are differences between AM and the AM deployment. The previous Sections about AM have already briefly described how aaset inspections and measurements of the asset performances should form the rationale for the management of assets. According to Attwater et al. (2014), measuring these asset performances and conditions is, although challenging, a relatively well-understood domain. At the other side, there are the performance measurements of the management of assets itself (e.g. measuring the performances of the organization's internal). When looking back at

the conceptual framework, one can see that these measurements of the AF strategy process form the input and trigger of the OF strategy process. So, the measurement results of the management of assets can form a reason to start deploying AM. Attwater et al. (2014) concluded that academic research and industrial practices have paid little attention to measuring the performance of the management of assets. According to them, also the AM maturity models that are often used within the industry cannot fill in this research gap. The key drawback of these models is that they evaluate AM capabilities based o best practices, but they do not measure the performances (Attwater et al., 2014).

2.2.4 Contextual variables

As shown in the conceptual framework, the strategy processes of the management of assets and the AM deployment are affected by contextual variables. These variables (human resources, organizational culture and other aspects) are discussed in this Section.

2.2.4.1 Human resources

First of all, multiple authors have recognized the importance of leadership within the concept of AM (FHWA, 2007; Hodkiewicz, 2015; IAM, 2014a; ISO, 2014; Volker et al., 2011; Woodhouse, 2007). To conduct AM, top managers and other relevant leaders should lend their authority to create and promote the objectives and strategies and align the organization to prevent conflicts in perspectives and priorities (Hodkiewicz, 2015; IAM, 2014b). Within the AM deployment, leadership is more about maintaining the momentum within the change process. Here, top management has to use its leadership to promote their vision on AM, generate the buy-in from key stakeholders, define responsibilities and provide the resources that are necessary for the change process (Austroads, 2013; IAM, 2014a).

Secondly, there is consensus that the benefits of AM can only be fully realized if the employees are aware and competent (e.g. Austroads, 2013; ISO, 2014; Moon et al., 2009; Woodhouse, 2007). In case of awareness, the people involved have knowledge about the strategy, objectives, the current internal context and their within this greater picture (IAM, 2008a; Moon et al., 2009). For the AM deployment, one could also refer to the sense of urgency and the true ownership of AM. Although the importance of competence management for AM is acknowledged by many authors (e.g. Austroads, 2013; IAM, 2008a, 2014a; ISO, 2014; Wijnia & Herder, 2010), there is no agreement on the required set of competences. However, as AM is an interdisciplinary approach, it is certain that an organization needs a large range of skills (from management/business to technical skills).

2.2.4.2 Organizational culture

Although many acknowledge that the organizational culture has a profound effect on the management of assets (Austroads, 2013; Azagra et al., 2016; IAM, 2008a), very little is known about this relationship and what kind of culture is required to execute AM (van Grunsven, 2012). Van Grunsven (2012) is one of the first that tried to solve this research gap. However, he discovered that there is no one size fits all culture for AM as the preferable organization's cultural values are related to the organizational objectives (van Grunsven, 2012). Nevertheless, based on the findings of Grunsven (2012) and previous Sections, it is possible to already provide a first indication about a favorable cultural profile for AM. In general, AM requires a culture that contains/values:

- Objective- and value-driven mentality.
- Collaboration and shared priorities between various organizational units.
- Instead of solely focusing on expenditures (the easiest parameter), organizations should also pro-actively control performances and risks. Measurements and inspections should therefore be seen as value adding activities, not as obligations.
- To a certain extent structure and bureaucracy. Standardization, predictability and a systematic and rational planning process are important core values within AM.
- Life cycle approach in which people are aware of short-term and long-term effects.
- System thinking. Value is created in a system context, not by isolated discrete assets. One should take this into account during analyses and optimizations.
- Continual improvements. AM should be supported by a culture in which the PDCA cycle is embedded and mistakes are used as an opportunity to learn.

It is the task of top management to proactively shape the organizational cultures that is both conducive to AM thinking and tailored to the specific AM objectives (IAM, 2014a). However, this a significant obstacle. It requires changes in the unconscious underlying assumptions of people that are very hard to change (FHWA, 2007; Schein, 2010; van Grunsven, 2012).

2.2.4.3 Other organizational aspects

Another aspect that is marked as relevant for AM and the AM deployment is the organizational structure (Amadi-Echendu et al., 2010; Austroads, 2013; FHWA, 2007; IAM, 2008a, 2014a; ISO, 2014). A structure that creates compartmentalized functions, responsibilities, priorities and performance measures can constrain the organization in a number of key characteristics of AM (e.g. life-cycle approach, optimization of activities, interdisciplinary, objective-driven). Moreover, the organizational structure can affect the success of the AM deployment. Challenges can arise in the deployment when AM is positioned wrongly within the organization chart (Amadi-Echendu et al., 2010; IAM, 2014a). When the people responsible for the AM deployment lack the authority to act strategically and when there is also no explicit accountability in senior management; it becomes difficult to drive AM across departments, into front line services and the supply chain. In such a scenario, the AM deployment may deliver incremental benefits but stays within a limited part of the organization (IAM, 2014a).

Finally, there is the interaction between the AM and other management systems and approaches (e.g. quality, environment, HR, health and safety and general risk management). To avoid conflicts and improve the synergy between them, multiple authors point to the importance of improving the integration across different disciplines (Austroads, 2013; IAM, 2008a; ISO, 2014; Wijnia & Croon, 2015). According to ISO (2014), the interaction with other management systems should already be recognized when AM is deployed. By aligning the AM deployment with existing management systems and other developments, there will be a higher willingness to adopt AM and lower efforts and expenses for creating and maintaining the operating model.

2.3 Internal strategic alignment

Section 2.2 introduced AM and the deployment process of AM. This provided some indications about favorable configurations of the strategy processes and the contextual variables. However, the Section did not explicitly mention the necessary conditions for the two types of internal alignment. As stated before, this is because AM research and standards do agree upon the importance of internal alignment, but have paid scant attention to an in-depth study (e.g. Austroads, 2013; FHWA, 2007; IAM, 2008a; ISO, 2014; Moon et al., 2009; Schraven et al., 2011; Wijnia & Herder, 2010; Wolbers, 2012; Woodhouse, 2007). Section 2.3 will fill in this research gap by importing knowledge from strategic management literature. By doing this, Section 2.3.1 will provide a definition for strategic alignment that is suited for the focus of this study. Section 2.3.2 will identify the necessary conditions.

2.3.1 Defining internal strategic alignment

2.3.1.1 Introduction

Strategic alignment is rooted in the contingency theory and consistent with the open system perspective (Acur et al., 2012). The primary proposition is that the organization's performance is the result of fit between two or more factors, such as the organization's performance, the environment, culture structure, systems, technology and other resources (Bergeron et al., 2004). Often, literature distinguishes two types of strategic alignment: internal and external alignment (Beer et al., 2005; Ouakouak & Ouedraogo, 2013). External alignment refers to the fit between the organization's strategy and the external environment which contains multiple threats and opportunities. As stated in the footnote of p.9, this research is mainly interested in the internal strategic alignment.

According to Ouakouak & Ouedraogo (2013), internal alignment refers to the alignment between the organization's strategy and internal factors such as the organizational structure, management system, organizational culture, human resources and leadership style. Earlier in this Thesis, these factors were referred to as contextual variables of a strategy process. When these factors align with the organization's strategy, they support the

organization in the execution of the strategy (Beer et al., 2005). Andrews et al. (2012) defined the internal alignment slightly different and looks to the vertical alignment. According to them, internal alignment refers to the degree to which strategies, plans, performance indicators and actions are consistent across different organizational levels.

Nevertheless, various authors acknowledged that that alignment is evolutionary and describes a process of continuous adaption (Bradley et al., 2013; Henderson & Venkatraman, 1993). Strategic alignment is a goal that can never be completely reached (Roelfsema, 2014). Dynamics within the internal and external environment require changes in the strategy and may have to be followed by changes in the vertical alignment and some contextual variables. Internal alignment is therefore related to external alignment.

2.3.1.2 Strategy process

Roelfsema (2014) linked internal alignment with the strategy processes. According to her, alignment means that the phases of strategy formulation and implementation are conducted successfully and form an intertwined and continuous process. With this last part, it is meant that the two phases are dynamically linked and there is no strict discrete division/transition moment between the two. The strategy formulation is successfully conducted when there is a clear and, indisputable and realistic objective and strategy that can guide the organization. This means that employees understand what needs to be achieved, how this can be achieved and why this is needed (Bradley et al., 2013). Successful implementation is about coherently translating the strategy into short-term goals, plans and actions (Beer et al., 2005; Roelfsema, 2014). An organization fails in this when it conducts actions that deviate from the pre-defined strategies and that do not contribute to the organization's objectives.

2.3.1.3 Outcomes of internal strategic alignment

There are several authors that described favorable outcomes of internal alignment (e.g. Acur et al., 2012; Andrews et al., 2012; Avison, Jones, Powell, & Wilson, 2004; Beehr, Glazer, Fischer, Linton, & Hansen, 2009; Beer et al., 2005; Bergeron et al., 2004; Henderson & Venkatraman, 1993). Their arguments often rely upon the statement that alignment involves the true ownership of organizational plans and a shared understanding and behavior throughout the organizational hierarchy (Boswell & Boudreau, 2001).

Andrews et al. (2012) combined this with the principal-agent theory. According to them, the problems of goal conflicts and information asymmetry are mitigated by strategic alignment. The employees involved hold similar values and implement the strategic decisions as given rather than transform it into something else. With this improved cooperation, the organization can lower the transaction costs and has less reason to rely heavily on the chain of command and the monitoring of subordinates. Moreover, top management can delegate more key decision making tasks to lower organizational levels (Andrews et al., 2012). Beehr et al. (2009) mentioned three other beneficial outcomes: greater job satisfaction, organizational commitment and lower turnover. According to Avison et al. (2004), alignment also results in improved return on investments as it increases the likelihood of successfully developing and maintaining systems and assets that are critical to the organization.

Avison et al. (2004) concluded that the improved understanding of employees about the internal context helps the organization to quickly react on dynamics within the external environment. However, Andrews et al. (2012) and Avison et al. (2004) also warn that too much alignment and shared values can result in group thinking and the inability to critically reflect on the organizational strategy and to generate new ideas. Instead of promoting flexibility, alignment could than result in a rather static organization.

2.3.1.4 Internal strategic alignment within this Thesis

AM literature generally focusses on the vertical alignment (referred to as the "the line of sight") in the top-down and bottom-up translations during a strategy process between objectives, strategies, plans, performance measurements and operational actions (Austroads, 2013; IAM, 2008a; ISO, 2014; Schraven et al., 2011; Wijnia & Herder, 2010). Based on the previous findings of the literature reviews, this Thesis widens the scope and also considers the contextual variables to be very relevant for the level of success in the management of assets and the AM deployment. The following definition is used for both the

management of assets and the AM deployment. Internal strategic alignment is (1) the consistency in the strategy process between the objectives, strategies, performance measures, plans and operational actions that are spread across the organization and (2) the consistency with contextual variables that affect the strategy process (human resources, organizational culture and other organizational aspects). This consistency within the strategy process should be reflected in both the top-down (the objectives and strategies form the rationale for operational actions) and bottom-up direction (the outcomes of operational actions provide the factual basis for adjustments in objectives and strategies).

2.3.2 Necessary conditions for internal strategic alignment

2.3.2.1 Analytical framework

This study takes advantage of the existing findings from the field of strategic management to identify the necessary conditions for internal strategic alignment. As stated, this Thesis focus on the alignment in both the management of assets and the AM deployment. Especially the study of Roelfsema (2014) demonstrates to be useful for this Thesis. In line with many other studies (e.g. Bradley et al., 2013; Economist Intelligence Unit, 2004; Hrebiniak, 2006; Kaplan & Norton, 2005b; PwC, 2014), Roelfsema (2014) concluded that striving for strategic alignment can be a difficult task. Based on this problem recognition, Roelfsema (2014) studied the variables that constrain and enable alignment. Roelfsema (2014) start by analyzing and ranking the findings from literature. The list of constraining factors was based on the studies of Steiner (1979), Alexander (1985), Beer & Eisenstat (2000), Hrebiniak (2006), Corboy & Corrbui (2007), Thompson & Martin (2010), Elquist LoRé (2012) and Ali & Hadi (2012). For the enablers, she studied Dobni (2003), Luftman (2003), Higgins (2005), Neilson et al. (2008), Li et al. (2010) and Vagadia (2013). Based on this literature review, Roelfsema (2014) concluded that enablers and inhibitors are often the two different sides of one and the same variable. Therefore, Roelfsema (2014) derived 4 new constructs (each containing variables) that influence strategic alignment (see appendix A). Roelfsema (2014) translated these constructs into a survey to test her model. According to the 175 surveys that were completed by various organizations, there are significant relationships between each of these 4 constructs and strategic alignment.

This Thesis will use the findings of Roelfsema (2014). However, her findings will not be simply adopted. Her categorization of variables into the four constructs raises some questions (the constructs overlap and some variables could be categorized differently) and was not tailored for the context of AM. Therefore, the findings of Roelfsema (2014) are combined with the findings of Section 2.2 to derive a new analytical framework. Instead of talking about enables and constraints, the new framework refers to necessary conditions. The new analytical framework consists two parts. The first part addresses the alignment within the management of physical assets (i.e. AM is a concept that can help to achieve this). In the second part, the focus is on the alignment in the AM deployment.

Within each part, alignment is the dependent condition and can be measured by the extent of successful strategy formulation and implementation. Similar indicators were used by Roelfsema (2014). The necessary conditions for strategic alignment are the independent variables. They have to be met in order to successfully complete the phases of strategy formulation and/or strategy implementation. Because the two strategic approaches have different focus points, there are some differences in their necessary conditions.

The necessary conditions for alignment in the management of assets are shown in Table 1 (p. 29). This is discussed in Section 2.3.2.2 (the conditions are *underlined*). The necessary conditions for the alignment in the AM deployment are shown in Table 2 (p. 30) and discussed in Section 2.3.2.3. For both Sections, a distinction is made between the necessary conditions in the strategy process and the contextual variables.

2.3.2.2 Necessary conditions in the management of assets

Necessary conditions in the AF strategy process

Below, one can find the conditions of the AF strategy process that are necessary to reach strategic alignment in the management of assets. Section 2.2 already mentioned most of these conditions because they are embedded within AM.

First of all, the strategy process requires the formulation of *clear and understandable* strategic *objectives and strategies* (SP1-AF). Poorly and vaguely formulated objectives and strategies are often mentioned in literature as a constraining factor of strategic alignment. They lead to a lack of clear purpose for the organization and create poor outcomes through poor implementation (Hrebiniak, 2006; Roelfsema, 2014) As discussed Section 2.2.1.4, the objectives and strategies for physical assets are often difficult to define, but are highly important. They provide the rationale for AM process.

Furthermore, it is important that strategy formulation is based on a *good understanding* about the consequences of strategic decisions and the processes, capabilities and resources that are available (Beer et al., 2005; Dobni, 2003). Without such knowledge, it is likely that formulated strategy is disconnected from reality and impossible to successfully implement (Mintzberg, 1994; Roelfsema, 2014; Turoff, 1970). Therefore, successful strategy formulation is usually not only based on top management's knowledge, but includes capturing information from different sources and experts (Mintzberg, 1994). Within Roelfsema's (2014) survey, the *translation from long term strategic objectives into more short-term and lower level goals* was ranked as another important constraint. The vertical cascading of goals is needed to align strategic decisions with lower level decisions, plans and actions (Neely et al., 1994). Moreover, it helps employees to understand their role in the bigger picture (Ali & Hadi, 2012; Bradley et al., 2013).

The second condition refers to the step-by-step *translation towards plans* (SP2-AF). The AM process model already extensively discussed how *plans* should be formulated based objectives, performance measures and asset data that is related to this. The planning of actions provides guidelines to the employees and helps to avoid an ad-hoc approach with ineffective and inefficient actions (Roelfsema, 2014). Another necessary condition for strategic alignment is that *all operational actions contribute* (SP3-AF) and can be traced back to the strategies, objectives and plans that were set previously (Roelfsema, 2014).

The fourth condition addresses the importance of *inspections and measurements* (SP4-AF). There are three sub-conditions for this. As discussed, *measurements and inspections* are essential for the management of assets and the generated data forms the life-blood of the AM process. The overview of the assets' performance, conditions and the effect of previous actions provides an essential *input* for the organization to formulate and adapt strategies, objectives or plans. The usage of the data makes decisions better substantiated and more likely to succeed (Roelfsema, 2014). However, as addressed in Section 2.2.3, this should all be based on a *limited and balanced set of performance measures*. This is needed to identify good performance, send the right signals and align and focus the organization's actions.

Strategic alignment also requires a *coordinated and organized* (SP5-AF) strategy process (Roelfsema, 2014). As stated by Roelfsema (2014), the strategy process needs to be *coordinated* and formalized in terms of processes, inputs and outputs, roles and responsibilities. This helps to prevent a chaotic and cluttered strategy implementation that results in an ineffective and inefficient management of the assets. Moreover, the various parts of the organization should be well *involved* during strategy formulation and implementation. Involvement of employees during the strategy formulation helps to gather more knowledge about the internal organization and improves the true ownership of objectives and strategies across the organization. Roelfsema (2014) and Corboy & Corrbui (2007) stated that involvement is also relevant for managers. According to them, early abandoning of management during the strategy implementation is often a deadly sin for alignment. By being involved, management can refresh their knowledge about the organization, motivate personnel and supervise the implementation of their intended course of action (Hrebiniak, 2006; Roelfsema, 2014). Finally, strategic alignment also requires that all relevant organizational units are involved during the strategy implementation. This helps to identify and consider all relevant interests and possible decision alternatives and make sure that the strategy is optimally implemented (Frolov et al., 2010; Moon et al., 2009).

Finally, there is the need for good *communication and documentation* (SP6-AF). As stated by Roelfsema (2014), strategic alignment requires the *documentation and formalization* of objectives, strategies, policies, plans and measures. The documents are a frame of reference for the employees as they can use them to understand the course of action and justify decisions. The second sub-condition refers to *communication*. Poor communication

can doom the strategy implementation as it negatively affects the organization's understanding about the organization's objectives and strategies (Dobni, 2003; Hrebiniak, 2006). It was one of the most important obstacles found by Roelfsema (2014).

Necessary conditions in the contextual variables

The text below discusses the contextual variables and their conditions that are required for internal alignment within the management of assets. Compared to previous Sections, the contextual variables are slightly adjusted in order to better fit the analytical framework.

The first necessary condition refers to the *human resources* (CV1-AF). As addressed before, *human resources* (CV1-AF) are considered to be a critical cornerstone within the the management of assets. Roelfsema (2014) came to the same conclusion when studying internal alignment for the more general field of strategic management. In line with authors such as Dobni (2003) and Beer et al. (2005), Roelfsema (2014) stated that a shortage in specific *competencies* endangers the strategy implementation and therefore the strategic alignment. This is no different for the management of assets. Secondly, strategic alignment requires a shared *understanding* of employees about the objectives and strategies and the contributions that are expected from them. Without this, successful strategy implementation (performing the right actions) and strategy control (measuring the right things) are difficult to reach. The essence of good *leadership* to coordinate the strategy process was already discussed in Section 2.2.4. According to Roelfsema (2014), an inadequate management style is a major constraint of strategic alignment.

Secondly, strategic alignment requires specific conditions of the *organizational culture* (CV2-AF). Roelfsema (2014) discovered that the organizational culture is one of the most important enablers of alignment. Here, there are 9 cultural values that are identified as necessary sub-conditions for the organizational culture. Many of them were already discussed as perquisites for an AM culture (2.2.4). First of all, as stated in Section 2.3.2, strategy formulation and strategy implementation should be approached as *one intertwined and continuous process*. This helps to assure that the phases of strategy formulation and implementation are aligned and can be quickly adjusted. Moreover, the strategic alignment is positively influenced if the organization is *objective-driven* (Roelfsema, 2014). Dobni et al. (2003) formulated this as the collective thoughts and actions of employees that are aimed towards the strategic goals. This requires clearly defined strategies and goals and employees that understand the what, why, when and how (Roelfsema, 2014).

The third sub-condition for organizational culture addresses the need for *continuous learning and improving*. As stated, the PDCA cycle is one of the fundaments of AM. Moreover, it is also characteristic for internal strategic alignment. As stated, internal alignment is evolutionary and describes a process of continuous adaption and change. Without continuous improvements and by repeating the strategy process over and over, the strategy may be unsuccessfully formulated (e.g. an outdated strategy) or implemented (e.g. outdated plans that do not included new innovations (Roelfsema, 2014).

Li et al. (2010), Vagadia (2013) and Roelfsema (2014) also discussed the importance of *collaboration* for strategic alignment. According to them, it brings together and aligns the several organizational sub-cultures and creates a shared understanding about *strategic priorities*. This helps to prevent ineffective expenditures of resources due to misalignments between the organization's actions (e.g. organizational units that solely follow their own priorities). The importance collaboration within AM was also discussed in Section 2.2.4.

Additionally, for this research, it is stated that strategies can only be successfully formulated and implemented when an organization explicitly considers the balance between three *expenditures, performances and risks.* To ensure this, all three parameters should be embedded in and valued by the organizational culture. It is assumed that an organization cannot reach the alignment and maximize the value creation if it focuses on only one or two parameters. For example: craftsmen that are highly risk-averse and focus on high-quality products and high performances may be unable to actively pursue a realistic balance between costs, performances and risks (e.g. very high costs due to risk aversion).

Section 2.2.4 already discussed the management of assets can best follow a *life cycle approach*. Because of a different research focus, Roelfsema (2014) did not mention this

sub-condition. However, one could assume an integral focus on all asset life cycle phases will increase the success of the strategy implementation. It helps to make sure that the organization strives for maximum value over the entire asset life cycles. As such, it does not simply strive for short-term benefits at the costs of negative long-term impacts. Besides, a life cycle approach can improve the collaboration and alignment of strategic priorities. It can bring together organizational units that have interests in different asset life cycle phases (e.g. construction versus maintenance engineers).

Furthermore, strategic alignment requires a *system thinking* approach. The argumentation for this is similar to the life cycle approach. An organization can create more value with the same budget if it focusses on the optimization of the entire asset system instead of focusing on optimizing each asset individually. In fact, a system thinking approach helps to improve the synergies between plans and organizational units that focus on different assets.

Lastly, there are necessary conditions regarding some *other organizational aspects* (CV3-AF). The first sub-condition here is about the interaction between the strategy and *other existing systems and policies.* Roelfsema (2014) demonstrated that a strategy should always be developed while keeping the existing and possible emerging systems in mind. Creating a synergy between systems positively affects strategy implementation and the strategic alignment (Roelfsema, 2014). Previous Sections mentioned a similar argument for AM. The second sub-condition refers to the *organizational structure.* Authors such as Dobni (2003), Higgings (2005) and Li et al. (2010) stated that a successful strategy implementation requires an alignment between the strategy and the organizational structure. Section 2.2.4.3 also discussed this for the setting of AM. As stated, a compartmentalized organizational structure does not promote interdisciplinary and this can make it highly difficult to implement strategies regarding the management of assets.

2.3.2.3 Necessary conditions in the AM deployment

Necessary conditions in the OF strategy process

Similar to the management of assets, also the internal alignment in the AM deployment requires certain conditions with regard to the *objectives and strategies* (SP1-OF); *translation towards plans* (SP2-OF); *translation towards actions* (SP3-OF); *inspect and measure* (SP4-OF); *coordination* (SP5-OF); and *communication and documentation* (SP6-OF). Many of these conditions were also introduced within Section 2.2.2. As stated, there is a need for a structured and planned change process in which the vision, strategy and objectives are communicated by a guiding coalition to convince employees and acquire their commitment. Reaching a shared understanding about the concept of AM is a crucial step in this.

Necessary conditions in the contextual variables

Again, the necessary conditions in the contextual variables apply to the *human resources* (CV1-OF), *organizational culture* (CV2-OF) and *other organizational aspects* (CV3-OF). In case of human resources, having enough capacity is an important sub-condition for the alignment in the deployment of AM. As found by Fernandez et al. (2006), having not enough employees and the right employees at the right place and time hinders successful implementation of the change strategy. Similar to the previous case, strategic alignment in the AM deployment requires that the *employees understand* the strategy and that *leadership* (i.e. a guiding coalition).is used to coordinate the strategy process

There is one aspect of the organizational culture that is particularly important for the alignment within the AM deployment: the willingness to *change*. This corresponds with the findings of Roelfsema (2014), as she stated that reluctance to change is a major killer of strategic alignment. According to Thompson and Marin (2010), the resistance to change is often caused by rigidity in the organization. Steiner (1979), Higgings (2005) and Roelfsema (2014) formulate this differently. According to them, willingness to change requires an organizational culture in which there is a sense of urgency and in which the collective thoughts are aligned with the organization's strategic orientation.

Lastly, there are necessary conditions for *other organizational aspects.* As already stated in Section 2.2.4, the deployment of AM should be aligned with *other large scale organizational development* in order to increase the likelihood of success. Coordinating the relations

between several organizational developments can lead to synergies, sharing of costs and more willingness to change. Lastly, it is stated that the deployment of AM should be supported by the *organizational structure*. As stated in Section 2.2.4. an organization can only drive AM across the organization if the responsibilities for the AM deployment are positioned correctly within the organizational structure.

2.4 Conclusion

Sub-question 1: What is asset management and how does the deployment of asset management look like?

Based on the conceptual framework, this Thesis frames both AM and the AM deployment as strategy processes that are affected by contextual variables.

AM is a concept that can help organizations to optimize their management of physical assets. Specifically, AM is a holistic interdisciplinary approach to optimally and sustainably manage physical assets by balancing the expenditures, performances and risks over the entire asset life cycles. Maximum value creation is a core principle in this. Instead of using the strategy process with the phases of strategy formulation, implementation and control; AM can also be conceptualized with an AM process model. This model is tailored for the setting of AM and defines 10 activities and 3 AM roles.

The AM deployment is a growth and change process that requires commitment over a sustained period, a clear vision and a plan with manageable components. Applying the operating AM model and its roles, tools, technologies are certainly important steps within the AM deployment. Nevertheless, the real differentiators for a successful AM deployment are actually the engagement of the workforce, their knowledge and competencies, the clarity of leadership and the collaboration. The AM deployment is a strategy process with three discrete phases. However, the AM deployment can also be schematized with one of the conceptual frameworks from the field of change management or one that is specifically tailored for the setting of AM.

Sub-question 2: What are the necessary conditions for the internal strategic alignments in the management of physical assets and in deployment of asset management?

This Thesis studies two types of internal alignment. First of all, there is the alignment in the management of assets. This Thesis states that AM is a concept that can help organizations to create such an alignment. Secondly, this Thesis also studies the alignment in the change process of the AM deployment. By importing findings from existing strategic management literature, this study widened the definition of internal alignment that is usually used in AM literature. For both approaches, internal alignment is defined as (1) the consistency within the strategy process (both top-down and bottom-up) between the objectives, strategies, performance measures, plans and operational actions that are spread across the organization; and (2) the consistency with contextual variables (human resources, organizational culture and other organizational aspects) that affect the strategy process. The extent of strategic alignment is measured with two indicators: successful strategy formulation and successful strategy formulation. By combining the findings from the fields of AM and strategic management, this Thesis identified the necessary conditions for the two types of alignment (Table 1 and Table 2). These conditions apply to the strategy processes and contextual variables. For each type of alignment, an organization is when one or more of the necessary conditions is not fully present.

Table 1 The conditions in the AF strategy process and its contextual variables that have to be met in order to reach strategic alignment in the management of assets. An organization is constrained in reaching strategic alignment when one or more of the necessary conditions are not present.

Item	Condition	Sub-condition	Description of (sub-)condition
The AF strategy process			
SP1-AF	Objectives and strategies	Clear and understandable	The objectives and strategies are clear, understandable and can be used as a frame of reference by others
		Good understanding	The consequences of the formulated objectives and strategies (on the internal organization) are known
		Translation	The objectives and strategies are translated into relevant short-term goals
SP2-AF	Translation towards plans	Plans	The objectives and strategies are translated in a coherent set of plans
SP3-AF	Contribution of actions	Contribution of actions	The executed activities are in line with the strategies, objective and plans
SP4-AF	Inspect and measure	Inspect and measure	The assets are inspected and their operations and functions are measured
		Set of measures	Strategy control uses a balanced and limited set of performance measures that is linked with objectives
		Input	The results are used as input to formulate or adapt strategies, objectives and plans
SP5-AF	Coordinated and organized	Coordinated	The strategy process is well coordinated and formalized in terms of processes, roles and responsibilities
		Involvement	The various parts of the organization are well involved during strategy formulation and implementation
SP6-AF	Communication and documentation	Documented, formalized and linked	The objectives, strategies, measures and plans are documented, formalized and explicitly linked with each other
		Communication	The communication within the strategy process is clear, frequent, timely, accurate, and accessible
The contextual variables			
CV1-AF	Human resources	Competencies	The employees have the right competencies to execute the strategy process
		Understanding	The employees understand the strategy, the impact it has on their jobs and wat is expected from them
		Leadership	The strategy process is supported by good leadership
CV2-AF	Organizational culture	One process	The strategy formulation and implementation together form one continuous intertwined process
		Objective-driven	The organization is fully driven by the objectives and strategies
		Continual improvements	The organization is continuously improving the management of physical assets and the value that is created
		Priorities and collaboration	There is a shared understanding about strategic priorities and collaboration is used to reach strategic objectives
		Expenditures, performances and risks	The organization pays attention and acts based on information about expenditures, performances and risks
		Life cycle approach	The organization manages it assets by considering all relevant asset life cycle phases
		System thinking	The management of assets is based on optimizations at a system level
CV3-AF	Other organizational aspects	Other systems and policies	The management of physical assets is aligned with other management systems and policies
		Organizational structure	The strategy process is supported by the organizational structure

Table 2 The conditions in the OF strategy process and its contextual variables that have to be met in order to reach strategic alignment in the deployment of AM. An organization is constrained in reaching strategic alignment when one or more of the necessary conditions are not present.

Item	Condition	Sub-condition	Description of (sub-)condition
The OF strategy process			
SP1-OF	Objectives and strategies	Clear and understandable	The objectives and strategies are clear, understandable and can be used as a frame of reference by others
		Good understanding	The consequences of the formulated objectives and strategies (on the internal organization) are known
		Translation	The objectives and strategies are translated into relevant short-term goals
SP2-OF	Translation towards plans	Plans	The objectives and strategies are translated in a coherent set of plans
SP3-OF	Contribution of actions	Contribution of actions	The executed activities are in line with the strategies, objective and plans
SP4-OF	Inspect and measure	Inspect and measure	The organization's processes are measured and inspected/reviewed
		Set of measures	Strategy control uses a balanced and limited set of performance measures that is linked with objectives
		Input	The results are used as input to formulate or adapt strategies, objectives and plans
SP5-OF	Coordinated and organized	Coordinated	The strategy process is well coordinated and formalized in terms of processes, roles and responsibilities
		Involvement	The various parts of the organization are well involved during strategy formulation and implementation
SP6-OF	Communication and documentation	Documented, formalized and linked	The objectives, strategies, measures and plans are documented, formalized and explicitly linked with each other
		Communication	The communication within the strategy process is clear, frequent, timely, accurate, and accessible
The contextual variables			
CV1-OF	Human resources	Capacity	The organization has enough capacity to execute the strategy process
		Understanding	The employees understand the strategy, the impact it has on their jobs and wat is expected from them
		Leadership	The strategy process is supported by good leadership
CV2-OF	Organizational culture	Change	The members (employees and managers/decision makers) of the organization are willing to change
CV3-OF	Other organizational aspects	Other organizational aspects	The deployment of AM aligned with other developments
		Organizational structure	The strategy process is supported by the organizational structure

3 RESEARCH METHODOLOGY

3.1 Introduction

To study how the necessary conditions for the two internal alignments manifest themselves in real-life, this Thesis applies the case study method. A case study allows the investigator to dig deeper into the richness of a largely unexplored phenomena in the real-world. It helps to understand how and why things happen in a specific way (Eisenhardt & Graebner, 2007; Yin, 2013). As was mentioned in Chapter 1, this study is based on two cases: the regional water authorities Vechtstromen and Zuiderzeeland. This study only focusses on two cases, since it attempts to empirically underpin and study in-depth how the necessary conditions for the two types strategic alignment can manifest themselves in real-life and how these conditions can be developed if they are not present yet. These first insights will contribute to the existing understanding about strategic alignment in the setting of AM. They can be used by future research to analyze more and other cases and to close the research gap even further. By using two cases instead of one, this Thesis is able to draw comparisons and this helps to identify the underlying dynamics that cause the organizations to behave in a certain way.

However, this research will also borrow a few concepts from the ethnographic case study (ECS) method. The ECS method can be defined as the application of ontological, epistemological and methodological features of ethnography to a set of cases (Visconti, 2010). This study adheres to the ECS method in the way the researcher is immersed within the inquired organizations in order to study them from the inside. Moreover, this study considers the interests of both scientific research and practitioners. This helps to prevent the relevance gap that is often involved in scientific research (Brannick & Coghlan, 2006; Visconti, 2010). Systematic cooperation between researchers and practitioners was used for the definition of the research objective; the collection of data through interviews and a document study; the generation of negotiated interpretations of reciprocal relevance; and reporting and dissemination. According to Visconti (2010), such a close cooperation has a positive effect on the study's relevance, namely through (1) the fine tuning of reciprocal expectations; (2) the sharing of the research experience; (3) the multiplication of the beneficiaries of the findings; and (4) the participation in the knowledge dissemination process.

3.2 Cases

For this research, the cases where chosen based on a non-probability sampling method. The researcher's personal judgement about the appropriateness, usefulness and availability of the cases were important determinants (Babbie, 2010). The goal was to find asset-intensive organizations that are confronted with difficulties within the deployment of AM. Moreover, the organizations had to be clients of Arcadis and were willing the invest time and capacity in the research. Based on these criteria, this research selected the regional water authorities Vechtstromen and Zuiderzeeland as cases. This research does not simply study all their assets or all their physical assets (e.g. cars, offices etc.). It focusses on their physical assets that together form the water systems and wastewater treatment chains (will be further explained in Chapter 4). Both organizations are still orientating how they should apply the concept of AM to improve their internal strategic alignments within the management of assets.

3.3 Collection of data

To strengthen the grounds of case findings, multiple data collection methods have been used. Data was mainly collected through the usage of semi-structured interviews and a document study. A characteristic aspect of the ECS method is the immersion of the researcher within the inquired organization. This can result in the collection of for example written observational data or diaries. Because of the limited time and some other practical reasons, full immersion was not possible for this research. The researcher stayed somewhat detached from the investigated context. The immersion was practiced by giving presentations to the informants, spending time within their offices and holding many informal talks with informants. In line with the conclusions of Gioia & Chittipeddi (1991) and Visconti (2010), this gradual process of naturalization helped to assure that the researcher's interpretations reflect the viewpoint of the observed as best as possible. In this way, the researcher was well prepared for the semi-structured interviews. Moreover, the gathered insights with the immersion helped during the

phase of post-processing when interpreting the observations of the semi-structured interviews. Finally, as stated by Vaast & Levina (2006) and Visconti (2010), immersion also helps to reduce the gap separating the researcher and informants. It opens the way to more open interrelations which generate more reliable and relevant data.

3.3.1 Semi-structured interviews

This study conducted interviews as they have proven to be highly efficient for revealing rich, empirical data about a phenomenon in a real-life context (Eisenhardt & Graebner, 2007). Semi-structured interviews were chosen over the structured interviews because of their flexible and fluid structure. Instead of limiting the interview to a fixed sequence of questions, semi-structured interviews are more loosely organized around the core themes. There is more focus on the natural flow of the conversation. The interviews, that were based on open-ended questions, proceeded in a conversational manner. They allowed the interviewees to present their own perspective about the strategic alignment and the difficulties that are experienced (Yin, 2013). Together with representatives of the organizations, the informants were chosen among the most competent agents. This helped to increase the researcher's chances of acceding to valuable information. This resulted in a selection of persons that were spread horizontally and vertically in the organizational chart. In total 25 persons were interviewed over 32 interview sessions (Vechtstromen: 16 and Zuiderzeeland: 18).

To generate findings that sufficiently answer the research questions, an interview guide was created. To encounter potential issues as early as possible, the interview guide was discussed with the supervisors of Arcadis and the University. The interview questions were linked with the lists of necessary conditions for the two internal alignments (Table 1 and Table 2). The questions were merely guidelines to start the interviews. By following a flexible and fluid structure, the interviewees were encouraged to discuss their experiences and opinions in detail and the researcher was able to figure out the background stories. Because of the variety in jobs of the respondents and the progressive insights; each interview had its own specific focus. The interviews were conducted at the offices of the authorities, tape recorded and transcribed for subsequent analysis.

3.3.2 Document study

The policy and planning documents that were studied are depicted in appendix B. These documents were selected in consultation with the practitioners. The documents describe the objectives of the organizations, how the physical assets are managed (e.g. translation from abstract organizational objectives towards short-term specific goals) and they also describe how the organizations intend to deploy AM.

3.4 Interpretation and reporting

For this study, the transcribed interviews were coded using Atlas.ti. By comparing the codes and quotations with the necessary conditions, the data were processed, interpreted and the results were written down. During this process, the first order data from observations, interviews and policy documents was translated into second order interpretations by the researcher’s personal elaboration. In such a way, one can make a distinction between the interpretations mediated across the researcher and practitioners (Visconti, 2010). The interpretations showing proximity to the informants' worldview are considered to be emic. Such interpretations relying on the researchers' previous knowledge and cultural schemes are defined as etic (Borghini, Golfetto, & Rinallo, 2006; Visconti, 2010). Through several sequential steps (discussions, presentations, reviewing the Thesis), etic and emic were shared, shared interpretations were generated and the report was written. In this way, the research serves both the academic and managerial audiences (Visconti, 2010).

4 INTERNAL ALIGNMENT IN THE MANAGEMENT OF PHYSICAL ASSETS

Chapter 4 will discuss the regional water authorities Vechtstromen and Zuiderzeeland and their strategic alignments in the management of physical assets. To do this, Sections 4.1 and 4.2 will first discuss background information about the regional water authorities. Section 4.3 will analyze how the necessary conditions for strategic alignment manifest themselves within the two cases (sub-question 3). Section 4.4 will discuss possible solutions for gaps in the conditions (sub-question 4). Section 4.5 will describe the conclusions of this Chapter.

4.1 The Dutch regional water authorities

The Dutch regional water authorities (i.e. water boards)(23 in total) are government bodies of functional decentralized administration with their own governing body and financing structure. They are concerned with the water management within their area of responsibility (Lazaroms & Poos, 2004). Their primary tasks are (Van Steen & Pellenbarg, 2004):

1. Flood protection: protection against flooding from both sea and rivers
2. Surface water quantity management: managing the amount of water within the hinterland and ensuring that it is kept at the right level (no too much, not too little)
3. Water quality management
    - Surface water quality: preventing water pollution and improving the quality of surface water by planning, monitoring and licensing
    - Transport and treatment of urban wastewater

The tasks are carried out on the `interest-pay-say' triplet. Those who benefit have to pay taxes, but receive a proportionate say in the general assembly (in Dutch: “algemeen bestuur” or “algemene vergadering”). This assembly is the highest governing body and is ultimately accountable for the organizations’ actions. Each external stakeholder category (e.g. householders, landowners, tenants, owners of buildings and industry) has a fixed number of seats within this assembly and elect its representatives. The general assembly is led by a chairperson (in Dutch: “dijkgraaf” or “watergraaf”). About every month, the members meet up and discuss the progress of the strategy process and future plans. They use their democratic decision-making process to set out the organization’s course of action. They are mainly concerned with the major outlines of the organization’s actions. To let them apply this focus, they are supported by the executive assembly (about 5 seats) (in Dutch: “dagelijks bestuur” or “college van dijkgraaf en heemraden”) and civil service (in Dutch: “ambtelijke organisatie”). The executive assembly is the second governing body. Its members are to take care over the day-to-day issues and concerns and to prepare and monitor the decisions of the general assembly (Lazaroms & Poos, 2004; Scholten, 2007). The executive assembly is in direct contact with the civil service. The civil service contains the civil servants. They are the persons that actually formulate, implement and control the objectives and strategies. They facilitate the governing bodies by disclosing information about for example the progress of the strategy process, by giving recommendations and by writing proposals for strategic decisions. The general assembly, with in between the executive assembly, supervises this and has the final say within the strategy process. This Thesis especially focuses on the civil service as this is the part where internal alignment is most relevant.

The water authorities are responsible for the management of two asset systems: the wastewater treatment chain and the water system. Significant amounts of resources, performance dependencies and risks are associated with the management of these two systems. Their physical assets form the focus point of this research.

Roughly speaking, the wastewater treatment chain consists out of pipelines, pumping stations and wastewater treatment plants that together transport urban wastewater, clean it and put it back into the water system. The pipelines can be considered as infrastructure assets. The pumping stations and wastewater treatment plants share many commonalities with the asset type ‘production facilities’. These are confined locations with assets that are constantly operated. There are inputs (e.g. polluted water), processes (e.g. usage of electricity) and outputs (e.g. water of good quality) that can be easily identified and measured. In general, all assets in the chain are well ordered (discrete elements with clear functions and clear

relations), standardized have a limited interaction with the external environment. These favorable characteristics have allowed the authorities to use a quite rational business approach to monitor and optimize the sustainability, continuity, effectiveness and efficiency of the assets. However, there is also a large need for such a rational approach. This is because asset failures within the wastewater treatment chain often have large immediate effects on the water management tasks (i.e. the assets are strongly linked with each other and are operated 24/7), financial performance and the organization's image.

The water system comprises both ground and surface water and includes the other water management tasks that were described above. The water system consists out small ditches, streams, water ways, siphons, culverts, weirs, dams, locks, basins, flood defenses and pumping stations. These assets provide a network that has a water level regulating function and a flood defending function. The primary flood defenses are not within the research scope. The management of these assets is strongly supervised and affected by norms of the Dutch central government. When discussing the water system in this Thesis, the emphasis will lie on its infrastructure assets. The pumping stations of the water system are production facilities and are managed in a same way as the wastewater treatment chain.

Compared to the wastewater treatment chain, the characteristics of the water system make it more difficult to rationally and uniformly plan and optimize interventions. First of all, this is because infrastructure assets often serve multiple interests and have multiple functions. Moreover, the water system does not have the same clear inputs, processes and outputs as can be seen within the wastewater treatment chain. Instead, the water system is responsible for functions such as biodiversity and water quantity. For these functions, it is difficult to define SMART objectives and performance indicators. Moreover, the one-on-one causality relation between the outcome and asset intervention is often highly complex. The relations are often indirect and involve a time lag. Moreover, the assets are located in an open environment in which natural processes (e.g. the weather) and actions of anonymous people can affect the assets. In such a situation, it can be highly difficult to compare measurements and attribute the observed changes to the impact of certain intervention. Besides, the inspections and measurements can be complicated because there are many unique assets with unique local conditions. Besides the relations between the assets are often complex, the assets are dispersed over large areas and they are sometimes submerged under water or underground.

4.2 Vechtstromen and Zuiderzeeland

Vechtstromen's area of responsibility contains the regions Twente, Northeast Overijssel and Southeast Drenthe (Figure 8). Zuiderzeeland is responsible for Eastern and Southern Flevoland, Northeast polder and two peripheral lakes. Table 2 describes some characteristics.

Figure 8 Map of the regional water authorities. Vechtstromen and Zuiderzeeland correspond to the orange and green areas

	Vechtstromen	Zuiderzeeland
Area (land, hectare)	226.000	150.000
Inhabitants	815.000	390.000
Primary flood defenses (kilometers)	-	208
Regional flood defenses (kilometers)	137	43
Dams	1300	365
Watercourses, ditches, streams, rivers and waterways (kilometers)	4.421	6.200
Major pumping stations	-	7
Wastewater treatment plants	23	5
Employees (fte)	449	250
Gross operating costs (M€)	130	75,3

Table 3 Some main characteristics of two cases (Waterschap Vechtstromen, 2016; Waterschap Zuiderzeeland, 2009, 2015a)

The area that is controlled by Zuiderzeeland contains land that was reclaimed between the 1940's and 1970's. The land reclamation made it possible to start from scratch on and

construct the water system and the wastewater treatment chain based on optimized, rational and standardized designs. Within Vechtstromen's area of responsibility, water management is already executed for a very long time. The water system has gradually developed during multiple centuries based on natural processes and human interferences. A similar argument holds for the treatment chain that has been constructed over multiple decades. Because its asset systems have historically grown over time, Vechtstromen copes with relatively more inconsistencies, ineffective and inefficient aspects (e.g. little standardization and less information available) compared to Zuiderzeeland. To put it bluntly, Vechtstromen has to manage assets that would be configured differently if it had this opportunity nowadays.

Moreover, there are differences between the water systems. Compared to Zuiderzeeland, Vechtstromen is located at higher grounds and contains relatively large altitude differences. This makes it relatively easy to discharge water using normal runoff. For Zuiderzeeland, the main part of the land lies below the IJssel lake level. The maintenance and optimization of the pumping stations are therefore relatively important topics for Zuiderzeeland.

4.2.1 Organizational structures

For both civil services, the distinction between strategic, tactical and operational planning manifests itself in two directions of the organizational chart (appendix B). First, it is shown in the chain of command. The civil service is led the managing board. The board is presided by the Secretary & Managing director and supervises the departments and their managers. A department manager (strategic-tactical) is responsible for the what: the results of the department that are required to achieve the objectives. Together, these managers form the managing team (MT). Most departments are subdivided in teams that each have their own manager. The team managers (tactical-operational) focus on the how: which activities and resources are required to achieve the results. Secondly, the distinction manifests itself also in the functional specialization of departments of teams. An explanation of this is provided below.

4.2.1.1 Regional water authority Vechtstromen

The starting point of Vechtstromen's organizational structure is the tactical-operational department called "water system and wastewater treatment chain" (in Dutch: "watersysteem en zuiveren"). This is the primary department that is responsible for the core business: the actual management, operation and inspection of assets. It forms the center of the organization. This department is the internal client to which the other departments contribute.

The department "technique and services" (in Dutch: "techniek en diensten") is one of these other departments. It is responsible for the storage of data, enforcing by-laws, permit licensing and executing technical maintenance for the physical assets. Vechtstromen's department "development and advisory" (in Dutch: "ontwikkeling en advies") has a large scope of responsibilities. First of all, it advises the managing board and governing bodies about visions, objectives, strategies and programs for the water system and wastewater treatment chain. However, the department also acts more tactically-operationally. It includes the center of expertise with experts that can be consulted by other departments and it includes a team with the project managers. The department "governance and organization" (in Dutch: "bestuur & organisatie") is responsible for supportive tasks (e.g. communication, HRM, finance and ICT) that enables the rest of the organization to operate efficiently and effectively.

4.2.1.2 Regional water authority Zuiderzeeland

Zuiderzeeland used a different approach to create its organizational structure. Zuiderzeeland modeled the translation from objectives and strategies towards actions into 5 steps (Figure 9) and used this to create 4 departments.

Figure 9 Line of thinking that is used to set up the Zuiderzeeland's organizational structure

Within Zuiderzeeland's civil service, the first 3 steps are performed for the water system and wastewater treatment chain together. The department "strategy and development" (in Dutch: "strategie en ontwikkeling") is responsible for (1) exploring the internal and external

opportunities and threats and (2) using this to determine the strategic plans (e.g. water management plan). The department “planning, procedures and advisory” (in Dutch: “plannen, procedures en advies”) is responsible for (3) the translation towards the tactical planning in the form of multi-annual intervention and improvement plans. This department also contains the center of expertise and is responsible for generating and enforcing by-laws and permits.

(4) Translation 2 is about concretizing the tactical plans in more operational plans such as the annual implementation plans and multi-annual maintenance plans. (5) Execution is about the execution of plans and includes for example the inspection and maintenance of assets. Here, a differentiation is made. The department “water management” (in Dutch: “waterbeheer”) conducts these two steps for the water system, excluding the pumping stations. Department “wastewater treatment chain and pumping stations” (in Dutch: “zuiveringen en gemalen”) focuses on the treatment chain and the water system’s pumping stations.

Additionally, Zuiderzeeland has 3 supportive departments. The department “water related projects and information” (in Dutch: “water projecten and informatie”) is responsible for the organization’s wide data management and the project management for regular projects (renovation of small assets). The department “business operations” (in Dutch: “bedrijfsvoering”) executes supportive tasks such as finance, purchasing, HRM and safety and quality management. The department “communication and services” (in Dutch: “communicatie en dienstverlening”) delivers general services (e.g. communication and ICT). Finally, there is the seperate group “project management” (in Dutch: “projectmanagement”). This group is responsible for managing the large and complex projects that have a significant impact on the organization and are of direct interest of the managing board and governing bodies.

4.2.2 Portfolios and programs

Both organizations use programs in their planning & control cycle. These programs are subsets of objectives that have similar focus points and that are part of the entire scope organizational objectives. This division into programs helps the organizations to structure and focus the communication and formal documents when defining or evaluating the objectives. Vechtstromen uses the programs (1) water system, (2) wastewater treatment chain and (3) and a general program called governance and organizing. Zuiderzeeland defines four programs: (1) water safety, (2) water quantity, (3) water quality and (4) general.

On top of the programs, the organizations also use portfolios. The portfolios are defined to spread the workload in the executive assembly and represent the set of responsibilities for each of its members. As such, also a portfolio is a subset of the entire scope of objectives. However, the portfolios do not have to match with the programs. The portfolios can change over time as they depend on the size of the executive assembly and the interests its members. Both organizations use portfolio meetings. Once every 1-2 weeks, for each portfolio, there is a meeting between an executive assembly’s member, a representative of the civil service (e.g. a member of the MT) and some advisors. During this meeting, the participants catch up, align their expectations and together monitor the progress of the portfolio. The executive assembly’s members communicate this with their general assembly.

4.2.2.1 Regional water authority Vechtstromen

Vechtstromen not only uses programs for documentation and communication purposes, but they also apply program management. Program management refers to the coordinated activity of translating the program objectives and strategies into an optimal and integral portfolio of interventions, allocating tasks to the departments and teams and making sure that the objectives are achieved. Vechtstromen applies this method for each of the 3 programs.

For each of these programs, the MT is held jointly accountable for the achievement of the program objectives. The department managers together approve the program plans, monitor the implementation and they are together responsible for the justification and documentation. Within the MT itself however, each program has been assigned to one manager. This manager is the representative of the MT and is made responsible for supervising the program management. For the programs water system and wastewater treatment chain (the focus of this Chapter), this is the manager of the department development and advisory. Because of the busy schedules of the department manager, the MT has appointed two program coordinators and these are mandated to actually perform program management. The

coordinators operate cross-functionally (i.e. make sure everyone aligns and contributes) and search for, initialize and monitor the interventions that should lead to the achievement of the program objectives. Once every 1-2 week(s), a coordinator holds a program meeting together with experts, managers and other members of the organization. This meeting is used by the coordinator to gather expert knowledge, information and recommendations.

So, the programs lie horizontally over the organizational chart and the program coordinators operate cross-functionally. This suggests that the civil service of Vechtstromen is a matrix organization. In fact, however, it is a hybrid system. At the end, program management and all the money and power is merged back into the chain of command. The MT is held accountable for the program objectives and the coordinators fall within the normal hierarchy.

However, the acutal situation is more complex than was described above. The programs water system and wastewater treatment chain are used for communication and documentation purposes. Internally however, the programs are managed differently. There is a single program meeting that discusses both programs. Furthermore, responsibilities of two programs are merged and reallocated. One coordinator focusses on the development and innovation projects to increase the value of the asset systems (e.g. the construction of nature-friendly river banks). This coordinator is positioned within the department development and advisory as they have a similar focus. The other coordinator focusses on the management of the existing water system and wastewater treatment chain and keeping the service levels steady (e.g. renovations, operations and maintenance). This coordinator is positioned within the department water system and wastewater treatment chain.

Finally, there is another aspect. Within Vechtstromen, the program coordinators primarily focus their attention on the investments (i.e. CAPEX). This is logical for the first coordinator because developments and innovations usually require investments. The other coordinator focusses on the investments that are needed to keep the service levels of the assets steady. This latter coordinator does also communicate with the teams about the ongoing business operations (OPEX, the regular exploitation). This coordinator than acts as the internal client and communicates about the main goals of the ongoing business exploitation and the budget that is available. After this however, the involvement of this program coordinator is limited. The actual formulation of plans (e.g. what, how and when will activities be executed) and the day-to-day control for these ongoing business operations is the concern of the team managers.

4.2.2.2 Regional water authority Zuiderzeeland

Zuiderzeeland does not want to create a complex matrix or hybrid organization. The management and control within Zuiderzeeland is therefore primarily based on the regular chain of command. The department managers form the linking pins in this. Roughly stated, the department managers are responsible for maintaining both the vertical and horizontal coordination. With the mandate of the governing bodies, these managers constantly monitor the vertical connectivity between the organizational objectives and operational actions. They determine and prioritize how the organizational objectives can best be realized. Moreover, the MT is made jointly responsible for controlling the coherence between the departments.

These responsibilities of the department managers are also reflected within the portfolio meetings. Each department manager is assigned to a specific portfolio meeting and he/she is the representative of the civil service. The meeting is used to make sure that the demands of the executive assembly's member are correctly followed by the civil service. For such meetings, the department manager facilitates and regulates the discussions and participates in these discussions. As portfolios usually cover the entire organization, it often occurs that a department manager participates in discussions about topics that are outside the scope of his/her own department. Because the manager is the representative, he/she must act at a strategical level and consider the overall interests of the organization. The original approach was to also make the manager more responsible for follow-up: coordinating the implementation of the portfolio meeting's decisions by the various departments. However, next Sections will demonstrate that this is currently not strictly applied.

4.2.3 Planning & control

Although there are several planning & control cycles within the civil service, the one that is used at the governance level is leading. This latter planning & control cycle level is strictly

formalized and is completed annually. In this cycle, the civil service acts as a facilitator and feeds the planning & control cycle with budgets, plans, evaluation reports etc. Some relevant documents are shown in Figure 10. The input for the cycle constitutes out of strategic documents such as the governance agreement, governance program (both made every 4 years) and the water management plan (every 6 years) that formulate the organization's strategies and objectives. The planning & control cycle uses these plans to determine what must be done in the coming year and the years thereafter. An important document in the *'plan'* phase is the multi-annual budget. It summarizes the organization's actions and financial consequences for the coming year and makes budget estimates for the 3 years after that. Although not shown in Figure 10, it is important to stress out that the authorities' planning & control cycles are affected by many external policies and regulations. For example: Water Framework Directive, Natura 2000, Delta Programme, National Water Plan, National Water Governance Agreement, Provincial Regulations and agreements with municipalities.

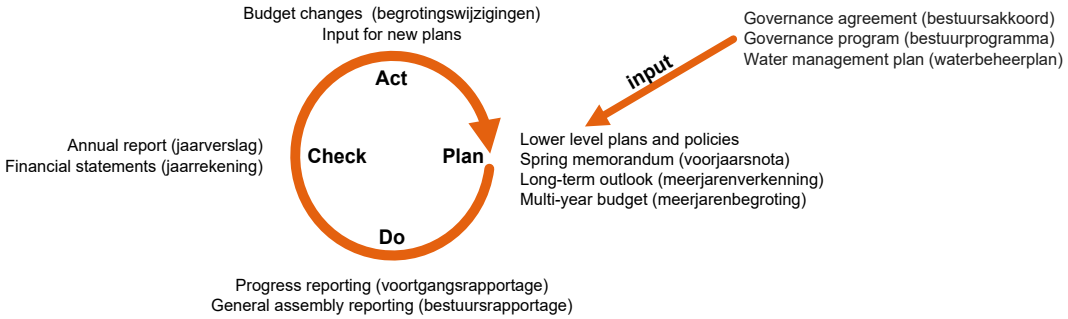

Figure 10 PDCA cycle at the governance level that is completed annually by the regional water authorities

4.3 The existing internal strategic alignments

Table 1 (p.29) described the conditions that must be met by an organization in order to reach strategic alignment in the management of assets. This Section will describe how these conditions manifest themselves (e.g. Are the conditions present? How? Why not?) within the two regional water authorities (sub-question 3). This Section is divided into 3 parts. Sections 4.3.1 and 4.3.2 will discuss the conditions in the AF strategy process and the contextual variables. For each condition that is discussed, the text starts with a traffic light indication. This gives the reader an immediate impression about whether the two organizations meet the conditions (V=Vechtstromen and Z=Zuiderzeeland). The number and colors (1) red, (2) orange and (3) green describe whether a condition is respectively minimally present, moderately present and (almost) fully present. It is important to stress out that the traffic light indication merely provides a first impression (limited nuance, no trends etc.). Section 4.3.3 will summarize the findings and describe the major constraining factors (Table 4).

Sections 4.1 and 4.2 already introduced the main characteristics of the two regional water authorities, the water system and the wastewater treatment chain. By having done this, this Section can discuss them quite simultaneously. Besides, as will be demonstrated, this study recognizes many commonalities in the strategic alignments of the two organizations. When looking to the institutional theory as discussed by Powell & DiMaggio (1991), this is not that remarkable. The two regional water authorities operate in the same institutional context. For example: they have similar responsibilities; they both operate in the Netherlands; they collaborate in many fields; they are affected by the same laws and regulations; their external stakeholders are quite similar; and their employees have somewhat similar backgrounds.

4.3.1 Necessary conditions in the AF strategy process

4.3.1.1 Objectives and strategies (item: SP1-AF)

Condition SP1-AF, sub-condition 1: the objectives and strategies are clear, understandable and can be used as a frame of reference by others	V 2 Z 2

For this Thesis, the water management plans of both organizations are the most relevant strategic plans. Within these plans, the organizations translate their missions and visions into long-term strategic objectives (for the coming 25 years) and mid-term program objectives (4-6

years)(examples are shown in appendix B). Besides, these water management plans also spell out extensively what will be done to reach these objectives. The missions of the two organizations describe that they, together with their stakeholders, take care of water safety, water quantity management and water quality management. Their visions rephrase this and contain keywords such as: together with society; sustainability; transparent; innovative; skilled employees; and spending public money in a socially responsible, efficient and effective way.

Although the water management plans and other strategic plans provide extensive information about the intentions, these plans do not always provide enough guidance for the strategy implementation and control phases. As frequently stated by the interviewees, the exact intended course of direction is not always clear for employees as it is often too vaguely formulated. In such cases, it is not exactly clear what an organization wants to achieve and how these considerations should be considered. As indicated by some interviewees, these strategical plans than lack an extra translation from the political-administrative intentions of the governing bodies (high abstraction level), towards more specific objectives for the water system and wastewater treatment chain that should be pursued by the civil service. Besides, when the strategic plans do discuss more concrete topics, the focus often lies too much on the efforts that should be (in Dutch: “inspanningsverplichting”) (what interventions, when and what budget). As such, the actual purpose of creating value for the stakeholders (in Dutch: “resultaatverplichting”) is not always well concretized with SMART formulated objectives and objective and quantitative indicators. There is therefore not always an unambiguous and clear strategic frame of reference of the organization’ value systems.

First of all, the above issues affect the processes within the civil services. Over the last decades, the tasks of the regional water authorities have become more complex. They face tighter budgets while the number of challenges (e.g. effects of climate change) is growing and the external stakeholders become more critical. More, there are new laws and regulations that result in extra complexities and require better justifications. Besides, the number of criteria within the decision-making processes has been increasing. Whereas the management of assets used to be primarily driven by money, continuity and quality; the organizations more and more include criteria such as sustainability and image within their planning process. All in all, this means that the authorities are more and more forced to prioritize their actions.

However, the existing strategical plans do not always provide sufficient guidelines. The civil services cannot always easily fall back on these plans and use them to integrally, objectively and quantitatively assess and prioritize problems and interventions. Besides, the lack of a clear frame of reference makes it difficult for civil servants to ensure that the choices they make are fully in line with the demands of the governing bodies. The existing situation can raise questions such as: On what basis should we make our decisions?; What business values are we exactly pursuing?; How do these values compare and what is the prioritization; How do we define and measure the values (e.g. what do we mean with sustainability)?; And what is the organization’s risk appetite? Both organizations do have some lower level policies that help them in this. However, also these have their limitations. This will be discussed later.

The above issues also affect the MTs and managing boards. They cannot always easily and systematically control (e.g. have informed discussions about the consequences of plans) their civil services. There are no clear guidelines on which they can fall back. This will be further discussed with the next Sections. Although to a different extent, this also applies to the governing bodies. Due to the absence of a shared frame of reference between the governing bodies and the civil service, it is sometimes difficult for them to speak the same language and discuss the consequences of proposals. Likewise, also this will be discussed later on.

Finally, the above issues also affect the interplay between the governing bodies and civil services. The existing focus makes that the civil services are mainly contracted on the level of actions that have to conducted and not the values that have to be created. As result, the civil services do not always have the flexibility to conduct portfolio management and constantly search for the optimum interventions. They are partly restricted in what they can do. As pointed out by interviewees, a clearer frame of reference is needed as it forces the governing bodies to more explicitly define the organization’s value system. If, the civil service become also more entrusted with more responsibilities for the planning process, the interplay can be professionalized. The governing bodies could then focus more on their own task and control the objectives on a high strategical level (in Dutch: “sturen op hoofdlijnen en doelbereik”).

Condition SP1-AF, sub-condition 2: the consequences of the formulated objectives and strategies (on the internal organization) are known	V 2 Z 2

Within both authorities, the objectives and strategies are formalized and determined in a democratic decision-making process in the general assembly. The civil services facilitate this process and provide the necessary information and recommendations. Because of the strong involvement of the civil service, the strategy formulation within both organizations seems to be sufficiently based on information from experts and various other sources. The findings of the next sub-conditions however will demonstrate that the civil services are not always able to provide the governing bodies with the right information. They cannot always provide sufficient insights into the balance between expenditures, performances and risks of the asset systems.

Condition SP1-AF, sub-condition 3: the objectives are translated into relevant short-term objectives	V 2 Z 2

The water management plans translate the organization's long-term objectives and visions into mid-term program objectives (for the coming 4-6 years). Table 7 and Table 8 in appendix B provide some examples of the long-term and mid-term objectives. Moreover, each year, the organizations establish a multi-year budget in which these objectives are updated. However, these strategic objectives do not always provide a clear frame of reference for the civil service on which they can fall back when assessing their asset systems and prioritizing interventions.

Both civil services have underlying policies and lower level objectives that do help them to identify what interventions need to be executed in the coming period. There are for example agreements with other government agencies or new national and international regulations that trigger the civil services to conduct projects. Parallel to this, there are the functional demands of the internal clients that form the objectives for project teams. Furthermore, there are the organizations' policy documents that describe the minimum conditions and performances of the asset systems and their assets (e.g. lower level risk matrices and quality levels). These references are used to assess the assets and detect where interventions are needed. However, also these policies and lower level objectives have limitations. It is for example not always fully clear how they are exactly related to the organizational objectives.

4.3.1.2 Translation towards plans (item: SP2-AF)

Condition SP2-AF, sub-condition 1: the objectives and strategies are translated in a coherent set of plans	V 2 Z 2

Both organizations translate their objectives and strategies into numerous plans (e.g. program plans, annual implementation plans, multi-annual maintenance plans). They detail out which line activities and projects need to be executed in the coming period. The organizations integrate these plans annually by establishing multi-annual budgets. On top of this, both organizations use department plans and team plans. These describe how the short-term objectives, tasks and responsibilities for the coming year are allocated to the specific organizational units. The text below will further explain how the two organizations plan their interventions. The roles and responsibilities will be discussed with condition SP5-AF.

Zero-based budgeting

Both organizations are more and more following a zero-based budgeting approach. The civil services each year have to start the budgeting process from zero. Only when they can justify the added value of their proposals, the civil services receive the necessary resources from the governing bodies. This is instead of an approach in which the annual budget is based upon previous year's budget and therefore is quite similar each year. In such an approach, the available resources determine what will be done and this leads to unnecessary expenditures.

The difference between the wastewater treatment chain and water system

With respect to the planning process, the two organizations show similar differences between the water system and wastewater treatment chain. Simply stated, the planning process for the wastewater treatment chain is more based on standardized and rational methodologies.

These help to conduct system optimizations and derive long-term plans. As stated in Section 4.1, the main reasons are the favorable characteristics of the waste water treatment chain.

Since several years, the two organizations are carrying out improvements to also apply a more rational and planned approach for the water system. In the past, the management of the water systems had a regional character. The overseers in the field had a lot of autonomy and they used their expert judgement, rules of thumb and contact with the stakeholders to manage the assets in their area of responsibility. Over the last decade however, a transition has been going on. The water system is more and more controlled by a centralized decision-making process and based on factual information, optimizations over long periods (fewer ad-hoc interventions) and optimizations on a system level (instead of local independent solutions). In line with this, the overseers are slowly becoming more like observers (performing inspections and measurements) and executors (following the assignments). Moreover, to eliminate the subjectivity and create more uniformity, the overseers are more and more working based on standardized methodologies and peer reviewing each other's inspections.

The objectives and reference levels that are used within the planning process

As stated, both organizations use numerous objectives and reference levels to identify where and when interventions in the asset base are needed. New development or innovative projects are for example triggered by the ambitions as formulated within for example the new national and European regulations and the ambitions of the governing bodies themselves. In case of a project, there are additional criteria that are formulated by the internal client and that must be followed by a project team. For managing the existing asset base, there are numerous policy documents that describe the desired states of the assets. For example: the Legger states the desired dimensions of the water courses; the water-level decree describes the desired surface water level; and the organizations have certain pre-defined requirements for the performances of the wastewater treatment plants.

Other important documents are the operational risk matrices and quality levels. These are used to assess the physical assets. Both organizations use operational risk matrices in their management of the wastewater treatment chain. Vechtstromen recently also started to adopt the risk matrices for the water system. The approach corresponds with discussion about risk management in Section 2.2.1.3. Teams of experts use the risk matrices to translate the results of the inspections and measurements into operational risks and determine whether they are tolerable or not. Zuiderzeeland currently manages its water system by comparing observations with pre-defined quality levels. Zuiderzeeland defined three quality levels (poor, basic and perfect) for different asset types and described these with text and photos. Their aim is to have the assets at level basic. Risks were implicitly taken into account when the quality levels were described (e.g. level basic should lead to acceptable risks). For the assessments however, there is no formal risk management approach. Assets of the same type are compared with the same quality levels and no formal distinction is made between assets based on the effects in case of risk failure. However, although there is no formal methodology, the experts do often use their judgements about risks to differentiate assets.

Areas of improvement in the planning process

The developments above have helped the organizations to critically evaluate their existing operations. The text below however discusses the need for additional improvements.

1) Asset data

Although the organizations have already focused a lot of the efforts on improving the situation, they still regularly face difficulties due shortcomings in their asset data. In those situations, data is for example missing, incorrect, outdated, not easy accessible and/or poorly structured (e.g. too much data and data without a clear usage). This for example applies to static asset data (e.g. age, location, material etc.), dynamic asset data (e.g. condition, maintenance, failure, performance) and incident data. Interviewees also indicated an underlying problem. According to them, it is often also the lack of clarity about agreements and responsibilities that results in difficulties. This results in questions such as: Who gathers the data?; In what data format?; How should the data be shared?; And who is responsible and who coordinates?

All in all, these above issues can hinder the organizations in their ability to pro-actively manage risks, to make reliable long-term budget forecasts and to make well-considered, justifiable and optimum strategies, plans and policies. To illustrate this, one the interviewed managers stated: "When I ask my employees if they could give me lists with our risks, the physical assets that belong to this and the investments that we face in the near future; I cannot always get a full reliable answer. This sometimes makes me quite uncomfortable".

2) Relating asset functionalities and interventions with organizational objectives

Currently, the civil services regularly face difficulties when trying to link functional requirements, risks of asset failures and the impact of interventions with the organization's value system. The added value of interventions is understood for the operational level, but it is often difficult to describe the exact contribution to the organizational objectives. The contribution is often more implicitly than explicitly known. It can for example be difficult to describe the trade-offs for value creation if: flora along the watercourses is mowed 2 instead of 3 times per year; if the inspection frequency for asset X is lowered; if the renovation of a pumping station is postponed; or if this budget is spend on an alternative intervention.

However, the above difficulties are not always the same. The relations are generally clearer for the wastewater treatment chain compared to the water system. Besides, also the type of activity can determine how clearly it is related to the organizational objectives. The text below explains this and makes a distinction between two extreme cases. The reader should be aware that this distinction is somewhat artificial and should not be interpreted too rigidly.

First of all, there are the more regular and simple issues within the asset base. These can be tackled with the simple daily operations and maintenance (in Dutch: "regulier beheer en onderhoud"). Within the water system, these activities are for example the mowing of flora in and along the watercourses and the small maintenance of the weirs. However, the top-down[3] (the operational data is used to formulate new objectives and strategies) and bottom-up connections (the new objectives and strategies are translated into operations and maintenance activities) for these activities are not always well-functioning.

Some interviewees illustrated this by stating that there is sometimes an imaginary boundary between the operational and tactical planning. The reasoning behind this is that the planning process for these daily operations and maintenance activities often remains an operational and somewhat tactical matter. It is often clear that these are necessary activities that have to executed in order ensure the continuity of the primary water management tasks. However, the operational data and the plans for simple daily operations and maintenance are not always well integrated with tactical and strategical departments and other initiatives.

Figure 11 Visualization of imaginary boundary between the operational and tactical departments

One of the main causes is the absence of a clear frame of reference about the organization's value system. Therefore, it is not always exactly clear how the organizational objectives are related with the reference levels and lower level objectives that are used for regular operations and maintenance. It is for example not fully clear how the pre-defined quality levels and operational risk matrices relate to and affect the higher level organizational objectives (e.g "we want to prevent water shortage" and "our water system functions well") and the KPI's (e.g. "asset system X will meet the national laws and regulations"). It is for example not well visible how the objectives are affected when the minimum quality level of the assets is shifted from basic to good or when the risk appetite within the operational risk matrices changed. As result of this, the reasoning behind the plans is not always easy to understand by others.

Secondly, at the other extreme end of the spectrum, there are the larger and more complex problems within the asset base that often require large investments. These are the

[3] Despite the fact that the bottom-up and top-down approaches are in fact horizontal relations within the organization charts, let's keep referring to them with these terms.

development and innovation projects to improve the asset base and the major investments that are executed to maintain the service level of the existing asset base. For example: the organizations are constructing many nature-friendly river banks to comply with the European regulations and Zuiderzeeland is planning large scale renovations of its pumping stations.

Because of the high stakes and the complexities; the organizations generally recognize that these issues can only be tackled when the operational, tactical and strategic departments actively collaborate. Therefore, the bottom-up and top-down connections and translations of data are clearer compared to the first extreme case. Furthermore, these cases receive a lot of attention because of the high financial risks, risks for the organization's image and because the necessity to intervene is evident (e.g. high risks). As result, these activities are often quite explicitly mentioned in strategic documents and the relation between the plans and the organizational objectives is clearer. Nevertheless, also here, the absence of a clear strategic frame of reference results in difficulties during the planning and decision-making process.

The above line of reasoning shows the two types of activities can be valued differently. The added value for the large projects is, although difficult to quantify, quite obvious. For the regular operations and maintenance activities however, the added value is not always clear and therefore almost look like obligations and cost centers. The interviewees agreed that this distinction is incorrect as all activities just means to achieve the organizational objectives. Nevertheless, they also stated that the distinction is still sometimes (unconsciously) made.

3) Systematic, integral, unbiased, evidence-based and transparent planning process

Thirdly, the planning processes within the organizations are not always sufficiently systematic, integral, unbiased, evidence-based and/or transparent. This will be discussed below.

As stated before, the organizations often lac a clear strategic frame of reference in their management of assets. They do have numerous policies and reference levels. However, these policies are often too narrowly focused on a few assets and life cycle phases, primarily apply an engineering perspective and are not always well linked with the organizational objectives. Moreover, as stated before, there is not always high-quality asset data available. The consequence is that the organizations do not always have the right systematics (e.g. standardized pre-defined rules) that help them to asses and prioritize the decision alternatives. There is often a lack of clarity in how and on what basis the trade-offs of alternative interventions should be evaluated and prioritized. This makes that decisions are often dominated by practical considerations: the costs and the preferences of experts.

So, the organizations would benefit from a more systematic planning process as it clarifies for the civil service and its employees on what basis decisions should be made. Besides, it would also help to create more uniformity in how the states of the assets are evaluated and how plans and the investments are justified. In its turn, this uniformity would make the civil services better able to integrally asses the added value of alternative interventions. This would enable thm to conduct optimizations over the entire water systems and wastewater treatment chains. Currently, the organizations are not always able to apply such an integral approach.

Furthermore, more systematics would help the planning processes to become less biased. It would be overstating the case to say that planning processes within the two organizations are currently purely subjective manners. However, the lack of a clear strategic frame of reference and systematics currently often forces the persons in charge to use their own interpretations. They then judge about the exact meaning of the organizational values, the trade-offs of the alternatives and the best option that should be selected. On top of this, the decision-making processes within the organizations are still regularly driven by expert opinions. In those cases, the decision makers simply do not have the right systematics and/or information available and therefore have no other choice than to follow the experts. Although this is somehow exaggerated, it illustrates the essence that the organizations still often depend on the expert judgements and this makes it difficult for others to critically upon the added value of plans.

Furthermore, the decisions in the planning processes of the two organizations are still not always fully evidence-based and well considered. Although it certainly does not apply to all decisions and the situation is currently improving, the findings of the interviews demonstrated that the decisions are sometimes made too rash. Interviewees referred to multiple past situations during which incidents or unsubtle warnings of experts resulted in anxiety, put the

organization on high alert and lead to fairly rash, ineffective and inefficient decisions. This for example lead to interventions that were too expensive and oversized

As stated by the interviewees, some of these past situations were caused by the facts that there was too little time and not enough high-quality data to thoroughly analyze the problem. However, as stated by the interviewees, this was not always the case. There have also been situations in the past during which the organizations simply did not take the time to make well considered and will informed decisions. In those situations, the sense of urgency grew so fast that the responsible employees quickly made up their minds. They got the perception that their organization must act immediately. In these situations, it was too late and impossible for others to slow down and temper the anxiety and the organization's tendency to take action.

Finally, the two civil services face another issue: the planning processes within the organizations are not always fully transparent. Because the planning processes are not always systematic, uniformly, unbiased and are sometimes too much based on personal judgements; outsiders do not always fully understand it. This can form a complication for both decisions makers (this will be discussed below) and regular employees. Employees for example call the decisions and plans that are imposed onto them into question because of this lack of understanding. Questions can arise such as: Why did the organization approve with this plan? Is this innovative solution really with in line with our definition of sustainability?

4) Difficulties for the decision makers

So, the regional water authorities regularly face situations in which they are confronted with one or more of the following issues: shortage in high-quality asset data; a not fully clear relation between the organizational objectives and the assets' functionalities and plans; and/or a planning process that is not fully systematic, integral, unbiased, evidence-based and transparent. Within both organizations, these issues also affect the MT, managing board and governing bodies. These decision makers do not always have a full grip on their organizations and face difficulties when trying to make well informed and optimum decisions. Once for example proposals are send to them, questions could arise such as: Do we know for certain why this is the best decision?; Does this plan really adhere to our objectives?; And if we do not execute the plan, what risks are we actually taking?. As result, the decision makers do not always have a full understanding about the possible decisions they can make. In other words: "What are the parameters that I can control?" (in Dutch: "Aan welke knoppen kan ik draaien?"). For example: what happens with risks if the available resources are reduced.

4.3.1.3 Contribution of actions (item: SP3-AF)

Condition SP3-AF, sub-condition 1: the executed activities are in line with the strategies, objective and plans	V	2
	Z	2

The planned and unplanned actions generally contribute to the strategic objectives. This is stimulated by the fact that their organization's employees are truly committed to and passionate about the primary water management tasks and therefore make their decisions with the best intentions for the organization. This has also been shown with the employee satisfaction surveys. However, as stated above, the difficulty is that the added values of the plans to the objectives are not always explicitly and exactly clear; neither is it explicitly demonstrated that these are optimal. Besides, both authorities have an organizational culture is which the emphasis often lies too much on whether the expenditures are within budget and whether activities are executed within the planned period. In this way, the added value is not always critically evaluated. This aspect will be further discussed in Section 4.3.2.2.

4.3.1.4 Inspect and measure (item: SP4-AF)

Condition SP4-AF, sub-condition 1: the assets are inspected and their operations and functions are measured	V	2
	Z	2

As stated above, the organizations still regularly face difficulties within their planning process because there is not always high-quality data available about the physical assets. The wastewater treatment chain is often a few steps ahead in this compared to the water system. This is simply because updating the data and conducting measurements for the thousands of

assets within the water system requires more efforts. Furthermore, the interviews demonstrated that the shortage in high-quality asset data seems to be slightly larger for Vechtstromen than for Zuiderzeeland, especially for the water system. This is likely because Vechtstromen's water system has developed over a very long time and is therefore less standardized, contains older assets and it is more difficult to trace back data.

Vechtstromen and Zuiderzeeland are however currently working on this. The organizations and their employees are becoming more are aware of the necessity to tackle this problem. They are therefore more and more focusing their attention on solutions such as: completing asset inventories, performing pilots to test certain software and conducting inspections and measurements. Both organizations even appointed project groups and/or created specific teams to tackle the issue of information management with an organization-wide scope. However, the problem is not such that it can be simply solved by conducting a onetime large-scale asset inventory and buying technology process this data. As stated before, the problem is often that information management is not always high on everyone agendas and the responsibilities and agreements are not always well defined and well known.

There is the need within both organizations to change the behavior of the employees regarding information management. Currently, overseers and other experts still have a lot of knowledge that is not stored within the information systems. Furthermore, not all observations in the field, incidents and changes in the asset system are registered. These behaviors originate from the organizational cultures. Employees tend to strongly focus on the '*do'* phase of the PDCA cycle and less on the '*check'* phase (e.g. registering data is seen as a distraction form the core tasks). Furthermore, there are still sometimes organizational silos within the civil services that obstruct the sharing of data. This will be discussed in Section 4.3.2.2.

Condition SP4-AF, sub-condition 2: strategy control uses a balanced and limited set of performance measures that is linked with objectives

V 2
Z 2

The tactical-operational departments use many performance measures to assess technical and functional performances of the assets. For this sub-condition however, especially the performance measures used at the highest levels seem to form a limitation for the strategic alignment. As frequently mentioned by the interviewees, the organization-wide strategy control is often too focused on the efforts that have to be made. As result, success is often measured as on time, as promised and within budget. The focus is for example still too much on the costs for constructing the new river banks, whether the projects are completed within the planning and how many kilometers river banks are constructed. A comparison with the findings of Section 2.2.3 demonstrates that this corresponds with input, processes and output measures of asset interventions. Figure 12 (next page) visualizes how this relates with the step-by-step translation from mission and vision towards actions.

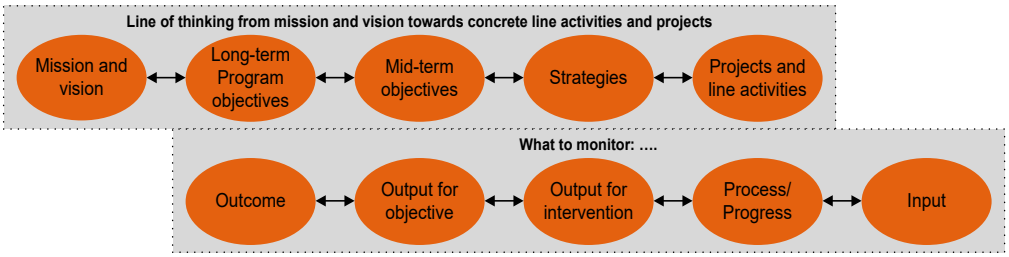

Figure 12 Top: the translation from the mission and vision towards the projects and line activities. Bottom: the aspects that could be measured alongside these steps

The interviewees agreed that the current situation is not ideal. As stated by some of them, the organizations are able to successfully complete the planning & control cycle simply because the costs are within the budget and the planning is followed. Although this statement is an exaggeration, it illustrates that too little attention is paid to controlling the actual outcomes of the organization's actions in the water system and wastewater treatment chain. So, in case of the nature-friendly river banks, too little attention is paid to monitoring the improved bio-diversity (the outcome) and studying whether this is better than alternatives. The danger of this is that the outcomes and the value creation become so much overshadowed that it becomes almost impossible to optimize them and continuously learn and improve.

The main reason of this uneven distribution in the organizations' attention is the simple fact that the performance measures too often focus on planning and financial performance. Moreover, indicators are often too qualitative and subjective and of an abstraction level that is too high (e.g. our assets are in a good state and comply with regulations). As result, they do not always clearly reflect the impact of the organization's activities and changes over time due to continuous learning and improving.

Because of the shortage in reliable performance measures for the outcomes in the water system and wastewater treatment chain, the decision makers focus their attention on performance measures that are better available and more evident: planning and financial performance. However, the situations have improved within both organizations during the recent years. Both organizations have started to define and to use more and better performance measures about mid-term and long-term objectives. However, this alone cannot simply solve the problem. The focus on financial performance and planning is also embedded within the organizational cultures. This will be discussed in Section 4.3.2.2.

Condition SP4-AF, sub-condition 3: the results of inspections and measurements are used as input to formulate or adapt strategies, objectives	V	2
	Z	2

The previous analyses already discussed how the organizations are more and more following a zero-based budgeting approach that is based on factual information. The results of inspections and measurements are for example translated into risk and quality levels and these determine what operational actions will be executed. A relevant development in both organizations is the long-term asset planning (LTAP). This is a model is currently developed and has to unravel large bulks of asset data and provide forecasts about the trends in the expenditures, performances and risks over time. This should help the organizations to better and pro-actively plan activities over the long term and spread investments over time.

However, as stated before, the regional water authorities regularly face difficulties in the bottom-up translation of operational data towards tactical and strategical planning and using this data to make informed decisions about the organizational objectives and strategies. This can be attributed to the absence of a clear strategic frame of reference and the implicit link between the operational reference levels and the organizational objectives. The operational risk matrices are for example not based on a higher level business value matrix.

4.3.1.5 Coordinated and organized (item: SP5-AF)

Condition SP5-AF, sub-condition 1: the strategy process is well coordinated and formalized in terms of processes, roles and responsibilities	V	2
	Z	2

Describing and formalizing the AF strategy process

To fulfill the demands of the external stakeholders and to comply with laws, regulations; the two authorities have a strictly organized planning & control cycle. There are many formal documents, formal intermediate evaluation moments and the relation between the governing bodies and the civil service is extensively documented. To clarify this even further, both organizations created overviews, so-called process architectures, of their main processes. However, despite these efforts, there are numerous employees within both organizations that do have an insufficient understanding about how their organization is operated. Due to the complexities of the authorities, many employees do not have a full understanding about how they and their colleagues are positioned within the organization and how they fit in.

Within Vechtstromen, the lack of clarity is for large part caused by the aftermath of a merge (start of 2014) and reorganization (start of 2015). The merge and reorganization resulted in a lot of organizational changes and not all of them were immediately completed and well documented. For many employees that did not know the ins and outs, this resulted in some uncertainty and confusion. During the most recent period however, the new organization has been further established, many changes have been finished and the employees have had the time to get accustomed to all of this. Nevertheless, there is still a need to improve this. So, to further stabilize the organization and create more order in the disorder, Vechtstromen is currently starting to use process management. The goal of this is generate more detailed

overview of the numerous processes, roles and responsibilities and give the employees better insights about how their organization is operated and how they should be a part of this.

Likewise, also Zuiderzeeland has numerous employees that do not have a good understanding of the organization's process and how they are positioned in this. Zuiderzeeland however has less of a tendency to organize the civil service along process management. This smaller tendency also applies to other management philosophies such as program management and AM. There could be many reasons for this and this is difficult to study (e.g. deeply embedded within the organizational culture). Nevertheless, the interviewees addressed that one of the most important reasons is the simple fact that need to apply management philosophies is less within Zuiderzeeland. This is because Zuiderzeeland is a more mature and stable organization and is smaller in terms of personnel and budget. Furthermore, the characteristics of the asset systems are more favorable. Zuiderzeeland faces significant challenges because of its location below the lake IJssel water level. Compared to Vechtstromen however, the asset systems are relatively new, have a rational configuration and contain a lot of standardized assets. The challenges are therefore more manageable and there is less need to look for help in certain management philosophies

Coordination within regional water authority Vechtstromen

As discussed in Section 4.2.2.1, the coordination within the strategy process of Vechtstromen is based on the program management and the regular chain of command. This currently works fine and there are no serious issues in this. However, as pointed out by several interviewees, the application of program management has developed in such a way that the roles, responsibilities and relations are now quite complex. According to some of them, it would be better to unravel everything and redesign a more rational configuration of program management. This is based on the following reasoning.

Currently, the two program coordinators focus on coordinating the investments that contribute to achieving the program objectives. A distinction is made between investments for innovations and developments and investments for keeping the existing water system and water treatment chain up to date. As explained in Section 4.2.2.1, the team managers are responsible for the ongoing business operations/exploitation. At least from a theoretical perspective, this configuration does not seem to be ideal. It suggests an imaginary boundary between different worlds (2x CAPEX and 1x OPEX) with their own budgets and interests for specific intervention types. As such, the way of reaching the organizational objectives (i.e. the type of interventions) almost seems to be more relevant than the objectives themselves. Moreover, it seems to obstruct integral decision-making and portfolio management.

Ideally, in the light of strategic alignment, the coordination in the strategy process is designed with the purpose of creating maximum value. In this situation, organization's actions are only selected after considering all available alternatives and there are no preferences that steer the decision-making process to a sub-optimum solution. What intervention type is executed (e.g. maintenance or renewal) is of secondary importance.

Moreover, the relation between program management and the regular chain of command is quite complex. As discussed, Vechtstromen is not a full matrix organization. Program management is integrated into the chain of command. While the program coordinators actually conduct program management, the ultimately responsibility is allocated to the MT. On top of this, the program coordinators are accountable in two different ways. They have to report to their hierarchical superior (e.g. for matters regarding HRM) and to the specific department manager that is (on behalf of the MT) made responsible for supervising the execution of program management. As stated by several interviewees, this works from a theoretical perspective, but it is difficult for many employees to understand how it works.

Coordination within regional water authority Zuiderzeeland

The control exercised within Zuiderzeeland is entirely based on the chain of command. As stated in section 4.2.2.2, the department managers are the linking pins within the planning process. They are responsible for maintaining both the vertical and horizontal alignment. Moreover, it was explained that the portfolio meetings are important tools in this. During these meetings, the managers are the representatives of the entire civil service.

The interviewees however indicated that the above control mechanisms are not functioning perfectly. In summary, one interviewee stated: “The department managers have complex jobs due to their multiple responsibilities and busy schedules. You cannot expect that all these managers exactly know what it is in the strategical documents, what all the objectives are and how every department, team and individual should contribute this. On top of this, also they experience difficulties due to the absence of clear strategic frame of reference and a systematic and transparent planning process”. To keep things manageable, the managers currently tend to pay most of their attention on organizing their own department. They do not always sufficiently act a strategical level and manage the coherence between departments (i.e. making sure that the organization’s interests and objectives are adopted).

This also affects the portfolio meetings. Zuiderzeeland would like to see that department managers take up an extra role and become more responsible for the implementation and monitoring of the portfolios. However, the department managers are currently unable to do so. Their role is currently mainly limited to participating and helping to organize and structure the meetings themselves. The usage of the portfolio meetings is further complicated by another fact. There is often mismatch between a manager’s department and the topics that are included in the portfolio he or she is assigned to. As such, a department manager often participates in portfolio meetings during which decisions are made that affect their colleague department managers. Because of these conflicts and the sensitivities, the managers are currently not inclined to take up the responsibility for the portfolio implementation.

Condition SP5-AF, sub-condition 2: the various parts of the organization are well involved during strategy formulation and implementation	V	3
	Z	3

At the highest level, the involvement of the civil service, the executive assembly and the general assembly is well organized for all phases of the strategy process. This is no surprise, as this is laid down in the laws and regulations.

Within the civil service itself, the topic of involvement is also very relevant and it affects the success of the strategy implementation. Involvement here helps get a good overview of all interests and information sources and this needed to make optimal choices. The majority of the interviewees indicated that this involvement has been improved over the past few years. Vechtstromen’s interviewees for example frequently mentioned how the internal stakeholders are better involved during projects for the construction or renovation of assets. In the past, the interests of the actual users of the assets were not properly considered during the project and expensive adjustments were needed to fix the shortcomings. Recently, this issue has improved. However, the collaboration within the civil service is not perfect due to the presence of organizational silos. This will be discussed with sub-condition CV2-AF.

4.3.1.6 Communication and documentation (item: SP6-AF)

Condition SP6-AF, sub-condition 1: the objectives, strategies, measures and plans are documented, formalized and explicitly linked with each other	V	2
	Z	2

The regional water authorities are public organizations with a formal planning & control cycle that face many laws and regulations. Because of this, there is a lot of documentation about the organizational objectives, strategies, measures and plans. Except from the fact that the links between the documents are not always exactly clear (due to the shortcomings that were mentioned before), no constraints were observed for this sub-condition.

Condition SP6-AF, sub-condition 2: the communication within the strategy process is clear, frequent, timely, accurate, and accessible	V	2
	Z	2

Like the previous sub-condition, the characteristics of the regional water authorities make that there is a lot of formal communication. However, a better frame of reference would positively affect this communication. This would help to remove some of the barriers between the organizational silos. Besides, it would provide more substantiation to the discussions and help to prevent that people talk past each other. The organizational silos will be further discussed with sub-condition CV2-AF.

4.3.2 Necessary conditions in the contextual variables

4.3.2.1 Human resources (item: CV1-AF)

Condition CV1-AF, sub-condition 1: the employees have the right competencies to execute the strategy process

V 3
Z 3

Within both organizations, the employees are generally real experts in their disciplines. They are well-skilled and have a lot of knowledge about their water system and wastewater treatment chain. Because of this, the regional water authorities have been able to successfully conduct the primary water management tasks for many years. The interviewees however agreed that, if their organization wants to improve itself and develop in fields such as AM, the employees' competencies must be further developed in the future.

Condition CV1-AF, sub-condition 2: the employees understand the strategy, the impact it has on their jobs and wat is expected from them

V 2
Z 2

In general, the employees of the authorities are passionate about and feel themselves responsible for the primary water management tasks. However, there are employees that are not fully aware of and understand the organizational objectives and strategies. The perception of these employees is that they can conduct the primary water management tasks without spending much time on studying the organization's objectives and strategies. The reasoning behind this is that the objectives and strategies are somewhat similar every year and are written down in documents that are too complex. As stated by an interviewee: "Some employees currently get lost within the numerous tables, numbers and abstract sentences".

To make the strategic objectives and strategies more attainable and relevant for employees, the regional water authorities have translated them into lower level team and department plans. Nevertheless, interviewees indicated that also the usage of these plans needs to be improved. Currently, these plans are not always used by the management to actively control their employees, they are not always actively adopted by every employee and they are not the guidelines that shape and form the basis of the employees' daily activities.

Condition CV1-AF, sub-condition 3: The strategy process is supported by good leadership

V 3
Z 3

Currently, both organizations are training their department managers and team managers to enable them to better manage the interrelations between organizational units. This will be further detailed out for sub-condition CV2-AF that discusses the organizational culture. Besides this, this study did show other noteworthy issues or difficulties regarding the leadership of the managing board, department managers or team managers.

4.3.2.2 Organizational culture (item: CV2-AF)

Condition CV2-AF, sub-condition 1: the strategy formulation and implementation together form one continuous intertwined process

V 3
Z 3

Within the organizations, the phases of strategy formulation and implementation are intertwined. Those people that define the objectives and strategies (governing bodies) are strongly supported by those that are responsible for the actual implementation (civil service). The strategy implementation is supervised and monitored by the governing bodies as they want to make sure that their intended course of direction is followed. Furthermore, the strategy formulation and implementation phases are both continuously conducted. It is not that they have a fixed sequence. The changing circumstances, the continuously flow of new demands and the continuous wear and tear of assets require the authorities to continuously adapt.

Condition CV2-AF, sub-condition 2: the organization is fully driven by the objectives and strategies

V 2
Z 2

Both authorities already conduct their primary water management tasks for numerous years and they have been quite successful in this. Furthermore, the civil servants are passionate about and committed to these primary water management tasks. However, there is room for

improvement in making the organizations more objective-driven. Due to the lack of a clear frame of frame of reference, the civil service and their decision makers regularly face difficulties when trying to aim their decisions at the intended course of direction. Besides, the objectives and strategies are currently not always well known by the employees.

On top of this, there is another issue. The organizations and their employees are not fully objective-driven. The focus is often skewed towards a limited set of performance measures: finance and planning. Some interviewees described this with an extreme example: “It is appreciated when I act quickly, vigorously decisively; according to the planning; and stay within the budget. However, it is often not questioned whether my actions are necessary and optimally contribute to the organization’s objectives”. As has been explained, this behavior is partly caused by absence of a clear strategic frame of reference. Interviewees however indicated that it is also caused by the attitudes of the governing bodies. The governing bodies are generally most interested in the planning and financial performance as these aspects are most visible for the external stakeholders and can simply be used by these stakeholders to judge their representatives. Besides, these aspects the most tangible objectives that can be checked and controlled relatively easy and can easily be used to promote successes.

Condition CV2-AF, sub-condition 3: the organization is continuously improving the management of physical assets	V	2
	Z	2

There are numerous situations in which the organizations evaluate the impact of their actions and the achievement of objectives. This is for example in the annual planning & control cycles in which they must justify how they have spent the public money and what objectives are achieved. Furthermore, also at lower abstraction levels, the organizations evaluate the results of the projects and line activities. However, the findings of these evaluations are not always captured as lesson learned and actively integrated in future activities to continuously improve.

The organizations do not have an organization-wide culture in which the PDCA cycle for continuous improvements is systematically applied. The focus is not evenly spread over the four phases. The focus is often primarily on the ‘*do’* phase and to a much smaller degree also the ‘*plan’* phase. The ‘*check’* and ‘*act’* phases are overshadowed. So, roughly stated, once for example a project is planned and executed, the focus often quickly shifts to a new project or activity. One of the main reasons is the heritage of the regional water authorities. The regional water authorities have a long history as execution organizations that had to constantly “fight” against the water. Moreover, this focus on the ‘*do’* phase still exists due to the constant urge of the representatives in governing bodies to do as much as possible within their parliamentary term. The third reason for the absence of a strong and continuous learning process is the primary focus on the financial performance and planning. With a strong focus accountability for value creation, the triggers to continuously learn and improve are smaller.

Condition CV2-AF, sub-condition 4: there is a shared understanding about strategic priorities and collaboration is used to reach strategic objectives	V	2
	Z	2

Although it differs per per activity and project; this study observed that both organizations face difficulties due to the existence of organizational silos. Because of these organizational silos, the organizational units and their employees is hindered. They do not always sufficiently focus on achieving the overarching organizational objectives and consider the interrelations and dependencies within the organization. Instead, units are often too focused on their own priorities. Some interviewees stated that there is sometimes the perception that certain employees “throw their outputs over the departmental wall and do not much care about the tasks of others”.

There are two main reasons for the existence of these organizational silos and these seem to be related with findings that were mentioned before. First of all, the various teams and departments mainly focus on their own tasks and objectives because this is mainly where they are mainly held accountable for. As stated, employees and their teams are mainly monitored based on whether they stay within the budget and work according to the planning. The second cause of organizational silos is the simple fact that the employees within both regional water authorities do not always have a full understanding about how their information and actions are relevant for others. It is not that all employees are unwilling to share information and

collaborate. However, employees regularly have an insufficient understanding about the processes and flows of information within their organization.

However, the presence of organizational silos has already received a lot of attention from the organizations and things have certainly improved over time. Within Vechtstromen for example, the situation is improving because the aftermath of the merge more and more disappears to the background. During the period directly after the merge, silos were created because the employees' responsibilities still had to be defined and the employees were positioning themselves. Now, many of the issues have been resolved and the authority is a more stable. Moreover, to fight the presence of these isolated organizational silos, both organizations have recognized that they should better inform the employees about the processes that run between the organizational units. As stated, Vechtstromen is tackling this problem somewhat more extensively and is paying a lot of attention to implementing process management.

Finally, both Vechtstromen and Zuiderzeeland are aiming to tackle the organizational silos by further developing their department managers. Both organizations move more responsibilities to the team managers in order to let the department managers act more on a strategical level. The department managers are made more jointly responsible and they also should feel themselves more responsible for the overall performance. The goal of this is to let the managers pay more attention to improving the relations between the departments and teams and stimulate the employees to adopt a more collaborative approach.

Condition CV2-AF, sub-condition 4: the organizations pay attention and acts based on information about expenditures, performances and risks

V 2
Z 2

The tactical-operational departments, especially for the wastewater treatment chain, use the information about expenditures, performances and risks to assess the state of the asset base. When looking across other parts of the organizations, the attention that is paid to these three aspects is more unevenly distributed. Previous discussions already addressed that the value creation is often overshadowed by the attention that is paid to finance and planning.

Because of their origin, the authorities used to be risk averse organizations. The organizations' employees are professionals and real craftsmen that want deliver products and services of the best quality. Actively taking and managing risks is not the nature of the beast. Risks used to be managed based on a reactive approach. However, this perspective has slowly been changing over the recent years as the authorities have been looking for ways to reduce the costs. Especially at the tactical-operational departments (mainly the wastewater treatment chain), risks are more and more pro-actively managed. As such, risk events are identified before they occur and adequate time is taken to assess which measures can best be executed. However, this development has not yet been fully embedded in cultures.

At the strategic level, the attention for pro-actively naming and managing risks is limited. There is no such method as the business value matrix that explicitly describes the existing and desired risk profiles for different business values. When risks are explicitly discussed, this is because of a legal obligation: to determine the capital requirements that should cover the costs if risks materialize (in Dutch: "weerstandsvermogen"). The organizations use a desk study and interviews to identify the main risks and to make an informed decision about how much financial reserves should be hold. However, the identified risks are often not explicitly and actively managed. Moreover, the risks are not derived from a systematic bottom-up translation of the risks that are observed at the asset level.

Condition CV2-AF, sub-condition 5: the organization manages it assets by considering all relevant asset life cycle phases

V 2
Z 2

Traditionally, life cycle thinking has not been embedded within the both organizations and their employees. This is because the focus within the regional water authorities lies on the '*do*' phase of the PDCA cycle. Because of their history and the criticality of the water management tasks, there is often a tendency within the authorities to mainly focus on here and now. There is often the tendency to spend less time on figuring out the consequences for future asset life cycle phases. As stated by an interviewee: "There is an organizational culture in which the employees want to roll up their sleeves and get to work. Many employees perceive that

nothing will happen when one extensively plans actions. According to them, the organization only starts doing things when the shovel is put the ground and the engineers physically work".

However, the above situation is slowly changing. To ensure that the strategy implementation is not only focused on short-term success and that money is spent in a socially responsible way, both organizations are more and more making decisions by considering the future asset life cycles phases. As discussed, this is for example done by considering the interests of future users of the asset. Furthermore, the organizations are more and more using systematic approaches to extensively compute and balance the trade-offs between future expenditures, performances and risks. Though, such approaches are currently applied somewhat incidentally, mainly for major projects that require large investments.

Additional cultural changes are needed to fully realize the benefits of these systematic approaches. The organizations currently mainly tend to use the analyses of the asset life cycles during the planning process when determining the optimum decision. The organizations pay less attention to this during later phases when the employees should in fact constantly monitor the data about the expenditures, performances and risks; storing these data; using these to conduct evaluations; and apply the new insights in future projects. Again, this is because the organizations tend to mainly focus on the *'plan'* and *'do'* phases.

In both organizations, the people that are responsible for managing the wastewater treatment chain are more experienced users of life cycle analyses compared to those that manage the water system. Because of the favorable asset characteristics, already more data is available about the life cycle phases of assets and predictions are easier to make.

Condition CV2-AF, sub-condition 6: The management of assets is based on optimizations at a system level	V	2
	Z	2

The management of assets within both organizations is increasingly systemized, standardized and controlled and coordinated from one central location. This has allowed the two organizations to manage the wastewater treatment chain and water system more at a system level instead of tackling each problem individually. As result, plans such as the annual implementation plan and multi-annual maintenance plan are made for entire asset systems. This has helped the organizations to prioritize the problems within the asset systems and has helped to optimize the operational activities.

However, these developments are not finished yet. The organizations' abilities to optimize the management of asset systems can still be improved. Currently, the civil services do critically reflect upon the states of the discrete assets, where the biggest problems are located and what actions must be performed. Though, the civil services do not always sufficiently take a step back and look to the overall value that should be created in system context. This system context is what actually matters and where the discrete assets yield their value. Currently, the organizations still too often focus primarily on the discrete assets. In the current situation for example, the civil services do decide to replace or renovate a certain weir that is located in a specific water system because of its bad condition. However, the civil services do not always sufficiently study alternative ways in which the water system as a whole could create the value. Alternatives are for example: change the characteristics of other weirs, start from scratch and reconfigure where the new weirs can best be located or change the land use.

There are multiple causes for these difficulties. Important reasons are the facts that the civil services do not have a clear and commonly shared frame of reference and systematic approach with which they can easily compare the trade-offs of plans and prioritize the plans. Furthermore, it is often difficult for the authorities to optimize their actions because they operate continuously (e.g. there is not always time) and because there is not always sufficient high-quality data and knowledge about the assets and the relations between them.

Finally, one remark should be made. The above text did not address difference between the wastewater treatment chain and water system. In fact, however, there are differences. In line with previous findings, one can state that conducting optimizations is currently easier and better manageable for the wastewater treatment chain compared to the water system. For the wastewater treatment chain, more is known about the assets, the interaction with the environment, the links between assets and the impact of human interventions.

4.3.2.3 Other organizational aspects (item: CV3-AF)

Condition CV3-AF, sub-condition 1: the management of physical assets is aligned with other management systems and policies	V 3 Z 3

As indicated before, the management of physical assets within the wastewater treatment chain and water system represents the core business for the primary water management tasks. So, the physical assets constitute the raison d'être of the regional water authority. Therefore, both organizations are organized in such a way that all other management systems and policies support and are aligned with the management of physical assets.

Condition CV3-AF, sub-condition 2: the strategy process is supported by the organizational structure	V 2 Z 2

The organizational structures of both authorities have been designed during the reorganizations after much and careful considerations based on several studies. However, previous findings have demonstrated that both civil services sometimes face difficulties because organizational units are often too much compartmentalized and isolated from the rest of the organization. Instead of changing the organizational structures, interviewees indicated that this problem should be solved in other ways. This could for example be done by better coordination in the chain of command (e.g. make department managers more jointly responsible) and the cross-functional collaboration by means of programs or portfolios.

4.3.3 Internal strategic alignment

Sections 4.3.3.1 and 4.3.3.2 will use the above findings to briefly discuss to which extent the two organizations successfully conduct the strategy formulation and implementation phases. As stated, these two indicators determine the extent of strategic alignment. Section 4.3.3.3 will summarize the major constraining factors that obstruct the organizations in meeting the necessary conditions for strategic alignment.

4.3.3.1 Successful formulation (ISA1-AF)

Within both organizations, the executive assembly is responsible for defining the objectives and strategies for the coming period. To help the governing bodies to make well informed decisions, the civil servants facilitate them with information about the conditions of the physical assets and recommendations about what objectives and strategies are desirable and realistic. However, this is not without any flaws. The civil servants cannot always provide complete overviews of expenditures, performances and risks of the asset systems and how this is impacted by new or alternative objectives and strategies. Furthermore, the objectives and strategies that are formulated in the water management plans and other related strategic plans do not always provide the sufficient guidelines during the phases of strategy implementation and strategy control. This has been framed as the absence of a clear strategic frame of reference. This one of the major constraints within both organizations and is the underlying cause of many other shortcomings within their internal alignments.

4.3.3.2 Successful implementation (ISA2-AF)

When being asked about the strategy implementation phase, many interviewees pointed about that their regional water authority is quite successful. After all, the authorities have been conducting the primary water management tasks already for a long period without any major disasters. Moreover, the physical assets are currently in a fair to good shape and the governing bodies are generally satisfied with the organization's performance. However, the same interviewees also agreed upon the fact that there is still much room for improvement. As also demonstrated in previous Sections, both organizations experience various difficulties in both the more hard and concrete conditions (e.g. asset data) and the soft and less visible conditions (the organizational culture). These will be listed below.

4.3.3.3 Major constraints in the internal strategic alignment

Based on the findings from previous Sections, Table 4 summarizes the 14 major constraining factors that obstruct the two organizations in meeting the necessary conditions for internal alignment in the management of assets. The constraining factors are the underlying dynamics

and main reasons why certain necessary conditions are not present yet. Section 4.4 will use Table 4 to identify how the organizations can improve their internal alignments.

In line with previous Sections, Table 4 shows that there are many similarities between the two organizations. Although the magnitudes and causes sometimes differ, both organizations experience many similar constraints. As explained before, this is for a large part caused by the similarities in the institutional contexts. The previous analyses also demonstrated the management of the water system and waste water treatment chain show many similarities, but that there are also some differences. As discussed, the constraints for the internal alignment are often (slightly) smaller for the management of the wastewater treatment chain. This is because of the more favorable asset characteristics and the fact that they are more experienced in using a rationally data-driven planning process (see Section 4.1).

Nr.	Cases	Major constraints in the internal strategic alignment for the management of assets
1	Both	The existing strategic plans do not always offer a clear and indisputable frame of reference of the organization's value system
2	Both	Although much effort is put into improving the situation, both organizations still face difficulties because there is not always high-quality asset data available (especially in case of the water system) and because the agreements and responsibilities regarding information management are not always clearly defined.
3	Both	The organizations are not always able to explicitly relate the functional requirements of the assets, measurements and inspections, risks of asset failures and added value planned interventions (especially regular operations and maintenance) with the organizational objectives and the organization's value system.
4	Both	The organizations are not always able to apply a systematic, integral, unbiased, evidence-based and transparent planning process during the strategy implementation.
5	Both	The decision makers do not always have full grip on their organization with regard to the management of physical assets. They do not always have full insights into the strategic decisions they could make (in Dutch: "het is niet duidelijk aan welke knoppen ik kan draaien") and what the consequences of these decisions are.
6	Both	During the planning & control cycle and in the interplay between the governing bodies and civil service, the focus often lies too much on whether the organization's actions are executed as promised (on time) and within the budget.
7	Vechtstromen	The existing configuration of program management is complex and therefore difficult to understand for regular employees. Besides, the distinction between the two coordinators of the programs water system and wastewater treatment chain and the regular command is not ideal in the light of integral decision-making and portfolio management.
8	Zuiderzeeland	The responsibilities of the department managers for the horizontal coordination are not always clearly defined and followed. As result, the managers do not always sufficiently act a strategical level and manage organization-wide strategy implementation and the coherence between departments.
9	Both	Several groups of employees do not fully understand the bigger picture in which they operate. These employees do not fully understand how the organizational objectives and strategies affect their jobs, how they are positioned within the various processes, what is exactly expected from them (roles and responsibilities) and how they relate to other colleagues, teams and departments.
10	Both	Organizational silos regularly obstruct the cross-functional collaboration and the quest of finding solutions that are acceptable for everyone.
11	Both	Risk management, especially in case of the water system, is currently not systematically incorporated in all organizational levels and all organization's decisions.
12	Both	Life cycle approaches and system optimizations are currently not systematically incorporated in all planning processes.
13	Both	The organizational culture does not strongly focus on continuous improvements. The focus during the PDCA cycle is still mainly on the *'do'* phase.

Table 4 Major constraints in the internal strategic alignment for the management of assets. This is a summary of the findings of Sections 4.3.1 4.3.2.

4.4 Improving the existing internal strategic alignment

This Section discusses what the two regional water authorities could do to improve their internal alignments in the management of assets (sub-question 4). More specific, this Section proposes 4 main pillars of solutions that can tackle the major constraining factors of Table 4.

One may argue that the organizations could simply implement AM to improve the internal alignments. The interviewees however stressed out that it is not an option for their organizations to strictly apply the concept of AM and do this within a short time period. It could result in unnecessary large organizational changes that require a lot of time and resources. Moreover, it could evoke anxiety and harm the existing well-functioning parts. Both authorities therefore aim to follow a problem based change process with small consecutive steps. This is taken into account for this Section. This Section discusses what the organizations could do to mitigate those problems that are most serious (i.e. the major constraining factors). Many of these solutions were proposed by the interviewees themselves or were discussed with them.

In the text below, each main pillar of solutions is discussed in separate Section. The focus is always on the general outline of the solutions (i.e. focus on the end result). It is up to the organizations to focus more on "how" these solutions should be executed and write this down in a more detailed action plans. In these next Sections, the text includes references (numbers in between the brackets, so for example **[X]**) to numbering of Table 4. In this way, one can see what constraining factors are discussed.

4.4.1 Developing the organizational culture

There are many constraining factors within the two organizations that require visible and specific solutions (changing the existing process model). These solutions will be discussed in subsequent Sections. However, implementing these solutions is often not enough. There is also a need to change the less visible and tangible aspects: the cultural values of the organization. This study recommends the organizations to focus on changing 7 cultural values. Top management and the governing bodies play a key role in this. They should for example act as role models, frequently communicate their vision, provide the necessary resources and time (e.g. for training and internal meetings) and fix the right preconditions (e.g. provide the right tools a techniques). The change process will be discussed in Chapter 5.

A more objective- and value-driven organizational culture

First of all, the organizations could develop a more objective- and value-driven organizational culture. This should help to prevent that employees act within their organizational silos based on their engineering (e.g. tendency for risk aversion) and asset focused perspective (i.e. a focus on discrete assets; this while value is created in a system context). The cultural change makes the employees more goal-oriented and it points everyone in the same direction **[9]**. Besides, it would help to ensure that the individual decisions at the level of assets create maximum value (per invested euro) in the wider system context. Finally, the emphasis on value creation could help to further clarify that regular management and maintenance activities are not just obliged cost centers. Just like largescale projects, these are profit centers that help to create value **[3]**.

A more collaborative organizational culture with shared priorities

In line with the above cultural value, this study recommends both organizations to fight the existence of organizational silos **[10]**. After all, as stated in the literature study, internal alignment requires a collaborative organizational culture in which organizational units share similar priorities. The managers should initiate this cultural change.
The managers should look more beyond the borders of their own organizational unit, search for integrality and promote this approach collaborative towards their employees. Both organizations are already making steps in this as they are training their managers to think more strategically and about the overall interests of the organization.

Focus on outcomes instead of input, processes and output measures

In accordance with the previous points, the organizations are advised to create a culture that focus more on monitoring and controlling the outcomes of the organization's actions (i.e. the

value creation). Currently, the focus within the planning & control cycle is often too much skewed towards the planning and financial performance (the input, process and output measures of the organization's actions) [6]. However, to conduct this change, the problem needs to be tackled at its roots: the control that is exercised by the governing bodies (see the text below). As stated, their way of controlling affects the behaviors of the civil servants.

Professionalize the interplay between the governing bodies and civil service

In addition to the previous point, this study recommends the organizations to continue their efforts to professionalize the interplay between the governing bodies and civil services. Instead of contracting (and restricting) a civil service on the efforts that have to be made, the agreements with a civil service should focus more on the values that should be created [6]. The governing bodies can then act on a higher strategical level and control the outcomes of the organization's actions. As such, a civil service gets the freedom it needs to conduct portfolio management and search for ways to create maximum value. Nevertheless, this distinction between the responsibilities should not be perceived too rigidly. The governing bodies always have the power to overrule the civil service.

Incorporate risk management across the entire organization

Furthermore, this study recommends incorporating risk management within all organizational levels. Only then, one can make sure that the decisions regarding the operational management of assets (this often requires considerations regarding risks, e.g. allowing certain risks to increase) align and are linked with the risk appetite and demands (e.g. reducing certain budgets) of the strategical decision makers [11]. Apart from smart methodologies, tools and software; this also requires that risk management is embedded within the organizational culture. In case of the regional water authorities, this could be a challenge and probably requires a growth process. After all, the people and decision makers working for the authorities are generally passionate about their water management tasks and currently often prefer to avoid any kind of risks.

Optimizations over asset life cycles and asset systems

As advocated in Section 2.3.2.2, internal alignment in the management of assets requires a culture in which life cycle thinking and system thinking are embedded. Previous results however demonstrated that this is not yet the case for the two regional water authorities [12]. This study therefore recommends the two authorities to look for ways to improve this.

Continuously learning and improving

Finally, this study recommends the two organizations to develop their organizational cultures in such a way that continuously learning and improving becomes a more common practice. As concluded in Section, this is currently not always the case. This is because there is often the tendency to primarily focus on the *'do'* phase of the PDCA cycle [13] and because the outcomes of the organization's actions are not always well monitored and controlled.

Summary

All in all, this study recommends the two regional water authorities to develop their cultures in 7 dimensions. However, writing these recommendations is easier said than done. As already stated in the literature study, changing this human element is a daunting task and requires a growth process over a sustained period (FHWA, 2007). In case of the regional water authorities, changing the organizational culture can especially be difficult because of the long heritage. They are oldest institutions in the Dutch state order and the cultural values are deeply embedded within their DNA. Furthermore, the political climate at the governing bodies could make it difficult to change the organizational culture.

4.4.2 A strategic frame of reference that is related to lower levels

Strategic frame of reference

Strategical plans with clearly formulated objectives and strategies ideally form the basis of the internal alignment. However, as discussed, the authorities' existing water management plans

and other related plans do not always fulfill this role. This constitutes one of the most important constraining factors within both organizations **[1]**. This study therefore also recommends them to improve this. Within both organizations, there is a need for a strategic frame of reference. This should provide a clear overview of the value systems regarding the water system and wastewater treatment chain. Such an overview should contain SMART formulated objectives and objective and quantitative performance indicators that address on the intended outcomes of the organization's actions. However, as admitted before, creating such a framework can be difficult for the authorities, especially for the water systems.

As discussed in Section 4.3, a clearer strategic frame of reference is needed to provide a better rationale for the civil services. They need this to assess, prioritize and monitor the asset conditions, performances and asset interventions **[4]**. From the other side, it is also needed to provide better guidelines for the MTs, managing boards and governing bodies to control their civil services **[5]**. Parallel to this, a clearer frame of reference is also needed in the light of the above cultural changes. After all, developing a value-focused culture is only possible when there is a clear description of the organization's value system **[9]**. Moreover, improved strategic plans are needed to align the organizational units and create a shared view about the balance between expenditures, performances and risks **[10, 11]**. Finally, these changes should also help to shift the focus more towards the outcomes of the organization's actions and to professionalize the relation between the governing bodies and the civil services **[6]**.

This study recommends the organizations to look into the possibilities of using a business value matrix. As stated in Section 2.2.1.3, this matrix can help to concretize the organization's value system and meets the above criteria. It is a tool that stimulates an organization to focus on identifying the core business values. It helps to describe how these values are defined and measured, how this translates in the organization's risk appetite, what the minimum and maximum goals are and how the various values compare to each other. Because the water system and wastewater treatment chain fulfill different tasks and involve different magnitudes of risks, the organizations could choose to define two separate business value matrices. Just like the existing strategic plans, these matrices should be based on the interests of the external stakeholders. After all, value is created if the interests of the stakeholders are served.

The business value matrix can best be incorporated within existing strategical plans such as the water management plan (e.g. as appendix). Because the governing bodies have to approve these plans, they can show their commitment and the matrix gets an official status. Nevertheless, the purpose of the matrix should not be to frame and restrict the political climate within the governing bodies. It should mainly function as an agreement and point of reference between the civil service and the governing bodies. The civil services and governing bodies can use the matrix in the communication when discussing the current states of the assets, the added value of proposals and the impact of the past organization's actions. At the higher abstraction level, the governing bodies than still have the freedom to discuss, formulate and monitor their political-administrative goals in their own way.

Finally, instead of starting from scratch, Vechtstromen and Zuiderzeeland are recommended to take advantage of already existing business value matrices from other regional water authorities. After all, the Dutch regional water authorities have similar water management tasks and in general, at the highest abstraction level, have similar business values. Vechtstromen and Zuiderzeeland could therefore choose to copy an existing matrix and conduct adjustments based on their needs and own perceptions (i.e. different scaling and prioritization of the business values). This method could help them to save a lot of time and resources that would normally be used to for the creation of the business value matrix. Nevertheless, as will be discussed in Chapter 5, such an acceleration is only possible when employees and decision makers improve their feeling with the concept of AM.

Cascading the strategic frame of reference to lower levels

When the above recommendation is followed, the strategic frame of reference as defined with the business value matrix describes what the authorities want to achieve at the highest strategical level. However, internal alignment requires that these strategic plans are linked with lower levels. The organizations are recommended to do this along multiple "dimensions". They could cascade the strategic objectives along for example the chain of command (e.g. linking the team, department and organizational plans), the policies and performance

measures that are used at lower levels (e.g. linking the operational risk matrices with the business value matrix), the processes (i.e. to see how each process contributes), the activities that are executed in the field (e.g. to see the added value of each project) and the hierarchy within the asset systems (e.g. to see the relations between assets, sub-systems and the entire asset base). Two visualizations of this are shown in Figure 13 and Figure 14.

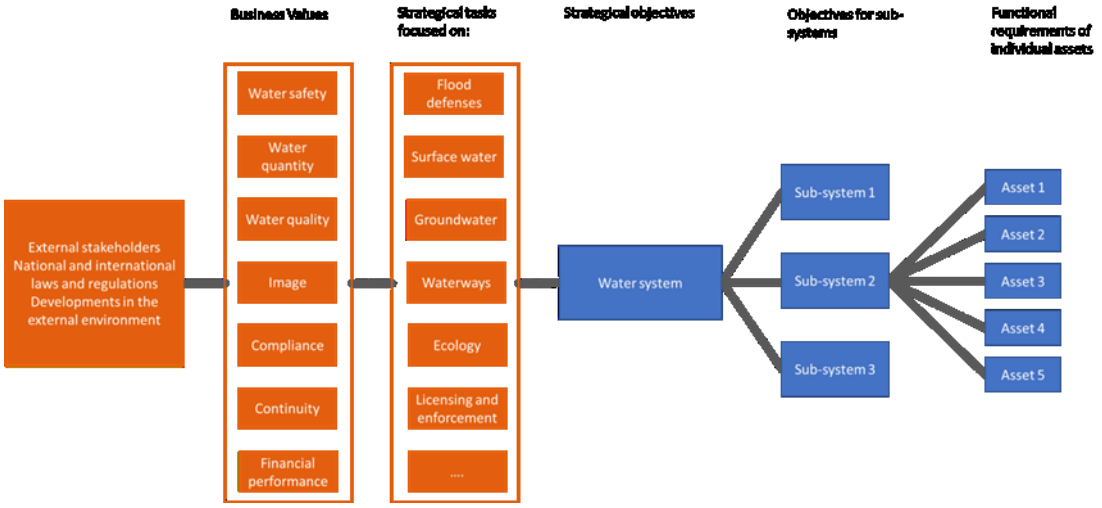

Figure 13 Visualization of the how the business values of the regional water authorities could be related to the functional requirements of individual assets

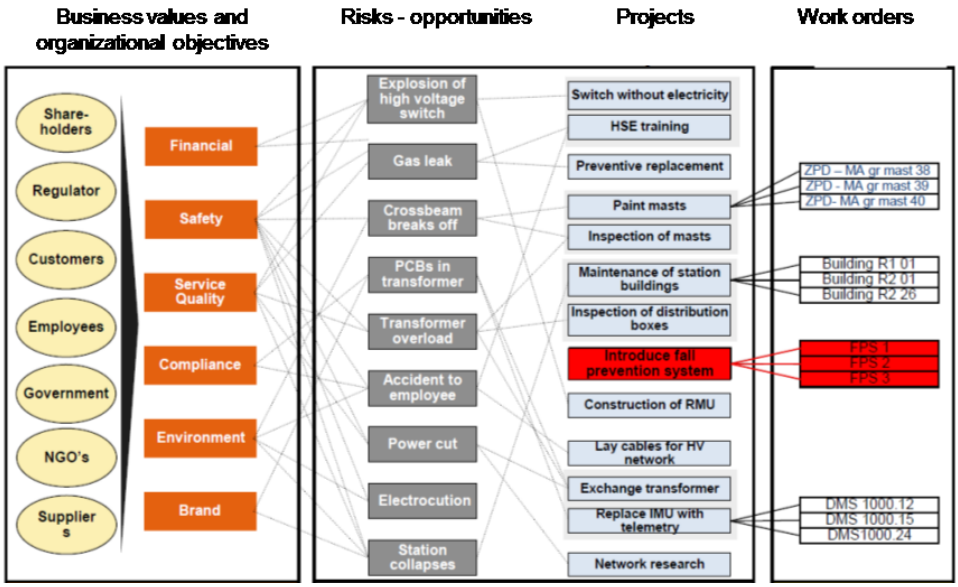

Figure 14 Visualization of the how the business values could be related to risks and opportunities, projects and work orders that are based on these projects. This is an example of a utilities company (Hartsema, 2015).

Although the organizations already started to conduct these above actions, there much room for improvement. This study therefore also recommends both organizations to continue with their existing efforts. This should help them to further clarify how functional requirements of the assets, measurements and inspections, risks of asset failures and added value interventions are related with the organization's value system. As stated, this is currently one of the major constraining factors within both organizations **[3]**. Besides, by streamlining the flows of information (i.e. real-time dash boards), the authorities can ensure that there is a top-down and bottom-up relation between the strategical plans and the rest of the organization. In this way, the decision makers can get a better grip on their organization and make sure that the organization aims at the right targets **[5]**. Finally the above actions could make the strategical objectives more attainable for employees. As stated, this is currently still an issue as not all employees have a good understanding about how they should contribute to the strategical objectives and strategies **[9]**.

4.4.3 Clarifying and improving the organization's processes and roles

The third pillar of solutions focusses on the processes and roles within Vechtstromen and Zuiderzeeland. These solutions could help to tackle several major constraining factors.

Providing clarity towards employees and fighting organizational silos

As also proposed by the interviewees themselves, the organizations could improve their overviews of the processes, roles and responsibilities and better inform the employees about this. This should give the employees a better understanding about how they are positioned within their organization and what is expected from them **[9]**.

The processes could at the same time also be used to fight the organizational silos that currently exist within the civil services **[10]**. The processes could give the employees a better understanding about how they are related to their colleagues, teams and departments. Besides, as also indicated by numerous interviewees (especially those from Vechtstromen), it would also help to control the civil services in a somewhat different way. Instead of focusing on the organizational chart and the isolated organizational units; the civil services may better be organized based on the processes that right run through organization. As proposed before, this requires that managers look beyond their own departmental walls and search for alignment with other units. As stated by an interviewee: "With organizational silos, employees only focus on their own isolated tasks, because that is where they are held accountable for. To prevent this, the managers should steer their employees more based on the processes and their inputs and outputs".

The organizations themselves should determine how and how far they want to improve their existing process models. As stated, Vechtstromen seems to more progressive in this. Nevertheless, for both authorities, it should be the intentions (e.g. just to inform people or to more strictly apply process models) that determine what kind of methodology (e.g. a RASCI matrix with new roles such as process owners etc.) and level of detail (e.g. the details of the input, output, steps and responsibilities) are used.

Improving the organizations' processes

As stressed out by the interviewees, the two organizations do not want to conduct significant changes within their process/operating models. They want to avoid changes in the organizational structures. The organizations are well operated and they already have spent lot of time during the most recent period (e.g. after the merge) on improving this even further. Nonetheless, this study recommends both organizations to critically evaluate the existing processes and, if necessary, conduct certain adjustments (e.g. based on a step-by-step growth process). To tackle some major constraints, the two regional water authorities should focus their future improvements on the following aspects

- The processes should enable the civil services to conduct their tasks in a more systematic, integral, unbiased, evidence-based and transparent way.
- The processes should to get full insights into how the strategical objectives are related with the functional requirements of assets, the results of measurements and inspections, the risks of asset failures and the outcomes of interventions.
- There is a need to incorporate risk management, life cycle approaches and system optimizations in to the processes
- The processes should allow the organizations to continuously learn and improve.
- The adjustments should help to pro-actively create and maintain a balance between the expenditures, performances and risks of the assets (measured of the life cycles) at all organizational levels. The decision makers than become able to make well-informed and well-considered decisions regarding the management of assets.

This study does not focus on the details about what and how existing processes should be adjusted. Nevertheless, looking to the above criteria, it would probably be useful for the organizations to adopt the mindset and some of the tools, techniques of AM. One could think of the AM process model (discussed in the next paragraph), the business value matrix, the underlying operational risk matrices and risk registers. As addition to this, several existing AM guidelines offer standardized (step-by-step) templates and methodologies that can be used by

employees to justify their plans and decisions in a uniform and transparent way (e.g. STOWA & Stichting RIONED, 2015). The templates for example require that one explicitly documents: (1) the relevant organizational objectives; (2) the existing and future asset performances; (3) the risks; (4) the alternative interventions; and (5) a prioritization of the interventions.

When conducting these above adjustments, the organizations would probably have to split their processes at a certain point. This could make a distinction between low and high-impact decisions (e.g. based on the value of the monetarized risks). It is not likely that small low-impact decisions walk through the same advanced and long processes that are needed for high impact decisions that involve high risks.

Applying the line of reasoning behind the AM roles

In addition to the previous paragraph, this study recommends both organizations to consider using the AM roles when improving their process models. However, as somewhat stated before, it is not likely that these AM roles will be strictly applied in the short-term. The organizations want to, at least for now, avoid far reaching organizational changes. This study therefore recommends both organizations to use AM roles more as a point of reference. They could study the line of reasoning behind the AM roles, select those parts that are most useful and embed this within the existing roles and processes. The text below will discuss this briefly.

1) Asset owner and asset manager

As discussed above, this study recommends both Vechtstromen and Zuiderzeeland to continue with their efforts to professionalize the interplay between the governing bodies and civil services **[6]**. Instead of focusing on the efforts that should be made, the agreements between the governing bodies and civil service should focus more on the intended outcomes of the organization's actions. A similar approach is followed in the collaboration between the roles of asset owner and asset manager. After all, it is the task of the asset owner to define, monitor and control the overall balance between expenditures, performances and risks. It is up to the asset manager to translate this balance into a portfolio of interventions.

Within both regional water authorities, the general assembly is the true asset owner. The members in this assembly are ultimately accountable, set out the authorities' course of direction and have the final say in the decision-making process. The executive assembly's members are the representatives of this general assembly and take over the role of asset owner for the day-to-day issues and concerns. The role of asset managers is located within the civil services of the organizations (the exact location is discussed in the next part).

All in all, the roles of asset owner and asset manager can offer some guidelines for the two organizations to improve the interaction between the governing bodies and the civil services.

2) *Civil service of Vechtstromen: asset manager and service provider*

This study recommends to Vechtstromen to consider the possibility of using the line of reasoning behind the roles of asset manager and service provider within their civil service.

For Vechtstromen, the main added value would be in improving program management and its relation to chain of command **[7]**. As stated in Section 4.3, the current distinction between the two program coordinators (for the programs water system and wastewater treatment chain) and the chain of command is, at least from a theoretical perspective, not ideal. A distinction is made in the responsibilities for OPEX and two types of CAPEX. Vechtstromen could solve this by creating the role of asset manager. The asset manager designs a portfolio of interventions with an optimum balance between expenditures, performances and risks. He/she makes sure that this balance is also kept in sight during the implementation phase. When doing this, the asset manager is open minded and uses the whole palette of alternative interventions to find the optimum portfolio. In other words, there are no preferences that steer the decision-making process to a sub-optimum solutions. Instead of thinking in terms of separate budgets for maintenance, replacements and construction of new assets; the asset manager focusses on overall budget for all life cycle costs.

Ideally, appointing such an asset manager would go hand in hand with appointing internal service providers. These roles would help to further clarify the internal relations with the civil

service. It would clarify that many departments, teams and their employees are to a certain degree service providers. They should contribute to and support (e.g. with expert judgements, or the actual execution of physical actions) their asset manager's. It is the task of the asset manager to make sure that the service providers align and contribute to the balance between expenditures, performances and risks. In other words, a kind of matrix organization could be created in which the asset manager operates cross-functionally and makes agreements with the departments and teams about the services they should be deliver.

However, as stated above, it is not likely that this above situation will be created in the near future. It would require some significant organizational changes that may affect well-function parts of the organizations. Furthermore, one has to deal with some sensitive issues. In an extreme form, it would for example mean that certain powers are taken away from the department and team managers and moved towards the asset manager. Furthermore, using these AM roles can be quite difficult as the distinction between operational, tactical and strategical planning is embedded within two directions of the organizational chart.

Therefore, this Thesis recommends Vechtstromen to study in-depth how and to what extent the AM roles could be embedded within the civil service. A first improvement may be to keep the responsibilities for the ongoing business exploitation in the regular chain of command, but to reshuffle the responsibilities of the two program coordinators. Instead of making a distinction between development investments and investments for the management of the existing asset base, the distinction can better be based on two programs. This would mean that there is one coordinator that manages the investments in the water system and one coordinator that does this for the wastewater treatment chain.

As concluded in Section 4.3, the existing lines of authority within Vechtstromen's civil service are quite complex. Vechtstromen could study whether, on top of the above proposal, additional changes are required to make it program management easier to understand for employees. A solution could be to unravel the reporting lines and place the program coordinators higher in the organizational chart.

3) *Civil service Zuiderzeeland: asset manager and service provider*

Likewise, also Zuiderzeeland could improve the internal operations within its civil service by using the roles of asset manager and service provider. The benefits of the two roles that were mentioned in case of Vechtstromen, to a certain extent also apply to Zuiderzeeland.

The main added value for Zuiderzeeland however lies in the horizontal coordination. As stated in Section 4.3, Zuiderzeeland does not apply program management. Furthermore, the department managers are currently not always able to manage the coherence between the various departments during the strategy implementation **[8]**. An asset manager could fill in this gap, coordinate the strategy implementation and make sure that all relevant service providers align and contribute to the organizational objectives. Just like Vechtstromen, Zuiderzeeland could choose to link these asset managers to the various programs they use.

This study recommends Zuiderzeeland to further study how they could best adopt the line of reasoning behind the AM roles and at the same time avoid large organizational changes. Because Zuiderzeeland already made the choice to not apply program management, it is not likely that they will strictly apply the AM roles.

4.4.4 Data and information management

The previous solutions already touched upon the need to improve information management. For example: (1) streamlining the data flows helps to connect the strategical objectives and lower levels, (2) data to measure the outcomes of the organization's actions and (3) data to pro-actively manage risks. Here however, it is framed as a separate pillar of solutions.

As stated in Section 4.3, the two authorities still too often face difficulties due to a shortage of high-quality asset data **[2]**. Especially in case of the water systems, the static and dynamic asset data are not always complete and up to date. Nonetheless, the shortage of high-quality asset data is often not a standalone problem. Problems regarding information management are also often caused by a lack of clarity about the responsibilities and agreements for information management. The organizations themselves have already acknowledged these above problems and they have initialized various improvement projects and pilots.

As proper information management is essential for effective and efficient management of asset, this study recommends both authorities to continue their efforts and maybe even intensify them. It is important that the topic is high on everyone's agendas and that everyone realizes that robust and accessible asset data is the essential for internal alignment.

To organize and structure their information management, the organizations can best apply a backward approach. Roughly stated, the organizations should link their data needs with the overall goal to create value for the stakeholders. In other words: the purpose is to create value – the organizations need to have strategies and plans to do this – these can only be made with the right processes and decisions – these have certain inputs and outputs of information – and to facilitate this, the organizations need certain data. By following this line of reasoning, the organizations can make sure that the right data is gathered with the right characteristics and that the costs of collecting the data do not exceed the benefits.

4.5 Conclusion

Sub-question 3: How do the necessary conditions for the internal strategic alignment in the management of physical assets manifest themselves in organizations?

For both regional water authorities, this Chapter concluded that the ideal state of internal strategic alignment is not yet reached. This is because not all necessary conditions for internal alignment are fully present. In total, this Chapter identified 13 major constraining factors that obstruct the two organizations in meeting the necessary conditions (Table 4, p.54). The constraints are quite similar for two regional water authorities. This is caused by the similarities in the institutional contexts. This study also looked into the differences between the water systems and the wastewater treatment chains. Again, many similarities were found. However, the study also revealed the management of wastewater treatment chain is often somewhat more advanced and the constraints are therefore sometimes less serious.

Sub-question 4: How could an organization develop the necessary conditions for the internal strategic alignment in the management of physical assets if they are not present?

For the two cases, this Chapter proposed 4 main pillars of solutions. The solutions can be executed by the two organizations to tackle the major constraining factors and to further develop the conditions that are necessary for internal strategic alignment in the management of assets. In summary, there are the following recommendations.

1. The organizations should develop their cultures in such a way that they:
    a. Become objective- and value-driven
    b. create shared priorities and promote collaboration between different units
    c. Focus on outcomes instead of input, processes and output measures
    d. Professionalize the interplay between the governing bodies and civil service
    e. Incorporate risk management across all units and levels
    f. Conduct optimizations over asset life cycles and asset systems
    g. Continuously learn and improve
2. The organizations should improve their strategical plans and convert them in clearer and more indisputable strategic frame of references. A business value matrix could help in this. Furthermore, the organizations could cascade these new strategic frame of references towards lower levels and create top-down and bottom-up relations.
3. This study recommends both organizations to:
    a. Improve their definitions of the process and roles and to inform the employees about this. Besides, the processes could be used to fight the existence of organizational silos
    b. Improve their processes in several areas (see p. 59). One of the goals should be create a more systematic, integral, unbiased, evidence-based and transparent planning process.
    c. Apply the line of reasoning behind the AM roles within their own operations
4. This study recommends both regional water authorities to continue focusing a significant amount of their attention on improving information management

5 INTERNAL ALIGNMENT IN THE DEPLOYMENT OF ASSET MANAGEMENT

In the past, the two regional water authorities already evaluated their internal alignments in the management of assets. Although their studies were not as extensive as the one of Chapter 4, they already did find some areas for improvement. This formed the trigger for them to start deploying the principles of AM within the existing operations. The authorities have recently formulated their change strategies and the actual implementation has just been started.

This Chapter will discuss how these AM deployments of the authorities look like and it will determine how the internal alignments in this are configured. It is important to stress out that this Chapter will study the **current situation**. The solutions that are proposed by Chapter 4 to improve the internal alignment in the management of assets are not yet adopted by the authorities. They can therefore be neglected when reading this Chapter. Roughly stated, Chapter 5 will start from zero and focusses on the here and now of the AM deployments.

Section 5.1 will study how the necessary conditions for alignment in the AM deployment manifest themselves within the two organizations (sub-question 5). Section 5.2 will describe how the organizations can develop those conditions that are not present yet (sub-question 6). Finally, Section 5.3 will describe the conclusions of this Chapter.

5.1 The existing internal strategic alignments

Table 2 (p. 30) mentioned the conditions that are necessary to reach strategic alignment in the AM deployment. This Section will discuss how these conditions manifest themselves within the two cases (sub-question 5). Just like as was done in Chapter 4 this Section consists 3 parts. Sections 5.1.1 and 5.1.2 will discuss the necessary conditions in respectively the strategy process and the contextual variables. Again, the traffic light indication uses the colors (1) red, (2) orange and (3) green to give a quick impression about whether the conditions are respectively not till minimally present, moderately present and almost fully till fully present. Section 5.1.3 will summarize the major constraining factors (with Table 5) and describe to what extent the organizations have reached a strategic alignment in their AM deployments.

5.1.1 Necessary conditions in the OF strategy process

5.1.1.1 Objectives and strategies (item: SP1-OF)

Condition SP1-OF, sub-condition 1: the objectives and strategies are clear, understandable and can be used as a frame of reference by others	V 2 Z 2

The water management plans of both organizations frame the AM deployment as a strategy that should lead to a more effective and efficient management of assets. Both organizations have strategic documents that are approved by the decision makers and that describe the AM deployment strategies in more detail. The three key premises of these strategies are:

1. The organizations ultimately aim to deploy AM for both the water system and wastewater treatment chain. However, the attention that is paid two these two asset systems is not evenly distributed. Just like many other regional water authorities, the efforts are predominantly focused on the wastewater treatment chain and the pumping stations of the water system in this). Quick wins can be achieved sooner within the wastewater treatment chain. This is because of the favorable asset characteristics and the fact that there is already more experience with some elements of AM.
2. In line with this study, the two deployment strategies frame AM as an interdisciplinary and holistic concept that covers multiple organizational levels and functional groups. Looking to the strategical documents however, there are differences between the two authorities. Zuiderzeeland only included the deployment of AM as a strategy within its programs that focus on the water system and the wastewater treatment chain. To point out that the AM deployment is an organization-wide change, Vechtstromen has also included it within the more general program: governance and organizing (see Section 4.2.2).
3. The organizations stress out that deployment of AM is not a goal in itself, but just a means to improve the management of physical assets. There is no need to fully deploy AM as many principles of AM are already adopted by the organizations. Besides, the existing

operations are have proven to be successful over a long time and are tailored to the water management tasks. Because of this, the authorities are aiming to embed AM within their existing operations and follow an iterative (i.e. small consecutive steps that are constantly evaluated) and problem-based (i.e. only conduct steps that directly fulfill the existing needs) approach in this. This growth process should also help to prevent that the organizations get lost in the complexities and the holistic characteristics of AM.

Several interviewees indicated that these deployment strategies need some further clarification. Their first and main argument is there is still some lack of clarity about what AM is. Moreover, especially within Vechtstromen, the interviewees pointed out that the existing vision on AM should be more clarified and translated into more SMART formulated objectives. According to them, this would give employees a clearer point on the horizon. Besides, it would clarify what organizational changes are expected, clarify what period and resources are needed, and provide a reference point for the iterative short-term step. Besides, as stated by an interviewee: “It would help to formulate some milestones in the change process as a AM deployment without objectives is too noncommittal”. However, this point of view was also criticized by some other interviewees. According to them, the organization should deliberately leave some room for further elaboration. The final outcomes of the AM deployment are currently not known and should be figured out during the iterative approach.

Condition SP1-OF, sub-condition 2: the consequences of the formulated objectives and strategies (on the internal organization) are known	V	2
	Z	2

There is a consensus within both organizations about the fact that AM can help to improve the existing operations. Nonetheless, this consensus has its limitations. Within both organizations, the knowledge about AM is mainly in the hands of a few experts that also took the lead in the initiation of the AM deployment. The other employees and decision makers however have often heard from AM, they often do not have a good understanding about what AM exactly is. AM is container concept (in Dutch: “container begrip”) as it has multiple different meanings amongst employees. The definition that is followed by this research deviates from the perceptions that many employees have. Many employees still perceive AM as a measure for tactical and operational planning to reduce the costs of operations and maintenance. As such, AM is not perceived as a holistic and interdisciplinary concept that helps to create more value with the assets. Besides this, there is currently no shared understanding about how AM compares to the existing organization and the desired AM maturity level. As such, there is a lack of clarity about which organizational changes are needed and how much time and resources this requires. This lack of a shared understanding is one of the reasons why the AM deployments are currently slowed down. Within both organizations, it is not possible to accelerate the change process because some people would become anxious and drop out.

However, there are differences between the waste water treatment chain and the water system. Those responsible for managing the wastewater treatment chain generally have more knowledge about and experience with the principles of AM. This is because they are more accustomed with some elements of AM. Moreover, for many employees, the way of thinking of AM also seems to be less logical and clear for the assets within the water system. As stated by an interviewee: “It is simply more difficult for employees to perceive the water system’s partially natural elements (e.g. the natural streams) as part of the organization’s assets that create value and that can be managed with a scientific, commercial and data-driven approach.

Based on this above line of reasoning, several interviewees concluded that the past decision to start deploying AM was not perfectly well considered. The decision makers had a limited knowledge about AM could not well oversee the consequences of the decision. Interviewees this illustrated with statements like: “the required change process has been underestimated”; “the decision to deploy AM might have been too rash” and “the decision makers did not exactly know what they agreed upon”. These statements somewhat indicate that the decision to deploy AM was strongly driven by the desire to deploy AM. However, it seems that it was not per se based on a good and shared understanding about the impact of the AM deployment. The above description exaggerates the situations and mainly refers to past. Nonetheless, it demonstrates that this sub-condition was and is still not fully present within the two authorities.

Condition SP1-OF, sub-condition 3: the objectives and strategies are translated into relevant short-term goals	V 2 Z 2

As stated, both organizations are following an iterative approach for which the ultimate objective is not yet clearly specified. As such, there are also no short-term objectives that are explicitly derived from the long-term objectives. Nevertheless, the next sub-condition will demonstrate that the two organizations do they already execute several initiatives. However, it is not always explicitly clear to what extent these contributes to the long-term objectives.

5.1.1.2 Translation towards plans (item: SP2-OF)

Condition SP2-OF, sub-condition 1: the objectives and strategies are translated in a coherent set of plans	V 2 Z 2

Both organizations do not yet have a clear action plan that provides an overview of the necessary measures and how these contribute to the objectives of the AM deployment. Nevertheless, the two organizations do not sit still. To already improve the management of assets, both organizations plan and execute some initiatives. These are often necessary building blocks of AM that should be implemented anyway as they are not dependent on the exact content of the action plan. The organizations are for example updating their asset inventories; implementing models and software packages to store this data and translate it into operational plans (e.g. LTAP and software packages such as Stream+, Optimizer+, Maximo and Gisratio); and improving the policies and reference levels that are used for the assessments of assets. However, these existing initiatives are often loosely connected and emerge bottom up. Because of this, the coherence between the initiatives is not always clear and the link with the overarching deployment strategy is often more implicit than explicit.

The existing initiatives have helped to deploy AM bottom-up and the result is that AM has already acquired a strong foothold within the organizations. As also observed by Wijnia & Herder (2010), AM was adopted in the maintenance and operations by focusing on the availability and reliability of assets and limiting the operational costs. With the recent movement to the more tactical planning, also aspects such as risk analysis and judging investments on their future asset life cycle phases are more and more common. However, the AM deployments stay within limited parts of the organizations. AM is not fully embedded within all departments and the expansion has not reached the strategic level yet. Therefore, AM is not yet interdisciplinary and not yet used to manage the asset bases as holistic entities.

5.1.1.3 Contribution of actions (item: SP3-OF)

Condition SP3-OF, sub-condition 1: the executed activities are in line with the strategies, objective and plans	V 2 Z 2

As stated, both organizations already execute a lot of initiatives. However, these are often loosely connected and the relations with the overall objectives are not actively coordinated.

5.1.1.4 Inspect and measure (item: SP4-OF)

Condition SP4-OF, sub-condition 1: the organization's processes are measured and inspected/reviewed	V 1 Z 1

The measurements within the organizations are mainly focused on the asset' performance (i.e. reliability etc.) and the overall organizational performance (e.g. tax rates etc.). The organizations do have performance measures that address the performance of certain processes (e.g. whether certain activities are executed). However, this number of performance measures is limited. The measures cannot be used to fully analyze the performance of the management of assets and how this contributes to the organizational objectives. Therefore, the effect of the AM deployment is difficult to measure. As stated by in Section 2.2.3, this is gap that is seen in many other organizations and within AM literature.

Condition SP4-OF, sub-condition 2: strategy control uses a balanced and limited set of performance measures that is linked with objectives	V 1 Z 1

There are no performance indicators that are specifically attributed to the deployment of AM.

Condition SP4-OF, sub-condition 3: the results are used as input to formulate or adapt strategies, objectives and plans	V	1
	Z	1

Nevertheless, the interviewees agreed that the existing situation has to be improved. Measurements and reviews of the internal processes are needed to monitor the impact of the change process, to control the deployment of AM and to convince criticasters of the added value of AM. There is however one difficulty in this. Observed trends in the organization's performance cannot be easily allocated to the AM deployment. This is because the organizations conduct many other changes simultaneously and operate in an environment in which external conditions are versatile and have a significant impact.

5.1.1.5 Coordinated and organized (item: SP5-OF)

Condition SP5-OF, sub-condition 1: the strategy process is well coordinated and formalized in terms of processes, roles and responsibilities	V	3
	Z	2

Currently, there is no central coordination within Zuiderzeeland's deployment of AM and there are no clearly defined sub-processes and responsibilities. Instead, the introduction of AM is loosely organized and initiatives mainly emerge bottom up (i.e. individual initiatives that are created to fix the most urgent problems). The majority of these initiatives are conducted by the department wastewater treatment chain and pumping stations and the department water management. This former department is often the leader in this as it has already more experience with the concept of AM. The collaboration between the two departments is however not formally coordinated. Moreover, because the frontrunners of the AM deployment are located in lower parts of the organizational chart, they have difficulties driving AM across the organization. Because of a lack of authority, they cannot easily transform it into an interdisciplinary and holistic discipline. Finally, because there is no organization-wide coordination, the coherence between the existing initiatives is not always coordinated and the contribution to the overall strategy is also not actively managed.

In the past, Vechtstromen identified similar shortcomings in its own AM deployment. Therefore, they recently started to frame the deployment of AM more as an organization-wide change and included it in the program governing and organizing. According to Vechtstromen, the organization-wide changes in for example the process models and organization's risk management cannot simply be driven by a bottom-up approach. It also needs a top-down coordination. Vechtstromen explicitly states that the top-down coordination is an addition to the bottom-up approach. The bottom-up approach itself is useful to maintain the buy-in of employees. Besides, it helps to make sure that the organizational changes actually fulfill the needs of the organization. The top-down coordination helps to create and maintain a momentum, It helps to drive AM across the organization, to coordinate the consistency between the loosely connected initiatives (i.e. prevent that the wheel is reinvented) and to make sure that initiatives really align with the deployment strategy.

Vechtstromen's MT acts as an internal client and has assigned several employees from various departments to form a steering group. Supported by a consultative group, this steering group is responsible for the organization-wide top-down coordination during the first phase of the AM deployment. The group is currently making an action plan about the future steps of the AM deployment and how the alignment between the existing initiatives can be improved. For the future phases in the AM deployment, the steering group is considering to appoint a full-time coordinator. He/she should take over most of the steering group's responsibilities, create and maintain the momentum in the change process and coordinate the AM deployment.

Condition SP5-OF, sub-condition 2: the various parts of the organization are well involved during strategy formulation and implementation	V	2
	Z	2

The involvement of the governing bodies, managing board and MT during the strategy formulation and implementation has been limited. During the strategy formulation phase, decision makers approved the deployment strategies and mandated others to start implementing this. However, as discussed before, this decision was not perfectly well considered. They had and still have a limited understanding about AM and the consequences of the AM deployment. This also has its effect on the implementation phase. Until now, the

involvement and commitment of the decision makers during the change process has been limited. This will be discussed with condition CV1-OF.

Furthermore, there is the involvement within the civil services themselves. Because AM is a holistic approach, it is important that all relevant organizational units are well involved during the change process. For Vechtstromen, the formulation of the deployment strategy has mainly been a task of the steering group. The involvement of the consultative group and other employees has been limited. This was done intentionally, as it was assumed that the various departments are already well represented in the steering group. Moreover, it was assumed that the added value of involving other employees during the exploratory phase would be small. Although the interviews showed some different opinions about whether this should have been done differently, they agreed that the employees need to be better involved in the future.

For Zuiderzeeland, the AM deployment has been mainly conducted bottom-up. A small group of experts took their responsibility, formulated the deployment strategy and started with conducting some initiatives. The AM deployment currently mainly stays within a specific part of the organization. These are the two tactical-operational departments wastewater treatment chain and pumping stations and water management. The involvement of the other departments has been limited. As agreed upon by Zuiderzeeland's interviewees, this should be improved in the future. Furthermore, the collaboration between the two tactical-operational departments for the AM deployment has to be better coordinated. This could help to improve the cross-fertilization and to prevent that each department reinvents the wheel and comes up with its own methodologies. Vechtstromen seems to be a few steps ahead in this. As stated by Vechtstromen's interviewees, the fact that the water system and wastewater treatment chain are managed by a single department helps to ensure that both disciplines collaborate and easily share their knowledge, experiences and best practices.

5.1.1.6 Communication and documentation (item: SP6-OF)

Condition SP6-OF, sub-condition 1: the objectives, strategies, measures and plans are documented, formalized and explicitly linked with each other	V	2
	Z	2

The regional water authorities are public organizations and have to comply with many laws and regulations. Because of this, the objectives and strategies for the AM deployment have been documented in many formal plans and required the approval of the decision makers. Currently, both regional water authorities do not have an overall action plan that details out how the deployment strategy is implemented. In this way, the consistency between the existing and future initiatives and the link with the deployment strategy are often unclear.

Condition SP6-OF, sub-condition 2: the communication within the strategy process is clear, frequent, timely, accurate, and accessible	V	3
	Z	3

The fact that organizations are just starting to formally deploy AM makes it almost impossible to assess the quality of the communication. For the moment, there seem to be no difficulties in the communication that suggest a constraint in the internal strategic alignment.

5.1.2 Necessary conditions in the contextual variables

5.1.2.1 Human resources (item: CV1-OF)

Condition CV1-OF, sub-condition 1: the organization has enough capacity to execute the strategy process	V	2
	Z	2

As mentioned by the interviewees and shown in the employee satisfaction surveys, the workload of the regional water authorities' employees is often perceived to be high. This research was unable to get a unanimous answer about whether there is a high workload in the entire organizations or if this is mainly the case for some specific parts. However, multiple interviewees pointed out that their organization has not enough staff capacity to execute all planned organizational developments in a successful way. These developments for example focus on improvements in the planning & control cycles; the organizational culture; information management and the implementation of process management and AM.

Nevertheless, it is not the shortage of staff capacity itself that needs to be solved. There are specific causes that lead to the shortage of staff capacity and these must be tackled. According to multiple interviewees, especially those from Vechtstromen, there is a shortage in staff capacity because their organization has initiated too many organizational developments at once without a clear prioritization. As one interviewee stated: “all developments are desirable so they are all initiated and all have a high priority”. Because of the lack of prioritization, the deployment of AM has to compete with other organizational developments in order to get the necessary resources. Multiple interviewees feared that the deployment of AM will be trampled underfoot. According to them, this is because there is currently still a debate about what AM exactly is and how the AM deployment should look like. Besides, there is a lack of coordination (especially Zuiderzeeland) and there is no strong guiding coalition (will be discussed with sub-condition 3).

Condition CV1-OF, sub-condition 2: the employees understand the strategy, the impact it has on their jobs and wat is expected from them	V	2
	Z	2

As stated, the knowledge and experiences with the concept of AM is mainly in the hands of a few advisors and experts. Large parts of the authorities do not yet have a full and shared understanding about what AM is and what kind of consequences this has for their organization. Because of this, many of them currently do not have a full understanding about how the deployment of AM affects their jobs and what is expected from them.

Condition CV1-OF, sub-condition 3: The strategy process is supported by good leadership	V	2
	Z	2

As agreed upon by the interviewees, the civil service’s top management (the managing board and MT) are the persons that should use their leadership to lead the change process. They should act as a guiding coalition and create and maintain the momentum in the change process. Within both organizations however, this currently does not yet happen. The top management agreed with the decision of the governing bodies and the AM deployment strategy and they mandated the civil service to start working with it. However, within both organizations, the involvement and commitment of the top management has stopped somewhere over here. Among other reasons, this is because the managing boards and management teams themselves do not have a full and shared view about AM. This has made them somewhat reserved (see the next Section). This limited commitment and involvement is one of the main reasons why the AM deployments are slowed down.

As shown by Vechtstromen, the actual top-down coordination of the AM deployment could be mandated to a steering group, coordinator or project leader. Interviewees of Vechtstromen however emphasized that the involvement of the top management should not simply stop after tasks are relinquished to other agents. As experienced by themselves, the steering group can only act decisively, vigorously and drive AM across the organization when there is direct commitment, support and supervision of the superiors.

5.1.2.2 Organizational culture (item: CV2-OF)

Condition CV2-OF, sub-condition 1: The members (employees and managers/decision makers) of the organization are willing to change	V	2
	Z	2

Although the deployment of AM may require changes in the existing processes, organizational cultures, competencies and responsibilities; the organizations’ employees are not fundamentally against these. Some people are even be motivated to contribute to the AM deployment as they see some personal benefits. AM clarifies the employees’ roles and clarifies how their activities contribute to the strategic objectives. Moreover, AM provides the employees clearer guidelines with which they can work. Finally, AM makes the decision-making process more transparent and unbiased and would help employees to better understand why their organization is making certain decisions. In this way, employees probably have less of a tendency to call plans into question once they are made.

However, many of the organizations’ employees are currently somewhat reserved towards the deployment of AM. This because of the uncertainty about what the concept of AM is, how AM will be deployed and how this affects the existing organization. Because this is not clarified,

there is the anxiety that the deployment of AM will be a goal in itself (moving the intended outcomes to the background). Some employees fear that AM will be system that dominates the operations and makes the organization too systematic, bureaucratic and inflexible. In line with this, some employees question whether the benefits of AM really outweigh the efforts and bureaucracy that are needed in such a strict system. Moreover, the (perceived) shortage in staff capacity is also a reason why many employees are somewhat reserved about AM. The employees are anxious about the extra work load they are confronted with and they fear that their work load becomes too high and unmanageable. This could make them less willing to participate in the AM deployment.

Although in to a smaller extent, also the managing boards, management teams and governing bodies are still somewhat reserved towards AM. They all acknowledge that AM can bring certain benefits, but there is not a full and shared understanding about AM and the deployment of AM. This lack of clarity makes that some members of the governing bodies and top managers of the civil service are somewhat reserved and hesitant towards the AM deployment. In line with the regular employees, they fear and want to prevent that the AM deployment leads to a systematic, bureaucratic and inflexible organization. They want to ensure that AM does not turn their organization into a kind of machine that uses fixed procedures to translate certain inputs (e.g. the objectives, asset data etc.) into outputs (plans and budgets) and constrain the managers and governing bodies in their tasks. In such an environment, the managers and governing bodies have no room to maneuver. They then do not have the freedom to control the organization based on their own insights and interests.

5.1.2.3 Other organizational aspects (item: CV3-OF)

Condition CV3-AF, sub-condition 1: the deployment of AM aligned with other developments	V 2 Z 2

As agreed upon by a few interviewees, the deployment of AM overlaps and affects many other kind of existing of organization-wide developments; and vice versa. Other developments are for example the application of process management, information management, improvement of the planning & control cycle and development of the organizational culture. There are no large contradictions between the various organizational developments and the AM deployment. Instead, the developments have many commonalities and are aiming in the same direction. In fact, many of them were also mentioned in the recommendations of Chapter 4. Up until now however, the AM deployments in the two organizations have been quite isolated from the other developments that are already planned and/or conducted. The relations and synergies between AM and the other developments are not actively managed. However, there is a need to improve this in the near future. As discussed in Section 2.2.4.3, creating an alignment between the developments could increase the success, increase acceptance and lower the required resources.

Condition CV3-AF, sub-condition 2: the strategy process is supported by the organizational structure	V 3 Z 2

First of all, let's focus on Zuiderzeeland. Many employees here perceive AM as a tactical-operational issue. This perception is strengthened by the fact that AM is mainly deployed bottom-up. The experts that are responsible for the AM deployment know that AM is a holistic and interdisciplinary approach, but they have struggles in changing the perceptions of others. Because they are positioned in lower parts of the organizational chart and because there is not clear explicit accountability for the top management, it is difficult to embed the principles of AM in all functional groups and organizational levels. The people responsible for the AM deployment lack the authority to act more strategically and to organize an organization-wide change. Because Zuiderzeeland has positioned the responsibilities for the AM deployment low within its organizational chart, the change process is hampered. It will therefore take longer before the potential benefits of AM are fully realized.

The above difficulties have already been recognized by Vechtstromen. To position the AM deployment higher in the organizational structure, Vechtstromen recently initiated a steering group. This group is responsible for the top-down coordination of the AM deployment. This steering group operates cross-functionally and is not bounded to a certain part of the

organization. Nevertheless, there is still room for improvement. Yet, from a formal perspective, this steering group does not yet have the authority and official mandate to control and instruct the organization. The reason for this seems the fact the AM deployment is currently at an early stage. However, the interviewees agreed that this needs to be improved in the future when a full-time coordinator is appointed. Moreover, there is the need to improve the accountabilities, commitment and involvement of the top management.

5.1.3 Internal strategic alignment

Sections 5.1.3.1 and 5.1.3.2 will use the previous findings to briefly describe to what extent the organizations successfully formulate and implement their strategies for the AM deployment. As stated, these two indicators determine the extent of strategic alignment. The summary of major constraining factors is shown in Table 5 of Section 5.1.3.3.

5.1.3.1 Successful formulation

As both organizations are still detailing out their deployment strategies, it is difficult to provide a final evaluation whether this phase is successful or not. What can be stated however, is that some first important steps are made. Among the members of both organizations, there is the consensus that AM is something that is already partly conducted. There is also consensus that AM can be used to improve the current processes even further. However, the strategy formulation phase is not yet conducted perfectly. The deployment strategies are not always well understood and still raise questions for some people. Within both organizations, there is still a lack of clarity about a number of major issues, for example: what is AM?; how does it work?; what is the exact aim of the AM deployment?; what kind of organizational changes are needed and how much time, staff capacity and other resources does this require?; and how does the deployment of AM relate to other organizational developments? These constraining factors will also be summarized in the table below (Table 5)

5.1.3.2 Successful implementation

It is even more difficult and somewhat premature to evaluate whether the strategies for the AM deployments are successfully implemented. For both organizations, the formal implementation is just starting. Nonetheless, both organizations are already executing some initiatives to fulfill the existing needs. These initiatives are necessary building blocks of AM and need to be executed regardless of the exact AM deployment strategy and action plan. Nevertheless, previous Sections have demonstrated that there are several constraining factors (e.g. lack of clarity, limited coordination, poor alignment between AM deployment and other developments) that obstruct the organizations from successfully implementing the deployment strategies. Table 5 below will provide a full list of the major constraints.

5.1.3.3 Major constraints in the internal strategic alignment

Based on the findings from previous Sections, Table 5 summarizes the major constraining factors. These factors obstruct the two organizations in fully meeting the necessary conditions for strategic alignment in the AM deployment. As show in Table 5 and as also discussed in the previous Sections, there are several similarities between the two organizations. Both organizations are somewhat at the stage of introducing AM into their operations and experience difficulties due to the lack of clarity and anxiety among employees and decision makers. The largest difference between the two organizations lies within the coordination of the AM deployment. Whereas Vechtstromen started to add a top-down coordination for the change process, Zuiderzeeland still mainly follows a bottom up approach.

Within both organizations, the constraining factors often have a smaller impact for the wastewater treatment chain compared to the water system. For the wastewater treatment chain, the AM deployment occurs more naturally and more smoothly. This is because the physical objects in the wastewater treatment chain can be more easily seen as assets that can be managed with a business perspective. Besides, those that manage the waste water treatment already have more experience with elements of AM. In order to simplify things, these differences are not included in Table 5.

Nr.	Which cases?	Major constraints in the internal strategic alignment for the deployment of AM
1	Both	There is often no commonly shared understanding about what AM is; how AM works; what the exact benefits of AM are and how AM relates to the existing organization. This applies to different organizational levels (governing bodies, managing board, MT, team managers and other employees) and functional groups.
2	Both, but especially Vechtstromen	Although there are different opinions about it, there seems to be a need to further clarify the context of the iterative approach. This means clarification about the exact objective of the AM deployment; the AM maturity level that is needed for this; what kind of organizational changes are needed; how long these changes take and what this requires from the civil service.
3	Both	Until now, the AM deployment has mainly been based on initiatives that emerge bottom up. The coherence between the existing initiatives and the contribution of the initiatives to the deployment strategies has therefore not always been actively managed. AM has already acquired a strong foothold in specific parts of the organization but is not embedded within all functional groups and organizational levels.
4	Zuiderzeeland	Whereas Vechtstromen recently started a top-down coordination to solve the previous constraint (nr. 3), the deployment of AM within Zuiderzeeland is currently still mainly bottom-up and without an organization-wide coordination. With this approach, Zuiderzeeland is unable to drive the principles of AM across the organization.
5	Both	There are no performance measures that address the impact of the AM deployment.
6	Both	The commitment and close involvement of civil service's top management (MT and managing board) in the AM deployment has been limited
7	Both, but especially Vechtstromen	In order to get the necessary staff capacity, AM has to compete with many other organizational developments. There is the fear that the AM deployment will be trampled underfoot by other organizational developments.
8	Both	Employees are not against the deployment of AM per se, but they are somewhat reserved towards this organizational change. This is because of the uncertainty about AM, the AM deployment, about the impact on their jobs and because of the extra workload that the change process requires.
9	Both	The relation between AM deployment and other organizational developments is currently not clearly defined and managed

Table 5 Major constraints in the internal strategic alignment of the AM deployment. This is a summary of the findings of Sections 5.1.1 and 5.1.2.

5.2 Improving the existing internal strategic alignments

This Section proposes several solutions that can be implemented by the two regional water authorities to tackle the major constraining factors that were summarized in Table 5. These solutions help the organizations in further developing the necessary conditions for internal strategic alignment that are not fully present yet (sub-question 6). The solutions are derived from the interviews and the findings of literature review (Section 2.2.2.1).

In total, this study proposes 6 main pillars of solutions and each of them focuses on tackling one or more constraints. In the text below, each main pillar of solutions is discussed in separate Section. The focus is always on the general outline of the solutions (i.e. focus on the end result). It is up to the organizations to focus more on "how" these solutions should be executed and write this down in a more detailed action plans. In these next Sections, the text includes references (numbers in between the brackets, so for example **[X]**) to numbering of Table 4. In this way, one can see what constraining factors are discussed.

5.2.1 Focus on the organization's needs

To start with, this study recommends both organizations **[7]** to better prioritize the deployment of AM and other organizational developments and **[9]** to better manage the relation between them. The solution for this lies in an evaluation of the organization's needs. Simply stated, the authorities are recommended to (again) identify the existing needs within their organization. Only when this is done, the authorities should determine what organizational developments are needed and how certain (elements of) management concepts can help in this. As such, the developments and the management concepts become subordinate to the organization's needs. To a certain extent, this way of reasoning is already applied by the two organizations. Nevertheless, there is room for improvement. As mentioned

before, the past decision to deploy AM was not perfectly well considered. The decision appeared to be strongly driven by the desire to have AM, but there was no good and shared understanding about AM and the change process of the AM deployment.

Prioritization of needs

So, the authorities are recommended to first identify the existing needs and only then determine what organizational developments and management concepts fulfill these needs. In fact, it should be the prioritization of the needs that should determine the pace and prioritization of the organizational developments. So, instead of talking about organizational developments that compete, the discussion should focus more on various needs that all ask for attention and resources.

However, as Chapter 4 demonstrated that AM can bring numerous benefits to the organizations, it is not likely the AM deployment will be canceled. However, a clarification of the prioritization would help to specify what elements of AM are most helpful. In this way, it can be prevented that the AM deployment will be unnecessarily trampled underfoot by other organizational developments in the battle for staff capacity and attention (see Section 5.1).

Relation between the AM deployment and other developments

By first studying the organization's needs, it also becomes easier to determine how the organizational developments and the management concepts are related to each other. In this way, the organizations can see how the deployment of AM relates and is maybe already embedded in the existing other organizational developments that are planned. Furthermore, it helps to identify how the AM deployment and other organizational developments can reinforce each other and maybe share resources.

Both organizations for example have existing organizational developments that focus on improving the organizational culture and clarifying the roles of departments and employees. Although the literature review already demonstrated that these aspects overlap with AM, the relations are yet not fully known and managed by the two organizations. Another relevant relation is the one between AM and the existing developments that focus on improving the annual planning & control cycle. Both organizations are for example aiming shift the focus in their planning & control cycle more towards controlling the achievement of outcomes instead of output. Chapter 4 also recommended to do this and stated that AM could provide useful guidelines. Currently however, the two developments are somewhat isolated from each other.

Another important relation that has to be better managed is the one between process management and AM. Especially Vechtstromen is currently busy with applying process management. This would help to clarify the positions and relations between the employees, teams and to optimize the workflows between them. Chapter 4 recommended both to continue with this and combine this with the concept of AM. The principles of AM are helpful guidelines for process management when defining and optimizing the inputs, outputs, roles, responsibilities of the processes. The other way around; process management could be a good vehicle to deploy AM. It could for example help to establish the AM roles and describe their positions within the processes.

Finally, there is another recommendation. This study recommends the two organizations to avoid talking about individual organizational developments and management concepts as much as possible. The relations between them are often complex and they draw away the attention from the organization's needs. Furthermore, employees can be confused when they face an overload of developments and management concepts that are difficult to understand. Besides, they all seem to ask for attention and resources. This study recommends the two organizations to focus the communication and structure the organizational changes and initiatives more along the organization's needs. The organization could talk about "effective and efficient management of assets" and use only one coordinator (see Section 5.2.3) and one action plan (see Section 5.2.4) to integrally manage all underlying developments.

5.2.2 Clarifying the concept AM for the governing bodies, managing board, MT and team managers

Together with the above recommendations, this study recommends the organizations to **[1]** improve the understanding of the governing bodies, managing board, department managers and team managers about AM. This helps to gain the buy-in of these group of people and to make the discussions about AM and the decision to deploy AM better informed. This can, in turn, help to improve their involvement and commitment and accelerate the pace of the AM deployment. Because of their different roles, the different decision makers from the governing bodies and civil services do not have to achieve the same knowledge levels. They can be informed differently. For now, however, let's do not focus on this.

The most straightforward solution would be to inform the decision makers with presentations. These could be given by the organizations' experts or coordinators of the AM deployment (see the next Section). As an alternative or addition for this, this study recommends the two organizations to invite representatives from other more AM mature organizations. They could present their view on AM. From their experiences, they can explain how AM is embedded in their organization, what the positive effects are and what the AM deployment asked from their organization. In addition to this, this study recommends the two organizations to let the decision makers experience what AM is. This could be done in an interactive session during which the participants discuss certain examples cases and explore how the AM process model and AM roles work. During such session, the participants could play a serious game. As was for example also done by regional water authority Brabantse Delta, the participants could experience how the business value matrix works and how differences in matrices can result in differences during the decision-making process.

The presentations and interactive sessions could also be used to remove some of the anxiety of the managers and other decision makers. The presentations and interactive sessions could explain that their fear does not have to become reality. The organizations themselves can choose how strictly they want to deploy AM and how strict the organization should follow the fixed procedures and mathematical optimization techniques. As stated, it should always be possible for decision makers to overrule the proposals that are identified as optimum decisions. Though, the AM process and a tool such as the business value matrix provide useful guidelines to translate the organizations' objectives into proposals for interventions. They help to explain the added value of the proposals and explain the consequences if alternative decisions are made.

5.2.3 Setting up the top-down coordination

This study agrees with Vechtstromen and states that the AM deployment requires both a top-down coordination and bottom-up approach. The bottom approach helps to make sure that the initiatives of the AM deployment fulfill the existing needs of the organization. The top-down coordination helps to drive AM across the organization and to coordinate the consistency between the initiatives. The deployment of AM can be seen as drilling a tunnel through a mountain. As stated by an interviewee: "In order construct the tunnel quickly, one has to start drilling the tunnel from two different sides. However, it is important to constantly monitor the drilling of the tunnel tubes in order to make sure that they eventually align and meet each other in the middle". In other words, an organization should constantly monitor whether the intentions from top-down meet up with the initiatives that emerge bottom up.

In line with the previous Sections, this study recommends the organizations to widen the scope of the top-down coordination. The top-down coordination can best focus on the entire group organizational developments that together aim at making the management of assets more effective and efficient. For this task, an organization could appoint one coordinator (in Dutch: "kwartiermaker"). This coordinator could be supported and advised by multiple small consultative groups with team managers and experts that each focus on specific elements of the AM deployment. Furthermore, the formation of these groups helps to make sure that the various organizational units are involved and that their needs and taken into account.

As stated, Zuiderzeeland currently only uses a bottom-up deployment of AM **[4]**. For Zuiderzeeland, it is recommended to allocate the responsibilities of the top-down coordination towards a project manager of the group project management. As stated in Section 4.2.1.2, the

group project management is used to manage major projects that are of direct interest of the managing board and governing bodies. By allocating the responsibilities to this group, the organization's commitment is made visible. Moreover, it shows that the AM deployment and other related developments are important organization-wide changes. Because of its position in the organizational structure, the project manager can act cross-functionally and drive AM and the other developments across the entire organization. Furthermore, he/she can help to improve the collaboration between the two departments for which the AM deployment has the largest impact: wastewater treatment chain and pumping stations and water management.

Although this study recommends Zuiderzeeland to make a project manager responsible for the coordination, this study also wants to stress out that deployment of AM should not be approached to rationally. It is not a normal project (e.g. fixed start and end date and clear discrete steps). As stated in Chapter 2, the deployment of AM is a growth process that requires commitment over a sustained period, is difficult to divide in discrete steps with fixed periods and is in fact a never-ending story of continuous improvements.

As said, Vechtstromen already started to coordinate the AM deployment top-down with a steering group. They are considering to appoint a full-time coordinator for future stages of the AM deployment. Because there are specific circumstances (e.g. budget and availability of employees) that have to be taken into account when appointing this coordinator, this study will not give a specific recommendation for this. Nevertheless, also Vechtstromen is recommended to widen the scope of the top-down coordination and not only focus on AM. This could already be done with the steering group, or Vechtstromen could wait with this until they appoint a full-time coordinator. Within Vechtstromen, especially the combined coordination of process management and AM is relevant. The developments largely overlap, can reinforce each other and are both currently at an early stage.

5.2.4 Clarifying and planning the AM deployment

Furthermore, both regional water authorities are recommended to clarify the goals and plans for the AM deployment and the other related organizational developments. This can be done by those that are responsible for the top-down coordination, with the approval of their supervisors. This is detailed out with the 4 bullet points below.

- As stated in Section 5.1, the interviewees mentioned two conflicting views about the need to translate the vision on the AM deployment into SMART objectives **[2]**. This study recommends the organizations to find a middle course. The organizations are advised to look into the possibilities of further specifying the objectives for the short- and mid-term, while still leaving some room for the long-term. This should at least help to partly solve the concerns that were mentioned frequently by the interviewees: the AM deployment is currently too noncommittal and there is the need to clarify the magnitude of the organizational changes. Again, this Thesis recommends to not isolate the AM deployment from other developments. There should be one set of objectives that addresses all organizational developments that together aim at improving the efficiency and effectiveness of the management of assets.
- As stated, AM and the other related organizational developments require an organization-wide change process that affects all organizational levels and departments and require both hard and soft initiatives. To strengthen this perspective, Zuiderzeeland is recommended to include the objectives of the change process also in its general program (see Section 4.2.2). As stated, Vechtstromen already does this.
- The two organizations are recommended to formulate an action plan. This action plan should describe how the objectives for the efficient and effective management of assets are translated into initiatives and how these initiatives relate to each other. Such a plan currently does not exist within both organizations and the existing initiatives of the AM deployment are therefore currently loosely connected **[3]**.
- Furthermore, the two organizations are recommended to specify performance indicators to measure and monitor the objectives for the efficient and effective management of assets **[5]**. Besides using this to monitor the progress of the change process, this can also be used to convince the employees of the added value of the organizational developments. However, as stated in Section 5.1, defining objective and quantitative indicators to measure the performance of management of assets can

be quite difficult. This is especially difficult for the regional water authorities as they operate in a versatile external environment. The two organizations should find a balance in which the benefits of using performance measures outweigh the efforts and costs of defining and monitoring them. In order to reduce the efforts and costs, the two organizations could consult other organizations or look into the findings of scientific literature such as the study of Attwater et al. (2014). Alternatively, they could use (AM) maturity models to monitor how the organization's maturity level changes over time. Although these assessments do not measure performances and certainly have other limitations (see Sections 2.2.2 and 2.2.3), one can easily execute them.

5.2.5 Commitment and involvement of civil services' top management

The organizations are also recommended to improve the commitment and involvement of the managing board and MT in the AM deployment and other related organizational developments [6]. First of all, this can already be done with the recommendations of previous Sections. The managing board and MT become more committed when they, together with the governing bodies, prioritize organization's needs and approve the objectives, performance measures and action plans. Once promises are made, the managing board and MT have to make sure that organization complies to them. Moreover, by including the objectives for the organizational changes in the general programs, the top management confirms that they are organization-wide changes that require significant resources and the cooperation of the entire organization. Finally, Section 5.2.2 has discussed how to gain the buy-in of the MT and managing board by informing them about the AM and by removing some of their anxiety.

This study also recommends the two organizations to use the existing formal meetings of the managing board and MT to regularly discuss the progress and impact of the AM deployment and other related developments. Again, it is advised that these different developments are presented and discussed as one. The input for the meetings can be facilitated by those that are responsible for the top-down coordination.

On top of that, there is another important recommendation. Within both civil services, the management team and the managing board have to act more as a guiding coalition. This should show their commitment and involvement and help to create and maintain the momentum in the change process. They should actively promote their vision, convince employees about the necessity of the organizational changes, put the employees into motion and enable the civil service to conduct the changes (e.g. define responsibilities and provide the resources). In line with this, it is important that they support, supervise and formally mandate those people that are responsible made for the top-down coordination.

5.2.6 Communication and involvement of employees

Finally, the organizations are recommended to formulate a clear plan about how to communicate the AM deployment and the other related organizational developments to the employees. Besides, this plan should state how these employees will be involved during the change process. This should help the organizations [1] to improve the employees' understanding about AM and AM deployment, [8] to remove some of their anxiety and reticence toward AM and to gather the necessary input as part of the bottom-up approach. Furthermore, once the employees are on board, it becomes possible to accelerate.

This study has a few general recommendations:

- Do not bother the employees too much with the many complex and holistic organizational developments and management concepts. This can lead to confusion, misinterpretations and unnecessary anxiety if the exact intentions of the organization are not explained. Instead, the organizations are recommended to group the various organizational developments and focus the communication more on the organization's needs and how the employees benefit.
- The managing board and MT will likely play a key role in the communication towards the employees. As stated, they should act as a guiding coalition, promote their visions and stimulate others to act. They could for example do this during central meetings, visit department or team meetings and/or use newsletters. However, they will likely focus on a somewhat high abstraction level. On a personal level, the team managers

should play a key role. They should explain the employees how they are affected by the change process (i.e. “what is in for me”) and how they should contribute.
- To convince the employees and keep their commitment during the entire change process, it is important to demonstrate quick wins during the change process. Some of these can already be derived by taking advantage of the existing initiatives.
- As part of the bottom-up approach, the employees should be involved during the change process. Their needs and the problems they face in their day to day routines should form the input and starting point of the AM deployment. Employees could for example be involved by inviting them to take place in the small consultative groups, by inviting them during information sessions or letting the team managers act as mediators and representatives of their teams.

5.3 Conclusion

Sub-question 3: How do the necessary conditions for the internal strategic alignment in the deployment of asset management manifest themselves in real-life organizations?

As was concluded for both regional water authorities, many necessary conditions for strategic alignment are not fully present. Part of this can be explained by the fact that both organizations only recently started with the formal deployment of AM. Table 5 (p.71) demonstrated the 9 most important constraining factors that obstruct the two organizations in meeting the necessary conditions for strategic alignment.

As demonstrated, the situations are quite similar for the two regional water authorities. The largest difference is the coordination of the AM deployment. The introduction of AM into Zuiderzeeland’s operations is mainly done bottom-up. Vechtstromen recently started to combine this bottom-up approach with a top-down coordination.

The study observed differences in how AM is deployed for the water system and the wastewater treatment chain. For the wastewater treatment chain, the AM deployment occurs more naturally and more smoothly. This is because of the more favorable characteristics of the physical objects and because the people that manage the waste water treatment already have more experience with elements of AM.

Sub-question 4: How could an organization develop the necessary conditions for the internal strategic alignment in the deployment of asset management if they are not present?

For the two cases, this Chapter proposed 6 main pillars of solutions. These solutions can be executed by the two organizations to tackle the major constraining factors that were summarized in Table 5. This should help them to further develop the conditions that are necessary for internal strategic alignment in the AM deployment. In summary, the recommended solutions are as follows.

1. The authorities can best focus (again) on their organization’s needs and use this to prioritize and clarify the relations between the organizational developments.
2. To give a boost to the change process, the two authorities should clarify the concept AM for the governing bodies, managing board, MT and team managers.
3. The AM deployment and the other related developments would benefit from a top-down coordination, this as an addition to the bottom-up approach.
4. The authorities are recommended to clarify the objective of AM deployment and other related development + include them in the general overarching program + formulate an action plan + develop performance indicators to monitor the developments.
5. Essential within the AM deployment and the other organizational developments is an improved commitment and involvement of the civil service’s top management. Let them act as a clear guiding coalition during the change process and let them actively support and supervise those that are responsible for the top-down coordination.
6. To put the organization into motion, the authorities should develop a clear plan for the communication towards the employees and the involvement of employees.

6 CONCLUSION

Research question: *How do the necessary conditions for internal strategic alignment in the management of physical assets and in the deployment of asset management manifest themselves in organizations and how can organizations develop these conditions if they are not present yet?*

This Thesis reviewed literature from the fields of AM and strategic management. Thanks to this combination, this Thesis was able to study internal alignment within the setting of AM. It identified 9 necessary conditions (divided into 24 sub-conditions) for internal alignment in the management of physical assets. Alignment for example requires a clear and explicit translation between strategical plans and operational actions; a balanced set of performance measures; and an objective-driven organizational culture. AM is a philosophy that could be adopted by organizations to acquire these conditions. This Thesis also studied this change process. In fact, this study determined that an organization should meet 9 conditions (18 sub-conditions) in order to reach alignment in the AM deployment.

To study how these necessary conditions manifest themselves in real-life, this Thesis conducted two case studies. The two cases were the Dutch regional water authorities Vechtstromen and Zuiderzeeland. Data was gathered with 32 semi-structured interviews and this was supplemented by a document study.

As observed during this study, the authorities have a lot experience with the primary water management tasks. They have conducted these tasks quite successfully over many decades and served the interests of their stakeholders. Nevertheless, this study concluded both organizations have not yet reached internal alignment in the management of assets. Not all necessary conditions are fully present. This Thesis related this to 13 factors that constrain the two organizations (Table 4 at page 54). Some of these factors were quite visible and specific. One of the most important constraints was for example the absence of a clear strategic frame of reference. Such frame of reference is needed as a basis to assess assets, design interventions, conduct portfolio optimization and make justifiable decisions. However, other factors were more difficult to detect as they are more deeply embedded within the organizational culture. This study for example determined that the members of the authorities tend to primarily focus on the *'do'* phase of the PDCA cycle. Moreover, the focus of planning & control is often skewed towards financial performance and the planning.

This study recommended the two authorities to conduct 4 main pillars of solutions (summarized at page 62) that could help to tackle the major constraining factors. These solutions are for a large part based on the concept of AM and the tools and methods that it has to offer. Again, the focus is on both the hard (e.g. applying a business value matrix) and soft (developing certain cultural values) aspects.

Already before this study was conducted, the two authorities formally started to deploy the principles of AM within their operations. In line with the above introduction, this study also studied this change process. Likewise, also for the alignment within these AM deployments, this study concluded that the necessary conditions are not fully present. This study revealed 9 major factors that constrain the two organizations in their internal alignments (Table 5 at page 71). The two organizations are for example obstructed because managers and their employees do not have a shared view on AM and the AM deployment. Besides, there is no clear guiding coalition and the relation with other organizational developments is transparent. Because of this, certain members of the organizations are somewhat reserved about AM and/or do not expect that the AM deployment will things will not be changed. Based on these findings, this study proposed 6 pillars of solutions (summarized at page 76) that help the organizations to improve their alignments within the AM deployments.

The case study findings have helped to start closing the existing research gap. They offer deeper insights into the concept of internal alignment within the setting of AM. Moreover, other organizations can adopt these lessons learned. However, as observed with the two cases, adhering to the large list of necessary conditions is not easy. It is especially difficult for organizations such as regional water authorities that have a broad range of tasks, manage public infrastructure assets and have a political climate. Besides, internal alignment is evolutionary. It continuous adaptions and this process is never completed.

7 DISCUSSION

Theoretical contribution

First of all, this Thesis contributed to the field of AM by proposing an alternative way of studying internal strategic alignment. This Thesis distinguished two strategic approaches (the management of assets and the deployment of AM) and claimed that internal alignment is the essential for both. Existing literature usually discusses these two approaches simultaneously. In other cases, the focus in existing literature is on the management of assets while the process of deploying AM is neglected. This Thesis demonstrated that the distinction can be useful. The analytical framework demonstrated that the necessary conditions for the two types of alignments are different. Besides, the two case studies demonstrated that the two types of alignments can be obstructed by different constraining factors.

Secondly, this Thesis contributed by widening the definition of strategic alignment. AM literature usually only refers to the vertical alignment. This is the top-down and bottom-up consistency between objectives, strategies, plans, performance measurements and operational actions (Austroads, 2013; IAM, 2008a; ISO, 2014; Schraven et al., 2011; Wijnia & Herder, 2010). AM literature often acknowledges the importance of contextual variables (e.g. leadership and organizational culture), but a direct link with strategic alignment is not made. By reviewing existing strategic management literature, this Thesis concluded that these contextual variables are also relevant. They are therefore also included in the definition.

Thirdly, this study contributed to the field of AM helped to close the existing research gap. As stated, existing practice and research-related AM research have emphasized the importance of internal alignment, but did not conduct an in-depth study (Schraven et al., 2011; Wijnia & Herder, 2010). This study developed a theoretical framework about two types of internal alignment and listed the necessary conditions. Furthermore, it used cases studies to generate new insights. The cases studies have helped to demonstrate how the necessary conditions for the two strategic alignments can manifest themselves in real-life and about how these necessary conditions can be developed if they are not present yet. The insights that were obtained with the 2 cases have helped to narrow the research gap, but future research should analyze more and other cases and to close the research gap even further.

Contribution to practice

The two regional water authorities can benefit from the case study findings. This research highlighted the major problems within their two types of internal alignment and proposed several solutions for this. It is up to the two authorities to further discuss these solutions with the internal stakeholders and develop a detailed action plan. Moreover, also other public and private organizations can benefit from this study. This study explained that organizations that want to achieve an internal alignment within their management of assets and/or AM deployment should focus on meeting several conditions. Besides, when the case study findings also apply to their organization, managers could take advantage of this Thesis. They could adopt some useful components of this study and use them as a first basis to improve their own organizations.

8 LIMITATIONS AND RECOMMENDATIONS

Every research is concerned with limitations. This research is no exception. This Chapter will discuss the limitations of this study and recommendations for future research.

First of all, future research should focus on the conceptual and analytical frameworks of this Thesis and the distinction that is made between two strategic approaches. The sharp distinction between the AF and OF strategy processes offers a new way of looking to strategic alignment in the setting of AM. This proofed to be useful during this research. However, because this approach has not been widely tested, it is important that the added value and applicability is further investigated by other researchers. Other researchers could test the approach with other cases (for various industries) and/or interview managers about the applicability and validity. One of the points that may need to be studied is the fact that the distinction between the two strategic approaches can be somewhat artificial and complex. In real-life, the approaches are conducted simultaneously and things can overlap. Take leadership for example. A department manager can use its leadership to make sure that its department contributes to the effective and efficient management of assets. However, the same manager can also use its leadership to promote the deployment of AM, convince employees and maintain the momentum in the change process.

There is also another limitation. This study identified several necessary conditions for the two types of strategic alignment. For this, this Thesis took advantage of the study of Roelfsema (2014). She showed with an empirical test that there are significant relationships between each of her constructs and strategic alignment. However, this Thesis modified the conceptual model of Roelfsema (2014) in order to better suit the context of AM. Because of these modifications, the empirical test results of Roelfsema (2014) cannot be applied this study. Therefore, future research could contribute by testing the relations two types of internal strategic alignments and their necessary conditions that were identified by this Thesis. One could follow a similar approach as Roelfsema (2014) and use surveys for this.

By conducting case studies, this research was able to obtain findings that are rich, in-depth and contribute to the existing AM research. However, only two cases were studied and there was only little variation between these cases. Both cases are regional water authorities and they operate in the same institutional context and manage similar types of assets. Because of this, it is hard to generalize the case study findings to other contexts and larger groups of organizations. Therefore, more research with more cases and different cases is needed to come up with more generalizable findings. It could for example be interesting to study small public organizations such as small municipalities. These have a smaller asset base and have tasks that are less complex and better manageable. However, such organizations probably also have less resources and a smaller knowledge base to develop AM. Furthermore, future research could study frontrunners within public AM such as Rijkswaterstaat and the municipality of Rotterdam. By studying their best practices and their growth path, future research could gain new insights that are useful other organizations. Finally, in order to validate the case study findings of this Thesis, it would be useful to also study normal businesses. These have different motivations (e.g. competitive advantage and profit) and may manage different types of assets (e.g. pure production facilities, mobile assets such as trucks or assets that are leased).

Finally, future research is recommended to look into the possibilities of using a more processual approach such as discussed by Pettigrew (1997) and van de Ven & Poole (1995, 2005). To a certain extent, this study followed a variance approach (i.e. a set of independent variables that affects two dependent variables). A processual approach (often applied with a longitudinal study) focusses more on explaining how and why certain sequences of events unfold over time. Moreover, they discuss how these events are affected by and affect a certain context and how this is linked with the outcomes of the process. Even more than was done in this research, such an approach is strongly based on the collection, deduction and induction of narratives: stories that are told by members and that use their perspectives to describe what happened and why this happened (Pettigrew, 1997; van de Ven & Poole, 1995, 2005).

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APPENDIX A: CHAPTER 2

Study of Roelfsema (2014)

Item	Variable	Description
Variables for determining internal strategic alignment		
STA1	Successful formulation	The extent to which the formulation of a strategy is successful
STA2	Successful implementation	The extent to which the implementation of a strategy is successful
Variables for strategic alignment		
STA3	One process	The act of seeing strategy formulation and implementation as one process
STA4	Representing interests	The extent to which the organization is represented during strategy formulation and implementation
STA5	Considering resources & capabilities	The act of considering the organization's resources and capabilities during strategy formulation
STA6	Defining actions	The act of defining actions according to strategic plans during strategy implementation
Variables for category culture and beliefs		
CSB1	Common strategic goal(s)	The presence of a common strategic goal(s)
CSB2	Direction	Whether the organization works towards reaching strategic goal(s)
CSB3	Collaboration	The extent of collaboration within the organization to reach strategic goal(s)
CSB4	Priorities	The extent to which priorities are conflicting or aligned regarding reaching strategic goal(s)
CSB5	Recognition individual contribution	The importance of individual contribution to strategy formulation and implementation is recognized
CSB6	Willingness to change	The extent of readiness and willingness to change within the organization
CSB7	Coordination	The extent to which management coordinates strategic change through the organization
Variables for category organizational capabilities		
ORC1	Fit organization and strategy	The extent to which the strategy is in line with the organization's capabilities
ORC2	Translation strategic goals	The act of translating (long-term) strategic goals/objectives into (short-term) objectives/actions
ORC3	Contribution actions	Whether actions contribute to the execution of the strategy
ORC4	Support of systems	Whether information systems support the strategy
ORC5	Monitoring and measuring	The extent to which the strategic progress is monitored and the impact on performance is measured
ORC6	Adapting plans	The act of refining and adapting strategic plans during implementation
ORC7	Employees competencies	Whether employees have the right competencies for reaching strategic goal(s)
ORC8	Involvement management	The extent to which management is involved during strategy implementation
ORC9	Decision making	Whether management takes enough time to make well-informed decisions
ORC10	Motivation management	Whether management is able to motivate strategic choices
Variables for category communication		
COM1	Strategy formulation	The presence of a formalized strategy (defined and official)
COM2	Communication	Whether there is clear communication of the strategy
COM3	Understanding	Whether the majority of the organization understands the strategy
COM4	Impact	The extent to which impact of the strategy on employees is widely known
COM5	Responsibilities	Whether responsibilities for reaching strategic goal(s) are known
COM6	Actions	The extent to which employees have clear understanding of expected actions
COM7	Quality communication	Whether communication is frequent, timely, accurate, and accessible

Table 6 Set of variables used in the research model of Roelfsema (2014).

APPENDIX B: CHAPTERS 3 & 4

Organizational charts of the two regional water authorities

Organizational chart Vechtstromen

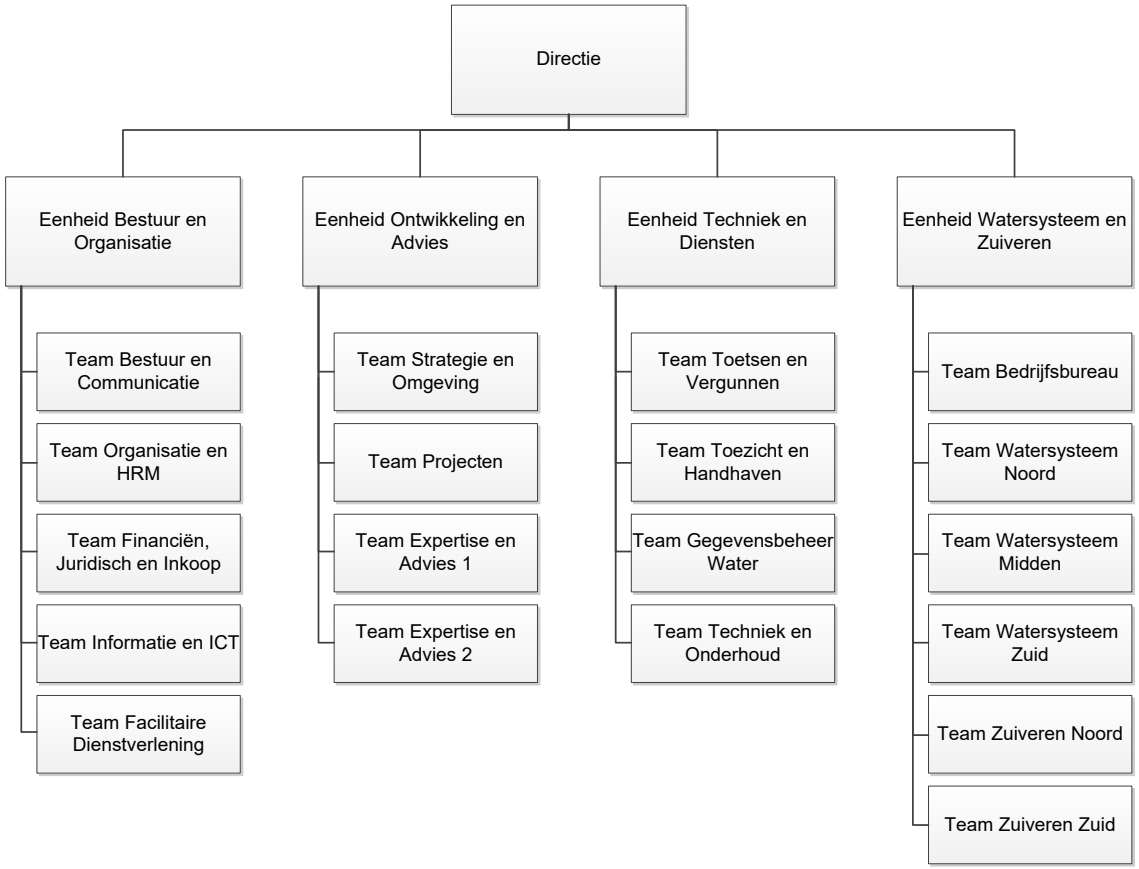

Figure 15 Organizational chart of Vechtstromen

Organizational chart Zuiderzeeland

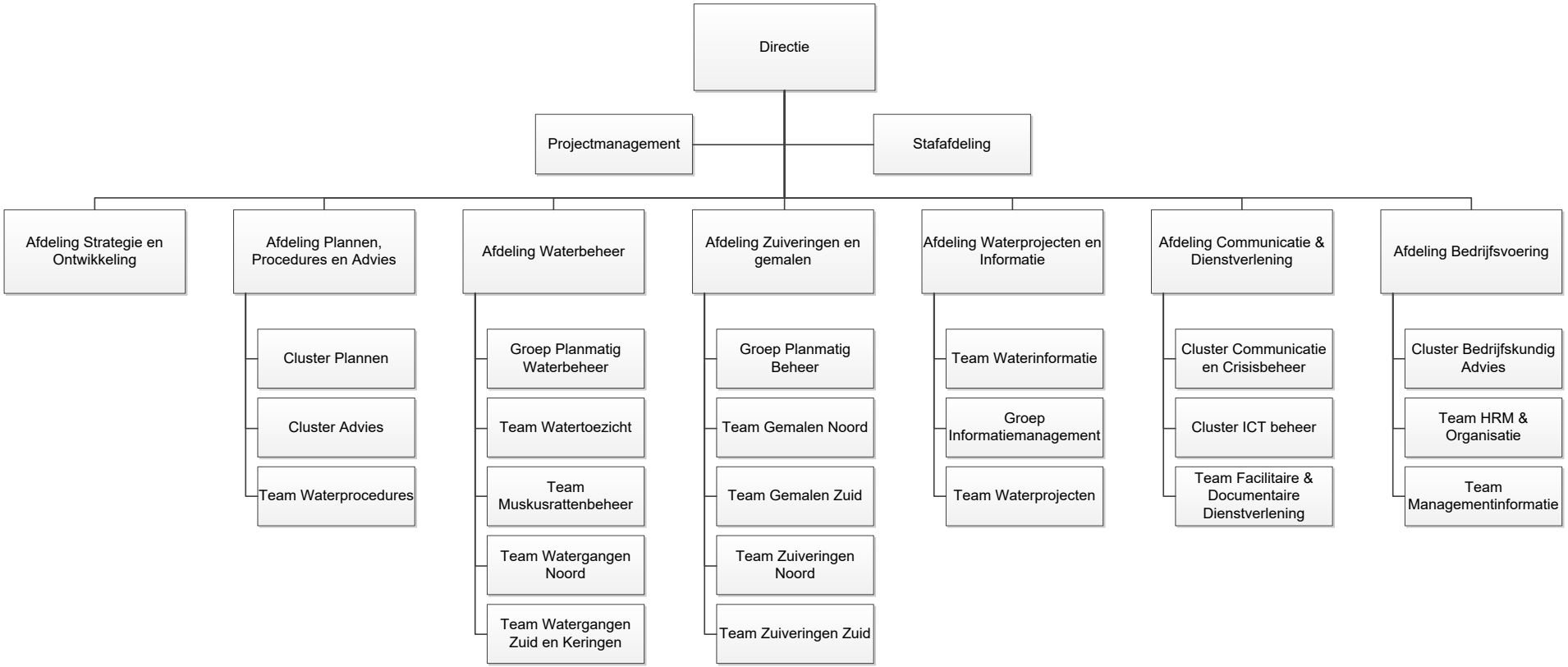

Figure 16 Organizational chart of Zuiderzeeland

Policy documents

Regional water authority Vechtstromen

The following policy documents were provided by regional water authority Vechtstromen.

Type	Title	Author ("Waterschap Vechtstromen" indicates that the document is formulated by many different employees, teams and departments)	Date
Document	Bestuursakkoord, door water verbonden	Waterschap Vechtstromen	2014
Document	Bestuursprogramma 2014-2018, door water verbonden	Waterschap Vechtstromen	2014
Document	Asset management, een verkenning	Vereniging van Zuiveringsbeheerders werkgroep asset management	09-2011
Document	Samenvatting Strategische Schets, het waterschap in 2020	Waterschappen Regge en Dinkel, Rijn en IJssel & Velt en Vecht	23-11-2011
Document	Waterschap Vechtstromen, organisatierapport, deel 1	Waterschap Vechtstromen	04-01-2013
Document	INK zelfevaluatie 2013	Regge en Dinkel	04-2013
Document	Concept achtergronddocument Kaderrichtlijn Water	Waterschap Vechtstromen	26-11-2014
Document	Programmabegroting 2015-2018	Waterschap Vechtstromen	26-11-2014
Document	Asset management, een verkenning binnen waterkracht	Waterkracht werkgroep zuiveren	12-2014
Document	Eenheidsplan Watersysteem & Zuiveren, 2015	R.S. te Velde	25-02-2015
Document	Eenheidsplan Bestuur & Organisatie, 2015	M. Ottevanger	03-2015
Document	Inrichting werkorganisatie watersysteem	J. Wagenvoort, R.S. te Velde	10-06-2015
Document	Waterschap Vechtstromen, advies directiestructuur	Volta, Waterschap Vechtstromen	24-06-2015
Document	Opdrachtbrief processturing	V. Hovinga	12-07-2015
Document	Memo stand van zaken processturing	V. Hovinga	15-09-2015
Document	Waterbeheerplan 2016-2021	Waterschap Vechtstromen	07-10-2015
Document	Visie en plan van aanpak asset management bij Vechtstromen	Waterschap Vechtstromen	21-10-2015
Document	Voorstel Visie en Plan van Aanpak asset management	V. Hovinga	21-10-2015
Document	Opdrachtbrief OBS 2.0	J.R. Limbeek	27-10-2015
Document	Concept eindrapport asset management zuiveren	Waterkracht werkgroep zuiveren	11-2015
Document	Programmabegroting 2016-2019	Waterschap Vechtstromen	25-11-2015
Document	Ontwikkelingsperspectief Vechtstromen 2015-2020	Waterschap Vechtstromen	25-11-2015
Document	Directieplan 2016	O. Dijkstra, M. Langeslag	09-12-2015
Document	Observaties en actieplan 2016 functie Opdrachtgever Projecten	P. van den Akker	29-12-2015
Document	Plan van aanpak ketenstrategie	M. Oosterhuis	19-02-2016
Document	Hoofdrapportage, medewerkersonderzoek Waterschap Vechtstromen	Effectory, Waterschap Vechtstromen	03-2016
Document	Gedachtengang opstarten asset management bij Vechtstromen	D. de Vroomen	17-03-2016
Presentation	Verkenning assetmanagement t.o.v. Vechtstromen	Waterschap Vechtstromen	09-04-2016

Presentation	Asset management bij een nwaterschap: Wat en hoe in een aantal dilemma's	V. Hovinga	14-04-2016
Document	Plan van aanpak, fase 2, procesmatig werken	R. van der Veer, D. de Vroomen, J. van den Hooff	19-04-2016
Document	Memo statusoverzicht OBS 2.0	D.Smit	25-04-2016
Document	Advies OBS 2.0, concept	Waterschap Vechtstromen	02-05-2016
Presentation	Doorontwikkeling P&C, presentatie voor het MT	Waterschap Vechtstromen	11-05-2016
Document	Procesvoorstel PvA asset management	Waterschap Vechtstromen	18-05-2016
Presentation	Concept proceslandschap, version 0.16	Waterschap Vechtstromen	24-05-2016
Presentation	Kentenstrategie	M. Oosterhuis	06-2016
Document	Meerjarenverkenning 2017-2020	Waterschap Vechtstromen	07-06-2016
Document	Jaarverslag en Jaarrekening 2015	Waterschap Vechtstromen	06-07-2016
Document	Meerjarenverkenning 2017-2020	Waterschap Vechtstromen	08-07-2016
Document	Programmabegroting 2017-2020	Waterschap Vechtstromen	30-11-2016
Document	Programmasturing 2.0 bij Vechtstromen	Waterschap Vechtstromen	-

Regional water authority Zuiderzeeland

The following policy documents were provided by regional water authority Zuiderzeeland.

Type	Title	Author ("Waterschap Zuiderzeeland" indicates that the document is formulated by many different employees, teams and departments)	Date
Document	Assetmanagement voor poldergemalen en zuiveringsinstallaties van Waterschap Zuiderzeeland	B. Rietman, H. Strikwerda, M. Oordt, D. Sprong, M. van den Boomen	2009
Document	Uitvoeringsprogramma Watersystemen, haalbaarheidsonderzoek assetmanagement Zuiderzeeland	Waterschap Zuiderzeeland	2011
Document	Bestuurs- en Management Aanpak Waterschap Zuiderzeeland	Waterschap Zuiderzeeland	2013
Document	Bestuursprogramma 2015-2019: duurzaam, verbonden, bekend en vertrouwd	Waterschap Zuiderzeeland	2014
Intranet	resultaten Medewerkerstevredenheidonderzoek per afdeling	Waterschap Zuiderzeeland	2016
Document	Onderhoud in beeld. Verantwoording beheer watergangen landelijk gebied	A. Schenk, D. van de Lagemaat	20-10-2006
Document	Gemalenplan 2011 – 2020	Waterschap Zuiderzeeland	02-2010
Document	Beheer- en onderhoudsplan Stedelijk Water Gemeente Noordoostpolder	Waterschap Zuiderzeeland, Gemeente Noordoostpolder	07-10-2010
Document	Maatwerkovereenkomst tussen gemeente Noordoostpolder en Waterschap Zuiderzeeland, stedelijk water	Waterschap Zuiderzeeland, Gemeente Noordoostpolder	07-10-2010
Document	Haalbaarheidsstudie Assetmanagement Waterschap Zuiderzeeland	H. Strikwerda, M. van den Boomen	20-04-2011
Document	Programmamanagement bij Waterschap Zuiderzeeland	T.A. Wendt	09-2011
Presentation	Projectplan Implementatie Assetmanagement bij SWK	H. Strikwerda	12-2011
Document	Waterschap Zuiderzeeland, Actualisatie Risicoprofiel & bepaling weerstandscapaciteit	AON	04-06-2012
Document	Memo Assets werkprocessen	L. Cooman	20-06-2012
Document	Watersysteembeheer, catalogus 2009-2010	Waterschap Zuiderzeeland	07-2012
Document	Implementatie Assetmanagement bij SWK, Dashboards & Data op orde	H. Strikwerda, M. van den Boomen	27-07-2012

Presentation	Eindresultaten Implementatie Assetmanagement bij SWK	Waterschap Zuiderzeeland	27-08-2012
Document	Nota risicobeleid	Waterschap Zuiderzeeland	26-01-2013
Document	Water werkt, Een nieuwe organisatiestructuur voor Waterschap Zuiderzeeland	Waterschap Zuiderzeeland	28-03-2013
Document	Effectmonitor 2012	T.A. Wendt, J. Janson	24-09-2013
Document	Samenvatting effectmonitor 2012	Waterschap Zuiderzeeland	24-09-2013
Document	Afdelingsontwikkelplan 2014-2017, afdeling Waterbeheer	J. Visser, H. Ticheler	05-2014
Document	Algemene vergadering, agendapunt Kaders en uitgangspunten Samen beter Werken	B. van der Stege	08-07-2014
Document	Review MJOP 2015-2018, watergangen landelijk gebied Zuiderzeeland	J. Mies	30-10-2014
Document	Meerjarenbegroting 2015-2018	Waterschap Zuiderzeeland	25-11-2014
Document	Transport- en Zuiveringsplan 2015-2019	L.A. van Efferen, M.W. Kuiper	02-12-2014
Document	Bestuurlijke uitgangspunten Beheer en onderhoud Afvalwaterketen en Watersysteem	B.J. Wonink, R. de Bekker, H. Kuipers	01-2015
Document	Algemene vergadering, agendapunt Transport- en zuiveringplan 2015-2019	Waterschap Zuiderzeeland	27-01-2015
Document	Verslag algemene vergadering 27-1-2015	Waterschap Zuiderzeeland	27-01-2015
Document	Afdelingsplan/-rapportage 2015 – Afdeling Waterbeheer	Waterschap Zuiderzeeland	09-02-2015
Document	Jaarstukken 2014	Waterschap Zuiderzeeland	02-06-2015
Document	Meerjaren Onderhoudsplan Watergangen Landelijk Gebied 2016 - 2019	A.J. Wonink, H. Ticheler	08-2015
Document	Meerjaren Onderhoudsplan Watergangen Stedelijk Gebied 2016 - 2019	A.J. Wonink, H. Ticheler	08-2015
Document	Bestuursrapportage 2015	Waterschap Zuiderzeeland	27-10-2015
Document	Waterbeheerplan 2016-2021, het waterschap midden in de maatschappij	Waterschap Zuiderzeeland	27-10-2015
Document	Asset Management voor afvalwatertransportleidingen	Waterschapsbedrijf Limburg	11-2015
Document	Meerjarenbegroting 2016-2019	Waterschap Zuiderzeeland	24-11-2015
Document	Meerjaren Onderhouds- en Investeringsplan Kunstwerken 2016 - 2019	A.J. Wonink, H. Ticheler	12-2015
Document	Werkwijze projectmatig werken, waterschap Zuiderzeeland (versie 1.1	Waterschap Zuiderzeeland	10-12-2015
Document	Afdelingsplan/-rapportage 2016 – Afdeling Zuiveringen & Gemalen	Waterschap Zuiderzeeland	01-01-2016
Document	Resultaten effect monitor waterschap Zuiderzeeland 2015	Arcadis	10-05-2016
Document	Jaarstukken 2015	Waterschap Zuiderzeeland	10-05-2016
Document	Voorjaarsnota 2017-2020	Waterschap Zuiderzeeland	31-05-2016
Document	Werkwijze voor beleidsmonitoring: het monitoren van effecten en resultaten	Hiemstra en de Vries	-

Objectives of the regional water authorities

In the tables below, one can find the objectives, program objectives and some examples of the tactical objectives for the two regional water authorities (Dutch). Moreover, the tables below also describe some examples of performance indicators that are used to monitor the program objectives.

Regional water authority Vechtstromen

Programs	Strategic (long-term) objectives	Progam (mid-term) objectives, also called themes	Tactical objectives/the efforts that will be made
Watersysteem	Samen zorgen voor een veilige leefomgeving met de juiste hoeveelheid water van een goede kwaliteit met inachtneming van de natuurlijke kenmerken van het systeem	Vechtstromen stelt zich ten doel om te zorgen voor waterveiligheid, zodat inwoners veilig kunnen wonen, werken en recreëren.	We voorkomen overstromingen door instandhouding (regionale) keringen en kunstwerken conform het vigerende beschermingsniveau.
			We voorkomen wateroverlast vanuit het regionale systeem door middel van verbetering en instandhouding van overige keringen
			We organiseren een effectieve crisisorganisatie.
			We vergroten het bewustzijn en eigen verantwoordelijkheid van inwoners, overheid en bedrijven bij wateroverlast en overstromingen.
		Vechtstromen stelt zich ten doel om het overgrote deel van de tijd de beschikbare hoeveelheid water overeen te laten stemmen met de wensen van de gebruikers, mits doelmatig en met inachtneming van de natuurlijke kenmerken van het beheergebied.	We beheren en onderhouden ons systeem goed door baggeren van watergangen en renovatie van kunstwerken.
			We werken in normale omstandigheden aan een doeltreffend en doelmatig waterbeheer gericht op optimaal functiegebruik.
			We willen watertekort in droge omstandigheden zo lang mogelijk voorkomen.
			We willen wateroverlast in natte omstandigheden zoveel mogelijk voorkomen.
		Vechtstromen streeft naar een goede kwaliteit van water als voorwaarde voor een goede volksgezondheid en voor een goed functionerende landbouw, industrie en natuur.	We zorgen voor een goede ecologische kwaliteit van het oppervlaktewater.
			We zorgen voor een chemische kwaliteit die de ecologie en het gebruik van het oppervlaktewater niet belemmert.
			We zorgen voor een goede kwaliteit voor grondwater, stedelijk water, zwemwater en waardevolle wateren.
Waterketen	Samen met onze partners in de waterkringloop verrichten wij op duurzame wijze de publieke zuiveringstaak.	Samen met partners een klimaatbestendige afvalwaterketen en een zo duurzaam mogelijke, veilige afvalwaterzuivering realiseren.	We zorgen voor een effectieve en efficiënte (afval)waterketen door partnerschappen met gemeenten en andere partijen.
			We zorgen voor een effectieve en efficiënte behandeling van afvalwater met veilige installaties voor een bijdrage aan een goede volksgezondheid en een schoon watersysteem.
			We leveren een bijdrage aan een meer circulaire economie door samen met bedrijven en andere partners te werken aan het terugwinnen van energie en grondstoffen uit afvalwater.
Besturen en organiseren	We zijn een duurzame, innovatieve en lerende organisatie die - samen met partners en belanghebbenden - de ambities bepaalt, waarbij maatschappelijk belang en goed werkgeverschap centraal staan	Onze ambities samen met partners en belanghebbenden bepalen/ realiseren, waarbij maatschappelijke waarde voorop staat	We verbeteren onze samenwerkingsgerichtheid richting partners en belanghebbenden.
			We verbeteren de herkenbaarheid en dienstverlening naar onze omgeving.
		Onze taken uitvoeren vanuit een lerende/innovatieve organisatie, die uitgaat van goed werkgeverschap.	We richten onze bedrijfsprocessen zo effectief en efficiënt mogelijk in.
			We versterken ons innovatief/lerend vermogen.
			We faciliteren de duurzame inzetbaarheid van onze medewerkers

***Table 7 Strategic, program and tactical objectives at regional water authority Zuiderzeeland. Derived from their muti-year budget 2017-2020 and water management plan 2016-2021* (Waterschap Vechtstromen, 2015, 2016)**

Regional water authority Zuiderzeeland

Programs	Strategic (long-term) objectives	Progam (mid-term) objectives, also called themes	Examples of interventions (Zuiderzeeland defined multiple interventions for each mid-term objective. Therefore, only a selection is presented here)
waterveiligheid	In het beheergebied van Waterschap Zuiderzeeland is de waterveiligheid gewaarborgd, zodat de inwoners van Flevoland veilig kunnen wonen, werken en recreëren.	Alle waterkeringen in het beheergebied zijn en blijven in goede staat.	Het waterschap voert periodieke onderhouds-,inspectie- en schadeherstelwerkzaamheden uit.
		Het waterschap beschikt over een goed kader om te beoordelen welke activiteiten op en rond de dijken verenigbaar zijn met het belang van waterveiligheid.	In 2018 evalueren en waar nodig aanpassen van het beleid waterkeringen en medegebruik.
		Uiterlijk 2021 is de versterkingsopgave op basis van de toetsing in 2011 opgenomen in het landelijke hoogwaterbeschermingsprogramma.	Het waterschap spant zich in om de versterkingsopgave van de primaire waterkeringen op grond van de derde toetsing in 2011 te programmeren in het landelijke hoogwaterbeschermingsprogramma.
		Uiterlijk 2021 is de Deltabeslissing Waterveiligheid in Flevoland geïmplementeerd.	Uiterlijk 2021 toetst het waterschap alle primaire waterkeringen aan de nieuwe veiligheidsnormen en brengt versterkingsmaatregelen in beeld.
		De regionale buitendijkse keringen voldoen aan de provinciale veiligheidsnorm uit de Verordening voor de fysieke leefomgeving Flevoland. Vier jaar na de wettelijke verankering van de Deltabeslissing Waterveiligheid voldoet de Knardijk aan de provinciale veiligheidsnorm.	In 2018 toetst het waterschap de regionale buitendijkse gebieden waarvoor de zorgtaak al is geïmplementeerd aan de provinciale veiligheidsnorm. Voldoen deze keringen niet, dan ziet het waterschap er op toe dat ze aan de provinciale veiligheidsnormen gaan voldoen.
			Het waterschap zorgt ervoor dat alle door de provincie aangewezen regionale buitendijkse keringen in 2018 voldoen aan de eisen zoals gesteld in de Verordening voor de fysieke leefomgeving Flevoland.
		Het waterschap is voorbereid op calamiteiten bij waterkeringen.	Het waterschap zorgt voor een actueel bestrijdingsplan voor hoog water. Jaarlijks voert het waterschap een calamiteitenoefening uit.
Voldoende water	Het waterschap stemt het waterbeheer optimaal af op de gewenste functies en draagt zorg voor goede afwatering en doorstroming in het beheergebied.	Het samenhangende stelsel van watersysteem, gemalen en kunstwerken functioneert goed.	De zorgplicht wordt vervult voor het watersysteem door de legger actueel te houden en door planmatig beheer en onderhoud van het watersysteem, de gemalen en de kunstwerken.
			Het waterschap start in 2016 met het opbouwen van een beheerregister watergangen.
			In 2018 verkent het waterschap de mogelijkheden van flexibeler peilbeheer.
			In 2016 verkent het waterschap mogelijkheden om het energieverbruik van de gemalen te verlagen en/of te verduurzamen.
		Het operationeel grondwaterbeheer is op orde.	Het Waterschap reguleert grondwateronttrekkingen
		Het waterschap levert een bijdrage aan het vergroten van de belevingswaarde van het watersysteem.	Het waterschap stimuleert het medegebruik van het watersysteem door inzet van het fonds medegebruik.
	Het waterschap wil een robuust watersysteem, waar bij de schade als gevolg van wateroverlast zo veel mogelijk wordt voorkomen en waarbij geanticipeerd wordt op langetermijneffecten van bodemdaling en klimaatverandering	Het watersysteem voldoet aan de inundatienorm.	Het waterschap heeft en houdt zicht op de kans op wateroverlast via een zesjaarlijkse toetsing.
		Het waterschap werkt continu aan borgen en waar mogelijk vergroten van het waterbergend vermogen van het systeem	Uiterlijk 2021 legt het waterschap, al dan niet in samenwerking met gebiedspartijen, 40% natuurvriendelijke en/of duurzame oevers aan langs de waterlichamen 'tochten' in Flevoland.
			Het waterschap verkent in 2016 mogelijkheden om de knelpunten voor wateroverlast te beperken door water in hogere delen van het peilvak vast te houden.
		Waterschap Zuiderzeeland is voorbereid op situaties met (dreigende) wateroverlast.	Het waterschap beschikt over een actueel calamiteitenplan voor wateroverlast en formuleert daarbinnen in 2018 een strategie voor de inzet van noodpompen
	Het waterschap wil een robuust watersysteem, waarbij de schades als gevolg van watertekorten zo veel mogelijk wordt voorkomen en waarbij geanticipeerd wordt op langetermijneffecten van klimaatverandering.	Het waterschap streeft op basis van een kosten/batenafweging naar het zo optimaal mogelijk voorkomen van droogteschade.	Het waterschap werkt in 2016 het voorzieningenniveau uit, zodat gebruikers van zoet water weten waarop ze mogen rekenen.
			Het waterschap verkent in 2016 de mogelijkheden om de inlaat van water vanuit omliggende Rijkswateren te optimaliseren, onder meer door het intern verdelen en vasthouden van water.
Schoon water	Het beheergebied van het waterschap biedt goede leef-, verblijf- en voortplantingsmogelijkheden voor de inheemse aquatische flora en fauna.	Uiterlijk in 2021 heeft het waterschap de inrichtingsmaatregelen uitgevoerd die nodig zijn om de regionaal vastgestelde KRW-doelen voor de ecologische waterkwaliteit van oppervlaktelichamen te bereiken.	Uiterlijk 2021 legt het waterschap, al dan niet in samenwerking met gebiedspartijen, 40% natuurvriendelijke en/of duurzame oevers aan langs de waterlichamen 'tochten' in Flevoland.
			Uiterlijk 2021 legt het waterschap een vispassage aan voor soorten die van de Rijkswateren naar de Noordoostpolder trekken.

		In 2021 is de visserij op aal in het beheergebied van het waterschap verduurzaamd.	Het waterschap onderzoekt voor 2017 samen met de beroepsvisserij hoe de aalvisserij in het beheergebied te verduurzamen is. In overleg met de sector worden de noodzakelijke maatregelen uitgevoerd.
		De inrichting en het beheer van de watergangen in Flevoland zijn gericht op het tegengaan van vestiging en verspreiding van exoten. De nadruk ligt hierbij op invasieve exoten.	Vanaf 2016 gaat het waterschap het bewust en onbewust uitzetten van exoten en de verspreiding ervan zoveel mogelijk tegen
		In 2019 zijn voor de oppervlaktewateren die niet vallen onder het regime van KRW ecologische doelen afgeleid	In de periode tot en met 2019 leidt het waterschap, samen met de betrokken gebiedspartners, regionale (ecologische) doelen af voor de niet-KRW waterlichamen.
		Om effecten op de zuurstofhuishouding te voorkomen, wordt maaisel dat vrijkomt bij het beheer en onderhoud van het natte profiel van de watergangen zo snel mogelijk uit de watergang verwijderd.	Voor 2018 onderzoekt het waterschap hoe het maaisel, dat in landelijk gebied vrijkomt uit het natte profiel van de watergangen, zo snel mogelijk kan worden verwijderd.
	De chemische toestand van de oppervlaktewateren vormt geen belemmering voor ecologie en gebruiksfuncties van water	Alle oppervlaktewateren in het beheergebied voldoen aan de nationale en Europese normen voor chemische waterkwaliteit en aan de regionale doelen voor fysische chemische parameters.	Uiterlijk eind 2018 implementeert het waterschap de nieuwe prioritaire stoffenrichtlijn in het monitoringsprogramma.
		In 2019 is bekend in hoeverre bacteriën die resistent zijn voor antibiotica voorkomen in de watersystemen in Flevoland en of ze gevolgen hebben voor de waterkwaliteit.	Uiterlijk 2018 inventariseert het waterschap het vóórkomen van resistente bacteriën en relevante emissiebronnen van resistente bacteriën in zijn beheergebied.
		In 2021 is bekend of microplastics een bedreiging vormen voor de waterkwaliteit in Flevoland.	Uiterlijk 2020 inventariseert het waterschap het vóórkomen van microplastics, relevante emissiebronnen van microplastics en risico's in zijn beheergebied.
		In 2021 is er een structurele samenwerking tussen producenten, gebruikers, provincie, waterschap en onderzoeksinstituten, gericht op het beperken van emissies van geneesmiddelen voor mens en dier en andere probleemstoffen.	Het waterschap zet gedurende de planperiode in op het terugdringen van zwerfvuil in en langs het water.
		Waterschap Zuiderzeeland faciliteert de uitvoering van het Actieplan Bodem en Water en levert daarmee een bijdrage aan de door LTO nagestreefde 80% reductie van de emissies van gewasbeschermingsmiddelen en nutriënten.	Voor 2021 stelt het waterschap water- en nutriëntenbalansen op voor de verschillende afdelingen in de Noordoostpolder en Zuidelijk en Oostelijk Flevoland.
		In 2019 zijn voor de oppervlaktewateren die niet vallen onder het regime van de KRW regionale doelen afgeleid voor de fysisch-chemische parameters, inclusief nutriënten.	In de periode tot en met 2019 leidt het waterschap, in samenspraak met de betrokken gebiedspartners, voor de niet-KRW waterlichamen regionale doelen af voor fysisch-chemische parameters, inclusief nutriënten.
		De binnendijkse zwemwaterlocaties binnen het beheergebied van het waterschap voldoen aan de eisen van de Europese zwemwaterrichtlijn.	Aan de hand van zwemwaterprofielen volgt het waterschap de zwemwaterkwaliteit en neemt zo mogelijk maatregelen om de waterkwaliteit op de zwemwaterlocaties te verbeteren.
	Het afvalwatersysteem is robuust, het beheer is doelmatig en het systeem is duurzaam ingericht.	De hydraulische en de biologische capaciteit van het afvalwatersysteem zijn op orde.	Het waterschap actualiseert in 2018 het Transport- en Zuiveringsplan
		De emissies vanuit het afvalwatersysteem voldoen aan de lozings- en milieu-eisen zoals opgenomen in het Activiteitenbesluit milieubeheer.	Het waterschap voert t/m 2021 voor alle zuiveringskringen/gemeenten de tweede generatie optimalisatiestudies uit en legt de afspraken vast.
		Het beheer van het afvalwatersysteem is op orde.	Uiterlijk in 2018 brengt het waterschap de kosten en baten van de verwijdering van nutriënten en medicijnresten op de AWZI's in beeld.
		De afvalwaterketen is doelmatig en efficiënt.	Het waterschap voert het maatregelprogramma (2014 t/m 2020) uit dat is opgesteld in de samenwerking afvalwaterketen Flevoland voor het behalen van de financiële doelstelling uit het regionaal bestuursakkoord water.
			Het waterschap zet gedurende de planperiode de invoering van assetmanagement voort.

			Het waterschap stelt in 2016 beleidsregels op voor het stabiel houden van het aanbod van afvalwater naar de zuivering.
		Duurzaam omgaan met energie en grondstoffen aanwezig in het afvalwatersysteem en klimaatbestendige inrichting.	Het waterschap neemt gedurende de planperiode maatregelen die ertoe bijdragen dat de afvalwaterketen in 2035 100% zelfvoorzienend is. Daarmee geeft het waterschap invulling aan de energiestrategie.
Programma algemeen	Als dienstverlenende en meedenkende partner die de belangen van het water behartigt, gaat het waterschap weloverwogen om met maatschappelijke belangen en de belangen van derden. Het bestuur van het waterschap handelt open en transparant en staat in verbinding met de samenleving. We stellen de relatie met inwoners en bedrijven in ons gebied centraal en geven hier verder betekenis en invulling aan.	Het waterschap is een excellente dienstverlener.	a) Uiterlijk in 2017 hebben we inzicht in onze inhoudelijke, bestuurlijke en organisatorische opgaven richting de toekomst (scope tot 2045) b) Het waterschap gaat in de periode tot 2019 haar vergunningverleningproces op een makkelijke manier toegankelijk maken voor inwoners en bedrijven. c) Het waterschap zorgt voor een actueel bestrijdingsplan voor hoog water. Jaarlijks voert het waterschap een calamiteitenoefening uit. d) Voor 2018 zorgt het waterschap voor duidelijkheid onder eigenaren, gebruikers en mede-overheden in de buitendijkse gebieden over de rolverdeling bij calamiteiten. Hiertoe start het waterschap in 2016 een dialoog met deze partijen. e) Het waterschap beschikt over een actueel calamiteitenplan voor wateroverlast en formuleert daarbinnen in 2018 een strategie voor de inzet van noodpompen.
		Het waterschap is een open, transparante en betrouwbare overheidsorganisatie.	
		Het waterschap treedt in zijn rol van vergunningverlener en toezichthouder op als regisseur en meedenker.	
		Het waterschap gaat weloverwogen om met maatschappelijke belangen	
		Het waterschap is voorbereid op calamiteiten bij waterkeringen.	
		Waterschap Zuiderzeeland is voorbereid op situaties met (dreigende) wateroverlast.	
	Waterschap Zuiderzeeland is een flexibele organisatie, die zich actief beweegt in de veranderende omgeving. De omgeving ziet het waterschap als een inspirerende partner, waar men graag mee wil samenwerken. Het waterschap heeft oog voor de belangen van de omgeving en draagt bij aan de verbetering van de kwaliteit van de leefomgeving. Het waterschap biedt ruimte voor het generen van ideeën en het stimuleert toepassingsgerichte innovatie die leidt tot meer efficiency, kwaliteit en duurzaamheid.	Het waterschap stimuleert duurzame ontwikkeling en handelt innovatief en ondernemend.	a) Het waterschap geeft uitvoering aan het innovatieprogramma. b) Het waterschap geeft samenwerking vorm vanuit een zelfbewuste houding. c) Het waterschap wil zich in de komende planperiode via de Dutch Water Authorities zowel in binnen als buitenland nadrukkelijker positioneren op het gebied van internationale samenwerking. d) Het waterschap gaat de dialoog aan met verschillende groepen in de samenleving. c) Het waterschap vergroot haar taak- en naamsbekendheid
		Het waterschap is een herkenbare en betrokken partner in de samenleving en creëert maatschappelijke meerwaarde.	
		Het waterschap werkt aan vergroting van het waterbewustzijn.	
	Het Waterschap Zuiderzeeland streeft naar een toekomstbestendige ruimtelijke inrichting van Flevoland.	Water wordt vroegtijdig en integraal meegenomen in ruimtelijke planprocessen.	Het waterschap streeft naar tijdig signaleren van en inspelen op ruimtelijke initiatieven.
			Het waterschap heeft haar rol in het stedelijk gebied uiterlijk in 2018 geprofessionaliseerd.
			Het waterschap geeft, uiterlijk in 2019, vorm aan en neemt deel aan participatieve beleids- en plantrajecten.
	Waterschap Zuiderzeeland zorgt voor een optimale inzet van mensen en middelen om de gestelde doelen te realiseren. Het waterschap streeft naar het behouden van zijn financieel gezonde positie. Dit doet het waterschap vanuit een transparant en maatschappelijk aanvaardbaar financieel beleid. Het waterschap, als moderne werkgever, investeert in zijn medewerkers zodat hun toegevoegde waarde optimaal benut wordt.	Zuiderzeeland is een gezonde modern organisatie met betrokken, vakbekwame medewerkers.	-
		Zuiderzeeland staat bekend als interessante werkgever bij potentiële werknemers.	-
		Het waterschap streeft naar een maatschappelijk verantwoord evenwicht tussen ambitie en lastenniveau op lange termijn.	Uiterlijk in 2017 wordt het reservebeleid van Waterschap Zuiderzeeland geëvalueerd en indien nodig herzien.
		Het waterschap ontsluit zijn kennis en informatie op een veilige, toegankelijke en transparante manier	Het waterschap gaat informatiewensen en –behoeften meer gestructureerd in kaart brengen, ordenen en van een prioriteit voorzien.

Table 8 Strategic, program and (examples of) tactical objectives at regional water authority Zuiderzeeland. Derived from their muti-year budget 2016-2019 and water management plan 2016-2021 (Waterschap Zuiderzeeland, 2015b, 2015c)

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