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The Governance Challenge of Ecological Restoration Projects in Estuarine Areas

A research on conditions for a successful implementation process of ecological restoration projects in estuarine areas protected by hard coastal defence structures

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Master Thesis

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Preface

In front of you is the Masterthesis '*The Governance Challenge of Ecological Restoration Projects in Estuarine Areas*'. The study focused on which conditions are necessary for a successful development and implementation process of ecological restoration projects in estuarine areas protected by hard coastal defence structures. The Haringvliet and the proposed change in the management of the sluices was analysed in depth. This thesis could be regarded as the concluding chapter of my Master's programme Sustainable Development: Earth System Governance at the University Utrecht. The thesis is an independent research as part of an internship at WWF – The Netherlands in Zeist.

Writing a thesis as the final part of a study is always an enervating experience. It was exciting to delve into a topic of interest and to perform an in-depth research which has contributed in broadening my own perspective on ecological restoration practices and the Haringvliet case. There were some minor hurdles, related to acquiring data, that had to be cleared during the research, however at the end everything turned out well.

I want to thank my supervisor Carel Dieperink for his help and his time to discuss questions and other relevant aspects during the whole process of the research. At the same time, I want to acknowledge WWF – The Netherlands for offering the opportunity to combine the writing of my Masterthesis with a research internship at their organisation. At WWF, I am especially thankful for the support of my supervisor Bas Roels for the brainstorm- and feedbacksessions and the help of Natascha Zwaal during the starting phase of my thesis. Also, I want to thank the Fresh Water Unit for their hospitality during my visits at the head office.

Several interviews were part of the research in order to collect data. I want to thank the experts I have spoken to for their time, openness and the pleasant conversations. They have provided me with useful information for the further course of the research. The research would have lacked important insight without their additions.

Lastly, I would like to thank my family and close friends that have supported me during the process of writing the thesis.

I hope you will enjoy reading this Masterthesis.

Yannick Buitenhuis

Utrecht, 31 juli 2017

Summary

Dynamic natural processes have resulted in unique environments such as estuaries. These are semi-enclosed coastal bodies of water where salt water of the sea meets the fresh water of the river. Estuarine areas are characterised by dynamic natural processes that made it possible for valuable ecosystems with high biodiversity to develop. The delta areas grew out to become densely populated areas with a lot of socio-economic values. This led to the construction of hard coastal defence structures - conventional engineered solutions constructed with 'hard materials' – to protect the area from water related risks.

A negative consequence of the construction of these hard coastal defence structures was that they interfere with the natural dynamics and ecosystems of the estuarine area. The nature of estuaries are put under human induced pressures leading to ecological degradation of the area, from which the loss of habitat is a major problem (Airoldi et al., 2005; Borja et al., 2010; Ducrotoy, 2010; Smits et al., 2006). Ecological degradation of nature in estuaries has increased the need for ecological restoration practices, in which humans try to assist the recovery of the ecosystems (Clewell & Aronson, 2013; Elliot et al., 2007; France, 2016; Worhley et al, 2013).

The ecological restoration of estuarine areas is, however, recognised as a great challenge. The reasons being that there is a lack of scientific knowledge regarding ecological restoration of estuarine areas negatively influenced by hard coastal defence structures. At the same time, estuaries are characterised by different issues, multiple actors with their own interests, and decision making on several interacting levels. This brings conflicts in interests and policy debates that slow down the realisation of the project. Knowledge is missing on how ecological restoration of estuaries are influenced by governance procedures. There is a lack of information on how ecological restoration projects in estuarine areas can be successfully developed and implemented to restore the damage inflicted by the construction of hard coastal defence structures.

The objective of the research is therefore to contribute in solving the knowledge gap on the governance process related to the development and implementation process of ecological restoration in estuaries. The knowledge can contribute to the reduction of ecological degradation in estuarine areas protected by hard coastal defence structures. The research led to a set of recommendations that could assist with future ecological restoration projects. The following research question was formulated to reach this objective: *"What are relevant governance conditions for a successful development and implementation process of ecological restoration projects in estuarine areas protected by hard coastal defence structures?"*

The research led to a framework with a set of relevant success conditions for the implementation of ecological restoration projects in estuarine areas. The identified success conditions can support participants in the implementation of ecological restoration projects. The objective was reached by performing a literature study that led to the identification of a set of theoretical conditions for successful development and implementation of ecological restoration projects in estuarine areas. These theoretical conditions were: (1) Experimentation; (2) Communication; (3) Role of key individuals; (4) Project support (5) Active stakeholder & knowledge integration. The theoretical conditions were then assessed against a single case study on the Haringvliet and several expert interviews.

The analysis of the Haringvliet case provided an detailed insight in the process. The Haringvliet case was dominated by inertia: it took several decades before the management of the sluices is being changed as a step to restore the estuarine dynamics and the routes of migratory fish species. The change conflicted with socio-economic interests of regional stakeholders. The process was therefore characterised by years of resistance, discussions and a search for consensus that overshadowed the whole development and implementation process. The analysis showed that the development and implementation process of the ecological restoration in the Haringvliet was deficient. Moreover, most of the success conditions were missing in the process.

The analyses of the Haringvliet case and the expert interviews provided insights in the relevance of the five conditions. The relevance of the five conditions were assessed and led to the following results:

Most relevant: *Active stakeholder & knowledge integration; Project support; Communication.*
Reason: Stakeholders have great impact on ecological restoration projects and determine the progression of the process. Stakeholders determine their position based on their interests. Communication leads to understanding the interests, the integration secures the interests and if the interests are well represented it is translated in support. These three conditions are able to influence the satisfaction the stakeholders have with the project and are able to manage this in favour of the project.

Moderately relevant: *Role of key individuals*
Reason: The characteristic of this person are of value, but are not useable if the individual is not placed on a critical position. The position should provide key access to other stakeholders and influence on the internal setting of the organisation. Key individuals could possibly assist the previous mentioned conditions, but its relevancy therefore decreases when the three previous conditions are already widely present.

Slightly relevant: *Experimentation*
Reason: Experimentation may indeed lead to new findings during the implementation of ecological restoration projects, but an experimental approach may further complicate an already difficult process. Experimentation has demanding requirements that are difficult to meet in complex water systems as estuaries. The positive influence the condition of experimentation could bring was questionable, because it could negatively affect the support for the project.

The analyses also indicated that conditions such as external events, the political setting and the complexity of the project have influence on the implementation process of the ecological restoration project.

A set of recommendations was formulated on base of the research. The recommendations are as follows:

- Perform a research on the area the ecological restoration targets before the start. The research provides geographical context and should lead to the understanding of regional sentiments. This allows to anticipate on these factors and adapt the governance strategies accordingly
- Facilitate multiple small meetings with different individual stakeholders to actively involve them in an interactive workshop. The workshop is designed around a constructive interaction process. The small meetings will contribute to the three most relevant conditions: communication, active integration and project support
- The development and implementation process of the ecological restoration project should be kept in a journal. The journal allows to critically reflect on the process. Moreover, the lessons learned are saved and can be shared.
- The development and implementation process should be accompanied by an independent coordinator that leads the whole process.
- The planning of ecological restoration needs to be on landscape scale, however make use of multiple small scale projects that succeed each other and are still able to cover the large scale target area.

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Chapter 1 | Introduction

1.1 Estuarine areas under pressure

Thousands of years of geological development have formed river deltas to what they currently are. The effects of natural forces coming from rivers on the one side, and on the other side marine influences, like waves, tides and sea level stabilisation, have created dynamic systems where a river meets the sea (NWP, 2014). Natural processes have characterised deltas with unique environments, like estuaries alongside the coast (Paalvast & Van der Velde, 2014). Estuaries are regarded as semi-enclosed coastal bodies of water that are (periodically) connected to the sea. The salinity of the water is unique, since the salt seawater is mixed with fresh water inputs from the river or evaporation (Scanes et al., 2017). Regular physical and chemical change due to sedimentation processes and distribution from the rivers and sea in combination with salinity, tidal and turbidity fluctuations and gradients characterise estuaries. These characteristics allowed estuaries to develop into valuable natural environments with dynamic ecosystems that provide high biodiversity (Ducrotoy, 2008; Ducrotoy, 2010; NWP, 2014; Paalvast & Van der Velde, 2014; Scanes et al., 2017).

Deltas are not only valuable for nature, they are also of socio-economic importance (Ducrotoy, 2010; NWP, 2014). In the past, delta areas were favoured for settlement, because of the presence of fertile land for food production, water and energy resources. River deltas therefore grew out to become densely populated areas with the presence of major cities, industrial areas and harbours, and agricultural areas (Ericson et al., 2006; NWP, 2014; Syvitski & Saito, 2007). Coastal and flood protection measurements became necessary to protect the large concentration of people and their economic activities (Airoldi et al., 2005). These anthropogenic pressures negatively influence the natural dynamics and ecosystems of the river deltas and estuaries. One of these pressures is the construction of hard coastal defence structures: these are conventional engineered solutions constructed with ‘hard materials’ (concrete, metal or stone) to reduce the risks of flooding and land loss due to erosion and sea encroachment (e.g. sea walls, barriers and dikes) (Temmerman et al., 2013; Dorset Coast Forum, 2010).

The construction of these coastal defence structures has severe ecological implications (Airoldi et al., 2005; Borja et al., 2010). This human intervention causes degradation or the loss of freshwater habitats. The result is that the average abundance of populations monitored in freshwater habitats declined by 81% for the period 1970-2012 (WWF, 2016). It is even argued that freshwater species are higher threatened by the risk of extinction then terrestrial species (Collen et al., 2004). In case of estuaries, habitat loss is one of the worst problems that is observed (Ducrotoy, 2010). The nature of estuaries in river deltas are thus put under pressure due to human interference leading to ecological degradation, but also the ability to provide ecosystem functions that are of value for humans (Borja et al., 2010).

Estuaries that are subjected to denaturalisation by means of coastal defence structures led to major loss of habitats and thus ecological degradation. The need for ecological restoration practices for estuarine areas therefore increased (Elliot et al., 2007; France, 2016). Ecological restoration is defined as ‘*the process of assisting the recovery of an ecosystem that has been degraded, damaged or destroyed’* (Clewell & Aronson, 2013, p.3; Worthly et al, 2013, p.538;). Ecological restoration practices are attempts of humans to intervene in degraded ecosystems to protect natural characteristic that are valued. The involvement of humans and their values are implicit fundamentals of ecological restoration (Schackelford et al., 2013). It is seen as a management strategy – an intentional and practical activity done by humans – that has the potential to recover degraded ecology and restore natural dynamics in the area (Apfelbaum & Chapman, 2015; Atkinson, 1994; Friberg, et al., 2017). It is therefore that managers of coastal areas are beginning to see the potential and possibilities offered by undertaking ecological restoration activities in estuaries (France, 2016).

1.2 Problem definition

Ecological motives minimally played a role when it was decided to construct coastal defence structures in river deltas (Nienhuis, 2008). Construction of coastal defence structures in estuaries majorly reduce the estuarine area (Paalvast & Van der Velde, 2014; Storm et al., 2006). It leads to negative effects on the natural dynamics and changes in the ecosystem and habitats of the area (Airoldi et al., 2005;

Ducrotoy, 2010; Rambonilaza et al., 2016). The ecological zoning patterns of estuaries are destroyed, estuarine habitats deteriorate and are disconnected from each other, and migration routes for certain fish species are disrupted due to the construction of coastal defence structures in estuaries (Van Meerkerk et al, 2013; Nienhuis, 2008; Smits et al., 2006; Ysebaert et al., 2016). For a lot of species, such as fish and migratory birds, the quality and the connectivity of the habitats are essential for '*their life cycles and fulfil important nursery, feeding, or reproductive functions'* (Ysebaert et al., 2016, pp. 46). The natural habitats were replaced by man-made habitats leading to changes in biodiversity (Smits et al., 2006). The construction of these coastal defence structures result in major damage to the ecological systems of estuaries (Airoldi et al., 2005; Ducrotoy, 2010). To solve this problem there is a need for the implementation of practices that restore the ecological system of these estuaries.

The recovery of the ecological system by means of ecological restoration practices in estuarine areas is, however, recognised as a great challenge (France, 2016). The knowledge necessary to implement ecological restoration in estuaries is not fully researched yet. Both Airoldi et al. (2005) and Elliot et al. (2007) argued that, compared to the management of terrestrial systems to mitigate ecological degradation, less attention is given to the ecology of coastal and estuarine zones regarding consequences of urban development and the design of restoration projects, particularly the zones influenced by hard man-made structures. In addition, Van Wesenbeek et al. (2014) add that the environmental impact of coastal defence structures and possible environmental solutions in delta areas have received less attention than extensive damming in the upper or middle course of the rivers. There is a knowledge gap regarding the implementation of ecological restoration of estuaries in the scientific literature and therefore a need to expand the scientific knowledge on this topic.

At the same time, it is also challenging to implement ecological restoration practices in estuaries due to the complexity of estuaries as a system. Estuaries are characterised by different issues, multiple actors with their own views and goals, and decision making that takes place on several interacting levels (EMOVE, 2015). The implementation process for ecological restoration in estuaries thus involves also the search for collaboration between a wide array of people and organisations that care about the decision making process and the outcome of the ecological restoration project (Failling et al., 2013). The enhancement of specific socio-economic uses and traditional coastal defence measures (e.g. coastal defence structure as part of flood risk management and to keep land arable) are mostly preferred over ecological restoration practices. Simultaneously, the implementation of ecological restoration in estuaries is associated with conflict in interests and policy debates that slow down the implementation process (Atkins et al., 2010; Boerema & Meire, 2017; Lonsdale et al., 2015). The involvement and interplay of the different actors and their interests makes it important to understand ecological restoration activities as a form of governance (Richardson & Lefroy, 2016). Yet, social and political science has shown limited interest in ecological restoration practice, while literature on coastal and estuarine zones have examined topics as management and governance to a lesser extent (Baker et al., 2014; France, 2016). The effective development and implementation of ecological restoration projects is dependent on the governance procedures, however governance conditions for the successful development and implementation of ecological restoration in estuaries are not widely available. There is thus a lack of research that combines theory on ecological restoration in estuaries into the practice of forming governance strategies for the implementation of ecological restoration projects in estuaries.

The problem is thus that there is a lack of knowledge regarding the implementation of ecological restoration of estuaries to restore the damage on the ecological system as result of the construction of hard coastal defence structures and how ecological restoration projects can successfully be developed and implemented in estuaries. The research focuses therefore on the following question:

"What are relevant governance conditions for a successful development and implementation process of ecological restoration projects in estuarine areas protected by hard coastal defence structures?"

1.3 Research objectives

The objective of the research is to expand the knowledge on the practice of ecological restoration development and implementation in estuaries, primary with the presence of coastal defence structures, that can contribute to the reduction of environmental degradation in estuarine areas. The research leads to a framework with a set of relevant success conditions for the implementation of ecological restoration projects in estuarine areas that can support the decision making and implementation processes by functioning as guideline. The research aims to contribute in knowledge about the governance process and the conflicting interests (socio-economic versus ecologic) related to change in estuarine management due to ecological restoration projects. Lastly, the research will lead to recommendations to increase the success rate for the implementation of ecological restoration projects.

The objectives are reached by performing a literature study on scientific studies of ecological restoration practices in estuaries with coastal defence structures, in coastal areas and of general project management. This formed a theoretical basis that led to the identification of a set of theoretical conditions for successful implementation of ecological restoration projects in estuarine areas. This framework with conditions is used during a single case study (the Haringvliet). The analysis of the case led to an assessment of the theoretical conditions and are compared with expert interviews. These real-world insights are used to form a list of relevant success conditions for the development and implementation of ecological restoration projects in estuarine areas. The results were used to learn lessons on the the development and implementation of ecological restoration projects and eventually recommendations for future projects.

1.4 Relevance

Delta areas can be understood as dynamic systems consisting out a natural and societal element. The research is also relevant for both systems for several reasons.

First, estuaries are put under a lot of anthropogenic pressures and the construction of hard coastal defence structures lead to severe ecological implications for the natural area: habitat loss is a major problem in estuaries (Airoldi et al., 2005; Borja et al., 2010; Ducrotoy, 2010). Estuaries are thus increasingly in need to be ecologically restored to stop the loss of ecological value of these areas (Elliot et al., 2007; France, 2016). Moreover, the significance of ecological restoration as a mean to face biodiversity loss and climate change is growing and is more and more increasing in policy salience (Baker et al., 2014). This research is relevant because it provides information about how the negative ecological consequences of coastal defence structures can be reduced by contributing in knowledge on conditions that can lead to successful development and implementation of ecological restoration in estuaries.

The research is also scientifically relevant. The research aims to contribute in knowledge about the implementation of ecological restoration in estuaries in relation to hard coastal defence structures and how this can be implemented successfully. In section 1.2, it already became clear that this knowledge is not abundantly available yet. The research contributes by providing a literature study on ecological restoration in estuaries and coastal zones that gathers and increases the scientific knowledge on these topics. Moreover, it is argued that ecological restoration activities should thus be understood as a form of governance: it captures '*the multifactor, collaborative processes by which societies through governments and nonstate entities seek to achieve environmental outcomes'* (Richardson & Lefroy, 2016, p. 668). Baker et al. (2014) are also of opinion that a political science perspective is of value as the practice of ecological restoration is also a governance issue. Professional and institutional norms and location specific interests and values are being met during the process of ecological restoration. At the same time, these kinds of projects will give rise to social dispute and need to be organised in such a way to reduce possible conflict between environmental, cultural, economic and community interests (Baker et al., 2014). The inclusion of political or governance related science can provide insight to form *'new criteria for evaluating the success of ecological restoration'* (Baker et al., 2014, p.509). This research thus contributes by providing knowledge that combines governance with ecological restoration practices in estuaries to possibly improve effective development and implementation of restoration projects that are dependent on governance procedures.

The research can also be placed in the larger scientific debate of switching from conventional coastal engineering towards multi-functional coastal defence that keep ecological functions into account next to the primary function of flood protection (Evans et al., 2017). Conventional coastal engineering (e.g. the construction of dams, dikes or sea wall) is increasingly being understood as unsustainable due to having negative impacts on natural processes that lead to the disturbance of ecosystems, and the maintenance of these defence structures is continually necessary and increasing in costs (Temmerman et al., 2013; Van Wesenbeeck et al., 2014). Moreover, climate change and the uncertainty it brings regarding sea level rise and increasing peak river discharges led to further reconsideration of conventional coastal engineering as favourable solution to reduce the risks of floods (Temmerman et al., 2013; Van Wesenbeeck et al., 2014; Ysebaert et al., 2016). The idea is that by introducing natural processes and creating or restoring large coastal or delta ecosystem, the safety of the inland will increase, while also contributing to the solution for environmental degradation of these areas (Temmerman et al., 2013; Van Wesenbeeck et al., 2014; Ysebaert et al., 2016). The introduction of these ecological processes is increasingly being explored, however the introduction these more on nature focused coastal defence structures in deltas is still scarce (Temmerman et al. 2013). Further scientific analysis contributes to the knowledge of these changes in management and allows to find conditions that are necessary to make the process of implementation of this change successful.

The results of the research can be of use for several stakeholders. The stakeholders relevant for this study can be categorised as actors involved in estuarine management and the implementation of nature restoration projects. Firstly, there are the decision makers of governmental agencies responsible for the management of water and nature, and the practical enactment of ecological restoration. For these actors, it is interesting to have a list of success conditions which help with better development and implementation of ecological restoration projects. The research provides these actors with lessons on the procedure of introducing ecological restoration in estuaries and thus knowledge to possibly adapt their actions accordingly for the best results. In the Netherlands, these actors are the Ministry of Infrastructure & Environment and Rijkswaterstaat (national government), provinces, municipalities and the water boards. Secondly, the results are also of use for non-governmental stakeholders – environmental organisations, businesses (agricultural sector) and local inhabitants - that are involved in ecological restoration projects. For instance, regarding the Haringvliet case several environmental organisations (e.g. WWF) and local farmers are included in the ecological restoration project. The results are relevant for them, since it provides insight in the process of the development and implementation of the ecological restoration project, as well as conditions that should be included in the implementation. It provides a basis that allows these actors to use the framework of conditions to judge taken decisions regarding ecological restoration and therefore the possibility to advocate for the strengthening of certain conditions or their interests, or changes in the decision making process. In addition, both the governmental as non-governmental actors will profit from the recommendations that will be provided regarding successful implementation of ecological restoration in estuarine areas. Lastly, academics and other experts can have an interest in the results as a source of knowledge or basis for a new research.

1.5 Research framework & (sub) questions

"What are relevant governance conditions for the successful development and implementation process of ecological restoration projects in estuarine areas protected by hard coastal defence structures?"

A research framework is constructed that shows the process of the research (figure 1.1). Each of the steps in this process is complemented with a sub question that contributes to answering the central research question.

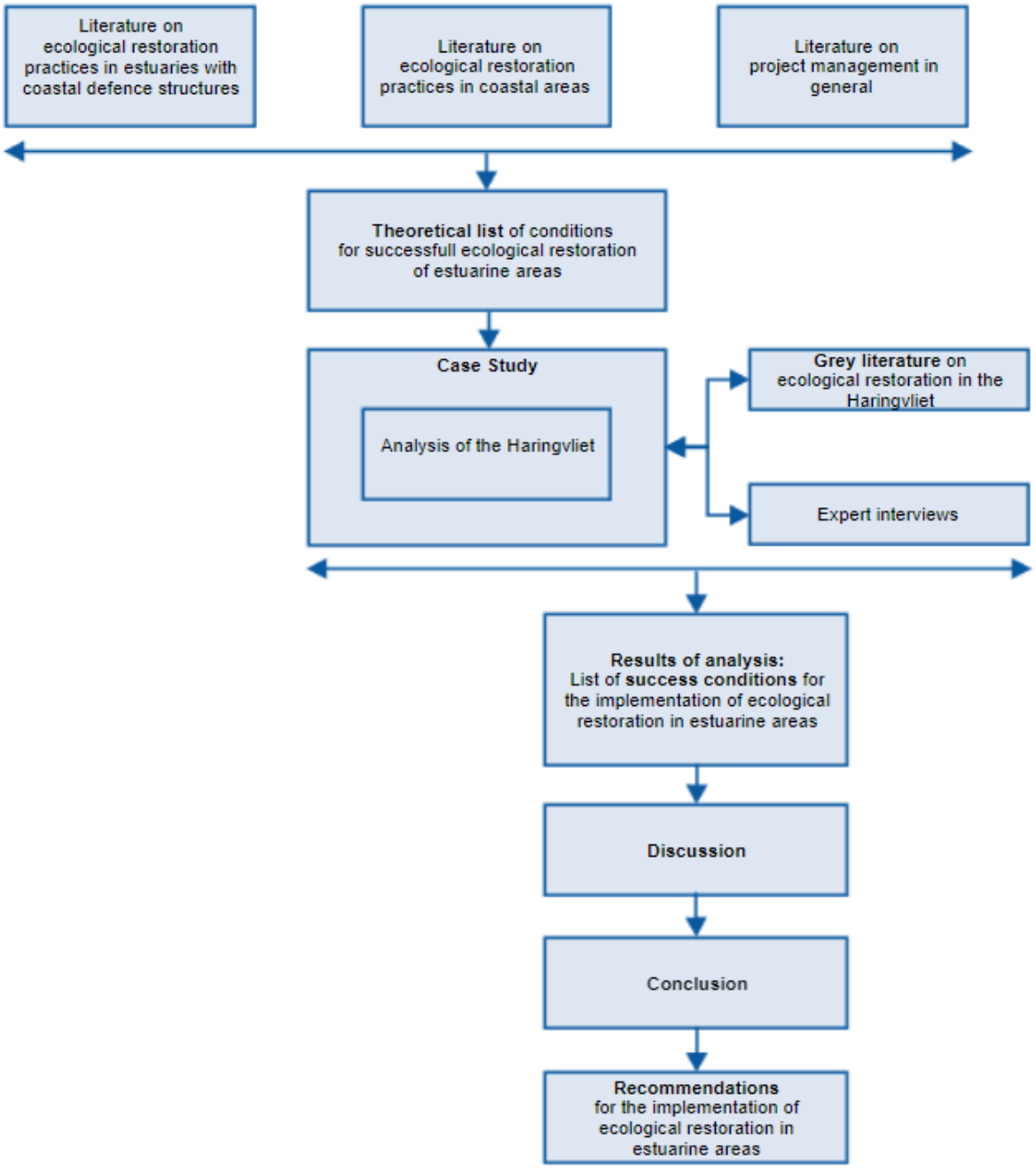


***Figure 1.1**: Research framework*

First, a theoretical basis is necessary to be able to answer the central research question. The first sub question followed from the first part of the research framework:

- What conditions are theoretically relevant for the implementation of ecological restoration projects?

This sub question will be answered using a literature study.

The theoretical basis will lead to a framework with theoretical conditions for successful implementation of ecological restoration projects in estuarine areas. This list will be used during the analysis of the Haringvliet case. The Haringvliet case will focus on the following sub questions:

- Which theoretical conditions on successful implementation of ecological restoration projects can be found in the Haringvliet case?
- What are the differences between the conditions found in the Haringvliet case and the conditions found in the theory?

The analyses of the Haringvliet will be compared with the perspectives of experts on theoretical conditions. The sub questions related to this phase are:

- What conditions are found relevant by experts in the Haringvliet case?
- What are the differences between the conditions found through the expert interviews and the conditions found in the theory?

The results from the analyses will be used to complement the theoretical list of success conditions by assessing the relevance of the conditions. This is done by answering the following sub question:

- What can be learned by comparing the results from theory with the results from the Haringvliet case study and expert perceptions to provide a list of relevant success conditions for the development and implementation of ecological restoration projects?

This sub questions help with answering the main research question of the research, as well as contribute to the formulation of the conclusion and a set of recommendations.

1.6 Outline

Chapter 2 discusses the methodology of the research and provides insight on the approach used to perform the research. The chapter elaborates on the methods used for the literature review (2.1), the single case study (2.2) and the expert interviews (2.3). Chapter 3 presents the theoretical framework of the research. In this chapter, first a definition for implementation process and governance conditions is given (3.2). This is followed by the discussion of scientific literature on ecological restoration in estuarine areas and hard coastal defence structures (3.3), ecological restoration in aquatic ecosystems (3.4), and project management in general (3.5). The chapter ends with a list of theoretical conditions for successful implementation of ecological restoration practices (3.6). Chapter 4 elaborates on the Haringvliet case. The chapter starts with an introduction to the area (4.1), then an analysis of the process of the Haringvliet case is given (4.2), and the chapter ends with a conclusion and timeline presenting key moments (4.3). In chapter 5 the relevance of the theoretical conditions is discussed. The chapter provides the assessment of the five theoretical conditions in the Haringvliet case: experimentation (5.2), communication (5.3), role of key individuals (5.4), project support (5.5) and active stakeholder & knowledge integration (5.6). This is followed by the analysis of perception of the experts on the conditions (5.7). Chapter 5 ends with a final elaboration on the relevance of the governance conditions (5.8) and the chapter's conclusion (5.9). Chapter 6 contains the discussion of the research. In the discussion, the results are related to the relevancy of the research and the limitations of the research are discussed. Lastly, chapter 7 presents the conclusion which also contains a set of recommendations for ecological restoration projects in estuarine areas protected by coastal defence structures.

Chapter 2 | Methodology

The research can be qualified as a combination of a literature study with a single case study. The choice was made to thoroughly analyse the phenomenon of developing and implementing ecological restoration projects in estuaries with coastal defence structures in an in depth and qualitative manner: to investigate and interpret all aspects, elaborate on them and show the complexity on a spatial and temporal scale in a contemplative manner. This influenced the chosen research strategies (Verschuren & Doorewaard, 2010). Chapter 2 describes the used strategies and shows that the research made use of a triangulation approach regarding the knowledge sources to guarantee that the sources complement each other. Firstly, in section 2.1, the use of a literature survey is explained for both the theoretical framework and the grey literature. Section 2.2 discusses the strategy of a single case study on the Haringvliet. Lastly, section 2.3 describes in more detail the method of expert interviews.

2.1 Literature review

A literature review was held to analyse scientific literature that was used for the theoretical framework forming the theoretical basis of the research. The literature review was held to access, analyse and interpret the scientific literature. The method allowed to critically analyse different researches in an in-depth manner. It made it possible to organise the existing relevant theoretical knowledge and to interpret these.

The same method was also applied in order to analyse the grey literature. The grey literature was used to gain insight on the implementation of ecological restoration projects in estuaries and necessary conditions for successful implementation from a more practical oriented perspective. The literature survey on grey literature provided the research with lessons learned from another perspective.

Scientific literature

The use of scientific literature was essential in this research. The scientific literature provided a decent base of theoretical knowledge on the implementation process of ecological restoration in estuaries with the presence of hard coastal defence structures, coastal areas and project management. The literature contributed in establishing the theoretical framework to define and explain concepts, but also to determine theoretical conditions that contribute to a successful development and implementation process of ecological restoration projects in estuaries. These theoretical conditions were used in the single case study of the Haringvliet and discussed in the expert interviews.

To guide the literature survey it was essential to use a well-defined systematic approach to assure that the search for information was effective. The systematic approach also provides insight in the used steps and therefore increases the transparency and replicability of the literature survey. The literature survey for the theoretical framework was therefore provided with a precise set of steps placed in a search plan.

The search plan was based on the problem definition, research objective and research (sub) question(s). These components helped with forming the goal of the literature survey and the identification of key concepts. The goal of the literature survey was to find and analyse scientific literature on the development and implementation of ecological restoration projects in estuarine areas with the presence of coastal defence structures, coastal zones and on project management. This was done to form theoretical conditions for successful development and implementation of ecological restoration in estuaries used for the single case study and the expert interviews. The key concept that followed from the research question are:

- Conditions
- Implementation process
- Ecological restoration projects
- Estuarine areas
- (Hard) coastal defence structures

The search plan made it possible to strategically find, select and assess scientific literature on the basis of a set of requirements of the results. These requirements are as follows:

- The theoretical framework is based on scientific articles.
- The literature is not published earlier than 2010 (maximum age of 7 years).
- The literature is written in English
- The literature can be grouped in three categories:
    1. *Ecological restoration practices in estuaries and in the presence of coastal defence structures*
    2. *Ecological restoration practices in aquatic ecosystems*
    3. *Project management*

The identified key concepts were used to formulate key terms that were used in the search engine (Appendix 1). Careful consideration of the key terms was necessary to increase search retrieval. The use of variant terminology for the same concepts was therefore accounted for by the use of alternative key terms with a similar meaning. At the same time, several search techniques were used: (1) Boolean operators (AND; OR; NOT; "…") allowed to combine terms to narrow or broaden the search. (2) Truncation (the addition of a *) allowed to find both singular and plural forms of the key terms, or key terms with a variant ending. (3) Wildcards (placing a ? in the search term) make it possible to find variant spellings of the key terms (e.g. British and American spelling).

The literature was found and accessed through the use of search engines that are recommended by the University Library of Utrecht University: Scopus, Google Scholar, Web of Science (University Library UU, 2017). The previous mentioned requirements were used during the search. The literature was further selected on an analysis of the abstract or the introduction of the literature to determine the relevance for further use. The results were stored in the electronic database Mendeley.

Analysis

The gathered literature has been analysed in a structured manner. Firstly, the articles were previewed through a first read. The next step was to ask a set of question for each publication: what is the goal? What are the major findings? What are the recommendations? And what are the key thoughts on the study? The article was read again during the answering of these question and the answers were documented. Lastly, a short summary of the analysed literature is written. The summary is based on the asked questions and was written in such a way to facilitate a better understanding of the literature. It formed a synthesis of the findings of the analysis. The summaries were the basis for the writing of the theoretical framework (Cronin et al., 2008). A raw concept was written in which parts of the summaries that help answering the research question were placed. The information was interpreted and critically evaluated. The raw concept also made is possible to highlight and compare the findings. The raw concept was transformed in a structured text and eventually in a final version of the theoretical framework.

Grey literature

A similar literature survey was held to find and analyse grey literature on the ecological restoration projects in the Haringvliet case. Grey literature is defined as research that is not produced through traditional academic and commercialised publishers. One can think about policy or government documents, research reports or consultancy reports. These are materials produced, by for instance, governments, non-governmental organisations or consultancies (McKenzie, 2016; RUG, 2016; UNE, 2016). These sources are relevant for the research as they provide useful (mostly up-to-date) insight on the governance challenge that were encountered during the Haringvliet case from different perspectives. Grey literature can complement the scientific literature, since it can focus on different aspects thanks to their relation to real life practice and the decision made by the producers.

The same systematic approach was used. The same key terms, derived search terms and search techniques were used, as the topic of the literature survey stayed the same. The requirements that were set for the grey literature are as follows:

- Grey literature is not published earlier then 2010 (maximum age of 7 years).
- Grey literature is written in English or Dutch.

The grey literature was accessed through the use of search engines. Google (Custom Searches) and Google Scholar were used. Most grey literature is found in form of PDF documents. The database of WWF was also consulted for grey literature. The found literature were further selected after an analysis of the introduction and summaries to be sure that the relevance of the document for the research was high. The found documents were also stored in the electronic database Mendeley.

Newspaper articles are used for the case study analysis. Newspapers have documented the process of the decision to open the sluices of the Haringvliet since the beginning in the 1990s and allowed different stakeholders to give their opinion. The newspaper articles therefore function as an addition source that helped describing and understanding the process, also through different perspectives. The newspapers were accessed through the database of *LexisNexis Academic*, which contains full text articles of national newspapers. The database make use of search system, therefore some requirements are set for the search:

- The newspaper articles are found through the search term 'Haringvliet'
- The newspaper articles are published in Dutch national newspapers, namely: NRC Handelsblad, De Trouw and Volkskrant. These newspapers are regarded as so-called quality newspapers that are more focused on informing the readers as best and detailed as possible. They are viewed as delivering the news more in-depth and more critical (Van Hoof, 2000; Kussendrager & Van der Lugt, 2007).

Analysis

The analysis of the grey literature was in a similar structured manner analysed as the scientific literature. It started with a preview of the grey literature. Then the literature were read again and the most important details were taken into account when a summary of the articles were written. When writing the summary, sections were categorised according to the set of conditions found in the theoretical framework. This was done to structure the analysis and to relate the different sources to each other. The documented information was interpreted and formed into a structured text. The structured text contained information on the process of the Haringvliet case and the related different conditions for success. The basis for the single case study was formed by the grey literature combined with scientific articles.

2.2 Single Case study

The second strategy is the use of a single case study of the Haringvliet. The single case study is used for a thorough analyses to gain knowledge on the implementation of ecological restoration projects in an estuary with the presence of a hard coastal defence structure. The case study allowed for an intensive study of a real world situation to generate understanding of the case as a whole and significant insights into the topic of research (Verschuren & Doorewaard, 2010). The case study made it possible to fully understand concrete and practical aspects of the complex process of developing and implementing ecological restoration in estuaries protected by hard coastal defence structures (Baxter, 2012).

The case of the Haringvliet was chosen for the single case study. The Haringvliet is an estuary part of the Southwest delta of the Netherlands. In 1970, the estuary became closed off from the North Sea. The safety of the inland was improved, however the estuarine dynamics and ecosystem degraded (Van Meerkerk et al., 2013; Smits et al., 2006; Storm et al., 2006). In the late 1980s - begin 1990s, the Dutch national government began to investigate change in management of the Haringvliet sluices to restore estuarine dynamics. The Dutch government suggested in 2000 to open the sluices slightly in 2005, however it takes till 2018 before the management of the Haringvliet sluices will be adjusted to restore the ecology of the area (Rijkswaterstaat, 2016).

The case of the Haringvliet is scientifically relevant. The decision to partially open the Haringvliet in 2018 offers a good opportunity to better understand the developments in the decision making procedure

that has taken place regarding the development and implementation of nature restoration in an estuary by changing the management of a hard coastal defence structure. The Haringvliet case allowed a scientific analysis on a situation in which a decision is made to partially reversing the enclosure of an estuary to benefit the restoration of the nature of the area. Moreover, the restoration of the natural estuarine dynamics in the Haringvliet has suffered from inertia and shows the difficulties of introducing an ecological restoration activity in estuaries (Marks, et al., 2014). The development that has taken place towards the partly opening of the Haringvliet sluices made it possible to assess necessary conditions for the implementation of nature restoration in estuaries and provides real world insight that can be of use for future projects regarding nature restoration in estuaries. The single case study produced theoretical explanations that are rooted in the Haringvliet. The Haringvliet case is however not the only case in which an ecological restoration project is implemented. An overview of other cases was provided (table 3.1). They found explanations could be also be related to similar situations with their own context (Baxter, 2012).

Analysis

Firstly, a set of basic requirements for the case study were formulated to structure the single case study:

- The case study is based on triangulation of sources that complement each other: scientific literature, grey literature and expert interviews.
- The single case study is limited to the period 1990-2018. This period contains the decision to change the management of the sluices of the Haringvliet to the latest developments in the case.
- The theoretical conditions are used in the analyses of the Haringvliet case and had a guiding role in the eventual analysis.

The case study started with an introduction of the Haringvliet area and provided the case study with a historical context. This is followed by an analysis of the process of the decision to change the management of the sluices of the Haringvliet. The process was broken down in different phases according to time periods. The events that took place in each of the time period were described and allowed to analyse the developments made in the case. This led to the creation of a timeline with key moments from the case providing an overview of the process.

The production of the process analysis meant that already an in-depth analysis was performed to better understand the developments in the case. At the same time, the different sources were also analysed by focusing on the theoretical conditions. In each of the information sources, sections that indicated the theoretical conditions were documented. These sections are further analysed and the Haringvliet case was interpreted per condition. The analysis of the Haringvliet case per conditions found in the theory allowed a critical understanding of the relevance of these conditions in context of a real-life process.

2.3 Expert interviews

Lastly, seven experts were consulted to supply the research with critical information. These experts supplied information through their experience or expertise in the research subject (Verschuren & Doorewaard, 2010). More experts were requested to participate in the research, however the research had to do with multiple non-responses on several requests to perform an interview. They consulted experts contributed to the research by supplying relevant and contemporary information on conditions relevant to the development and implementation of projects related to ecological restoration. Moreover, experts have also supplied information on the implementation process regarding ecological restoration in the Haringvliet. Their experience helped identifying necessary conditions for successful development and implementation of ecological restoration that follows from intellectual and practical experience. The findings are analysed and compared with the literature survey and integrated into the single case study analysis to add critical insight. The interviewed experts are kept anonymous on request.

The experts were questioned about the topic via a semi-structured interview. An interview scheme, based on the literature surveys and single case study, were used to guide the interviews (Appendix 2). It provided flexibility to the interviews: at the one hand, it helped with steering the interview towards relevant answers, at the other hand it offered the interviewee also possibilities to provide thoughtful information about the topic (Boeije, 2009; Dunn, 2012). The interview guide was also flexible, because

when an interview was held, important findings or side notes were adapted in the interview guide for the next use.

Analysis

The interviews were converted into transcripts and were coded. This allowed information from the interviews to be organised and made large amount of data clear along key themes (Cope, 2012). The coding phase was also part of the analysis, since it asked already full involvement to process the information. At the same time, coding made reviewing of the information and making connections possible (Cope, 2012). Coding led to the interpretation of the interviews and to usable information that was used as input for the research. The coding and analysis was done by the use of the software NVivo. The used codes were based on the themes that returned in the literature, therefore on the theoretical conditions, but also on themes that were identified in the transcripts. A scheme with the codes is added in Appendix 3.

The interviews contributed in the understanding of the developments in the Haringvliet case over the selected time period. In addition, the interviews also provided different perspectives on the Haringvliet case based on personal experience and own knowledge. The interviews were sources of information that were integrated in the single case study. The interviews also had an second function, namely as an cross-check to confirm or disprove the relevance of the theoretical conditions. The relevance of the theoretical condition per interviewee are presented in a table.

Chapter 3 | Theoretical framework

3.1 Introduction

The research framework in section 1.5 showed that the theoretical framework is based on literature categorised according to three topics: ecological restoration projects in estuaries with coastal defence structures; ecological restoration in aquatic ecosystems; and project management in general. Chapter 3 follows these three categories to structure the theoretical framework. The theoretical framework therefore has a hierarchical form: the literature that is studied differ from specific to broad.

Chapter 3 starts with defining key concepts of the research in section 3.1. This is followed by the analysis of ecological restoration projects in estuaries with coastal defence structures (section 3.2). These are specific projects that may ask for a certain approach to their implementation and therefore a specific set of conditions may be necessary for successful implementation. Next, ecological restoration projects in aquatic ecosystems (section 3.3) are discussed. By analysing aquatic restoration projects lessons on which conditions are relevant for successful implementation may be learned for estuaries as a specific kind of aquatic ecosystems. Lastly, several studies on project management are discussed (section 3.4) to complement the previous found conditions with conditions related with implementing projects in general. The theoretical framework concludes with section 3.5 that presents the found conditions that in theory contribute to a successful implementation of ecological restoration projects.

3.2 Defining *implementation process* and *governance conditions*

Several key concepts were already recognised to form the search plan of the literature survey (section 2.1.1). The terms *Estuarine area* and *Hard coastal defence structure* were already introduced in the introduction of the research. It is however still of key importance to understand how this research comprehended *governance conditions* and *successful implementation process* of ecological restoration projects.

The implementation process can be understood as the process of translating abstract goals and objectives into actions (Khan & Khandaker, 2016). Implementation is regarded as a problem solving activity that gets enacted and confronted with the reality (Goggin, 1986 in: Wali, 2010; Savard & Banville, 2012). The implementation process is thus the moment in time when the concepts of the ecological restoration project are being put into practice. The implementation of policies or projects differs from how they were conceived on paper. How a plan is implemented is a result of the decisions made and actions taken from the moment a plan is adopted by the respective authorities towards the time when the plan is more or less fully realised (Goggin, 1986 in Wali, 2010). The implementation of ecological restoration practices are both complex and dynamic. Multiple objectives are present due to the engagement of a practitioners during the implementation and these may lead to that both the people who implement as who are affected by the plan may experience tensions, strains and conflicts (Bracken & Oughton, 2013, Smith, 1973). Different factors influence the implementation process and thus determine the eventually how well or badly a project is realised. The procession and management of the implementation process determines the outcome (Khan & Khandaker, 2016). Research on implementation processes focuses on these conditions under which policies, projects or plans lead to the (non)-realisation of the goals (Berman, 1978 in: Wali, 2010).

It was necessary to indicate when the implementation process of ecological restoration is considered successful in order to allow the research to make conclusions. The implementation process of ecological restoration projects in estuaries with coastal defence structures is regarded as successful when: the change in management of a coastal defence structure is started and will start delivering ecological benefits due to the ability of the estuarine area to naturally restore the inflicted damage due to human interference. Projects initiated with as goal to restore the ecology of the area, also need to reveal to have beneficial effects on the ecology of the area (Palmer et al., 2005). It is, however, not enough to only focus on the ecological success, it is also necessary to take human aspect into account before speaking of successful implementation of ecological restoration projects (Shackelford et al., 2013; Wortley et al., 2013). The implementation thus also needs to satisfy the involved actors (stakeholder success) (Palmer

et al., 2005). Lastly, the implementation of an ecological restoration project is considered a success when the implementation process contributes to the scientific knowledge and management practices for future ecological restoration project implementation (learning success) (Palmer et al., 2005).

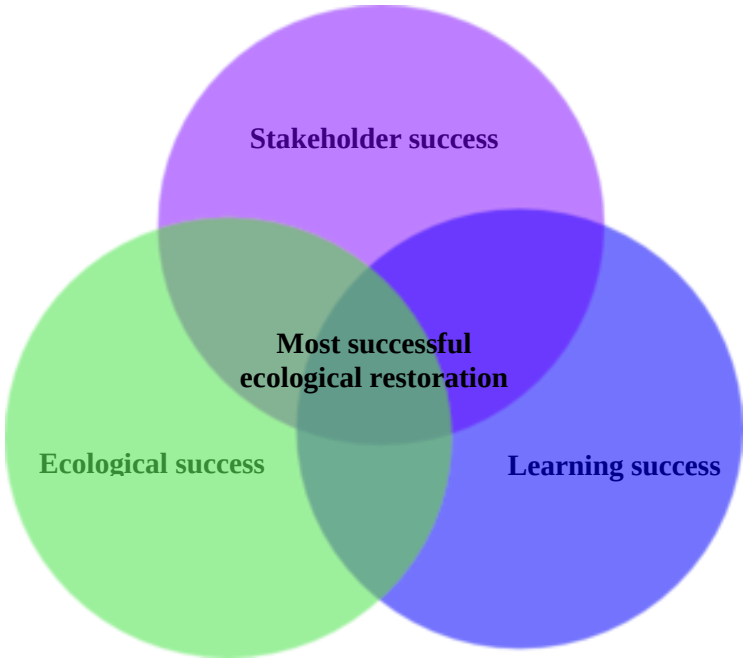


Figure 3.1: *The most successful ecological restoration can be found at the intersection of three axes of different types of success* (Adapted from Palmer et al., 2005).

A successful implementation process of ecological restoration project consist thus out both ecological and human attributes. In short, the implementation process of ecological restoration projects in estuarine areas with coastal defence structures are regarded as most successful when the management of a coastal defence structure is (1) changed to benefit the ecology of the estuarine area, (2) is backed up by actor satisfaction, and (3) advance the knowledge for future implementation processes (Palmer et al., 2005).

Ecological restoration activities are developed and implemented through a process of involvement and interaction of multiple actors at multiple levels creating dynamic contexts, also denoted as governance (Driessen et al., 2012; Richardson & Lefroy, 2016). Multiple actors of different kinds – public or private – and on different scales – local to national - may have stakes in the ecological restoration as the measure may affect their own interests positively or negatively. This affects the perception actors have on the issue. The ecological restoration is dependent on this process of interplay between actors (Driessen et al., 2012). The successful implementation process of ecological restoration in estuarine areas is therefore regarded as an dependent variable that is influenced by conditions related to the governance process. These conditions are necessities that are required or needed to be made for the implementation procedure of ecological restoration in estuaries to be considered successful. The research aims to find a set of these governance conditions.

3.3 Ecological restoration in estuarine areas and hard coastal defence structures

The first set of literature focused specifically on the implementation of ecological restoration projects in estuaries and the incorporation of ecological standards in coastal defence structures. This provided the research with relevant information that is closely related to the research topic. The literature discussed conditions relevant for the adaptation of coastal defence structures to enhance the ecology of an area. Moreover, examples of ecological restoration projects were found that provided scientific lessons from analyses on real situations.

Ecological enhancement of coastal defence structures

The pressure that humans place on natural habitats found in coastline and estuaries through the construction of coastal defence structures, led to the examination of possibilities to incorporate ecological standards into these coastal defence structures: the idea of ecological enhancement (Bulleri & Chapman, 2010; Evans et al., 2017; Naylor et al., 2012). The goal of ecological enhancement is *'to improve conditions for species through the modification of development activities undertaken primarily for non-ecological reasons (e.g., infrastructure or coastal defence). Enhancements can therefore be used to increase the ecological value of structures relative to those that do not include enhancements.'* (Naylor et al., 2012, p.37). Coastal defence structures placed in natural areas are always modifying the ecology. It is therefore that ecological enhancement can only provide secondary benefits for the ecology next to the primary function of flood protection (Firth et al., 2014). The construction of coastal defence structures are however still done with only the primary function in mind, while opportunities to benefit the ecology of the area are hardly considered (Bulleri & Chapman, 2010; Naylor, et al., 2012). Scientific literature therefore discusses ways to possibly support ecological enhancement of coastal defence structure and the introduction of secondary ecological benefits.

The introduction of secondary ecological benefits, however is not simply done. Negotiations to search for a balance between multiple, complex and conflicting uses and values of stakeholders that are part of the implementation process increase the difficulty. The perception of stakeholders on the priorities for the development of coastal defence structures are a factor of influence (Evans et al., 2017). Evans et al. (2017) therefore focused on the perception stakeholders have on introducing secondary benefits regarding ecology into coastal defence structures next to the primary function of flood protection. The research made clear that contradictory personal and professional thoughts on how the development of coastal defence structures should be provided, were present with all the stakeholders from different sectors. The findings, however, showed that stakeholders all shared the support to prioritise secondary ecological benefits to be built-in to coastal defence structures to positively impact habitats and the natural system (Evans et al., 2017). This identification of consensus among stakeholders can be seen as valuable information, as it could show the potential of stakeholders to consider implementing ecological enhancement into coastal defence structures. Consensus alone, however, does not automatically lead to the embracement of ecological enhancement.

Knowledge creation

The creation and availability of knowledge is seen as an essential part to facilitate ecological enhancement of hard coastal defence structures. For instance, Evans et al. (2017) discuss in their research steps to introduce secondary ecological benefits during the implementation of coastal defence developments. All the steps relate to the role of knowledge and show similarities with the propositions to incorporate ecological benefits made by Bulleri & Chapman (2010) and Naylor et al. (2012). This demand for knowledge seemed to originate from several knowledge gaps. Firstly, there seems to be a need for knowledge on the ecological processes that are affected and for the role artificial coastal structures play in ecological habitats (Bulleri & Chapman, 2010; Evans et al., 2017). Secondly, evidence on the efficacy of the ecological benefits need to be gathered to increase the support for environmental enhancement. Moreover, clarification on the value of the secondary ecological benefits is asked that can justify the potential additional costs of the ecological enhancement (Evans et al., 2017). Scientific and systematic gathering of knowledge through desk research or cost-benefit analysis are found necessary to provide information (Bulleri & Chapman, 2010; Evans et al., 2017).

A lot of attention was, however, given to the possibility of gathering knowledge through experimentation trials before the actual implementation of the hard coastal defence structure. It was argued that experiments on secondary ecological benefits related to coastal defence structures can fulfil multiple purposes. Firstly, the experiments would make it possible to gain context specific information on the best way to facilitate secondary ecological benefits, but also clarification and evidence on the efficacy. In addition, the information gained through these experiments should allow that the most suitable implementation will be chosen, tailored specific for that situation, which helps the process (Evans et al., 2017; Naylor et al., 2012). Secondly, when experimentation trials are executed, valuable and critical chances for researchers will be provided to trail new strategies and collect new and necessary knowledge on the ecological enhancement of coastal defence structures. The experiments allow the researches to expand the available knowledge on ecological outcomes and the implementation process which can be of use for future projects (Bulleri & Chapman, 2010; Evans et al., 2017; Naylor et al., 2012). Lastly, the experimentation trials provide new context specific information that can be of use to create actor support, acceptance of and awareness for ecological enhancement during the implementation process of coastal defence structures (Naylor et al., 2012). Experimentation should thus be regarded as a way to create and increase scientific and practical knowledge that can guide the implementation process of ecological enhancement of coastal defence structures on several aspects.

Knowledge exchange & knowledge brokers

In relation to the demand for sufficient knowledge on ecological enhancement of coastal defence structures, comes the necessity to make this knowledge visible and useful for the actors in the implementation process of a coastal defence structure. Evans, et al. (2017) argued that there is a lack of awareness of the existing scientific information on facilitating secondary ecological benefits with the practitioners. The common way of placing knowledge out there, ready to be used, is seen as an ineffective way of spreading the information from the producers to the users. Pro-actively facilitate exchange and uptake of the relevant knowledge, so that the evidence reaches the users, is seen as essential to encourage engagement among relevant actors with the practice of ecological enhancement (Evans et al., 2017). Suggested ways of communicating the knowledge are given in the form of training sessions and practitioner-focused workshops (Evans et al., 2017), or by providing operational frameworks in which the knowledge supporting ecological enhancement is embedded (Naylor et al., 2012).

Selected individuals can play an essential role in facilitating the exchange of knowledge when a multitude of disciplines, sectors, actors and views are present. These individuals act as knowledge brokers who function as intermediaries to bridge the gap that exists between the researchers and the users of the knowledge (Evans et al., 2017; Naylor et al., 2012). The knowledge brokers make interaction between these two groups possible and are able to translate the research into relevant and useful information for the users (Evans et al., 2017; Naylor et al., 2012). Naylor et al. (2012) showed the critical role knowledge brokers have in the application of ecological enhancement for coastal defence structures. Knowledge brokers were able to show relevant actors the value of ecological enhancement from their own perspective and ensure that the requirements of the involved actors are met. They can create support for the implementation of ecological enhancement and were able to bring in the necessary funding (Naylor et al., 2012). The presence of individuals who have the capacity to understand different perspectives, have knowledge of both political and economic factors that influence the implementation process, as well as the role of science, are essential. Dedicated individuals with communication skills, and considerable time and energy can play a vital role in the exchange of knowledge during the implementation process that benefits the realisation of ecological enhancement practices (Naylor et al., 2012).

The introduction of ecological enhancement is a way to secure ecological benefits for a nature area. To increase support for these kind of measures, the creation of specialised knowledge, foremost through allowing experimentation trials, and the exchange of this knowledge seemed to be essential. Especially, individuals that can act as knowledge broker can have a critical role in this process.

Estuarine restoration projects

Estuaries underwent changes due to the influences by humanity. The placement of coastal defence structures have led to change and loss of estuarine habitats (Boerema & Meire, 2017; Ducrotoy, 2010). The necessity to restore the estuarine areas to a natural state similar to a previous, original state by mean of human intervention grew (Lineman et al., 2014). Ecological restoration projects in estuaries world-wide are researched, compared and discussed to assess the implementation process of the project (see table 3.1 for an overview of example studies). This shows that research on how the implementation and management of estuarine restoration can be improved exists. This allows the examination of success conditions for development and implementation of ecological restoration in other estuarine areas. This allows to learn lessons from other projects.

Estuary	Scientific source
Colombia River Estuary (USA)	Krueger et al., 2017
Elbe Estuary (GER)	Ducrotoy, 2010
Elkhorn Slough Estuary (USA)	Wasson et al., 2015
Essex Estuary (UK)	Garbutt & Wolters, 2008
Humber Estuary (GBR)	Ducrotoy, 2010; Elliot et al., 2016; Lonsdale et al., 2015;
Nakdong Estuary (KOR)	Lineman et al., 2014
Po Delta (ITA)	Root-Bermsteim & Frascaroli, 2016
Puget Sound Estuary (USA)	Cereghino, 2015
Sacramento-San Joaquin Delta (USA)	Nagarkar & Raulund-Rasmussen, 2016
Scheldt Estuary (NED/BEL)	Ducrotoy, 2010
Seine Estuary (FRA)	Ducrotoy & Dauvin, 2008; Ducrotoy, 2010
Somme Estuary (FRA)	Ducrotoy & Dauvin, 2008
The Vouga (Ria de Aveiro) (POR) & *Planos de Ordenamento de Estuários* (*POE*) (Estuary Land Use and Management Plan)	Carvalho & Fidélis, 2013; Fidélis & Carvalho, 2015.

Table 3.1: *Overview of ecological restoration projects in estuaries*

A common theme among the researched cases is that the estuaries all underwent a similar development of alteration as a result of human disturbance (population growth, economic and urban development, development of coastal defence structures and land reclamation for human use). The restoration of these estuaries brings challenges due to the often complex and conflicting sets of social, economic and natural interests concentrated in the area (Carvalho & Fidélis, 2013; Fidélis & Carvalho, 2015). The implementation of ecological restoration is related to governance and often becomes a continuing series of decisions or actions that affect the ecological restoration project (Clewell et al., 2005; Murray & Marmorek, 2003 in: Nagarkar & Raulund-Rasmussen, 2016). The different studies, however, mentioned conditions that can have a positive influence on the process.

Stakeholder involvement & collaboration

A recurring conditions that affects the implementation process of ecological restoration projects in estuaries positively relates to the stakeholders that are involved in the process. The development of ecological restoration projects in estuaries means that a large amount of actors with different backgrounds and interests are involved. After identifying each of the stakeholders (Lonsdale et al., 2015), it is necessary to integrate the stakeholders in the implementation process (Fidélis & Carvalho, 2013). The interaction between stakeholders is seen as essential to come to an effective approach to the implementation process of estuary restoration (Fidélis & Carvalho, 2013). Carvalho & Fidélis (2015) therefore also identified participation and collaboration of stakeholders as essential principles for the governance of estuaries and their restorative projects.

The idea behind the involvement of stakeholders is that each of them can contribute to the implementation process. Stakeholders have their own knowledge, understanding, information and insights on local problems that result in different perspectives and alternative approaches. These sets of

differing visions can be brought together to engage collaboration between stakeholders, but also to assure that each voice is heard. The collaboration can result in mutual trust in each other, a shared vision for the implementation and actor support for the estuary restoration project (Wasson et al., 2015; Zedler, 2017). Lineman et al. (2014) discussed that the lack of stakeholder involvement during the ecological restoration project of the Nakdong Estuary (1990-2012, KOR) was a major reason for the failure of the project. The project was meant to restore the nature of the estuary as a response to the disturbance brought by the construction of an estuarine barrage, however the project failed. The wrong stakeholders were present during the implementation of the project, while the right ones were left out. For instance, scientific experts were left out in both the design and construction phase of the ecological restoration project, while engineers had the upper hand. The design became an engineered solution placed in a natural system without knowledge on the present ecological functions and processes (Lineman et al., 2014). The involvement of the right people provides knowledge on the pre-disturbance situation and ecological processes, how the project can lead to ecological restoration, and that necessary modifications can be dealt with quickly (Lineman et al., 2014). The case taught that the right stakeholders should, to a greater or lesser extent, be involved in the implementation.

It is, however, challenging to coordinate the multiple stakeholders involved in the ecological restoration project in order to come to a collaborative approach. The stakeholders are all in possession of varying values, interests, perspectives and professional cultures. It is recognised as a hard task to reconcile these differences (Boerema & Meire, 2017; Nagarkar & Raulund-Rasmussen, 2016; Wasson et al., 2015). The implementation of ecological restoration in the Elkhorn Slough Estuary (California, USA) was challenging due to the presence of highly engaged participants from different disciplines who differed in professional culture. This resulted in a variation of contrasting values, concerns about the accuracy of other disciplines and the used methods, and the contrast between desired restoration outcomes and evaluation methods (Wasson et al., 2015). To reduce conflict that could arise from these differences and to coordinate the involvement of a great variety of stakeholders during the implementation process, Wasson et al. (2015) argue to collaboratively develop shared objectives for the restoration project and to develop a clear role division with clear responsibilities for the stakeholders. Firstly, the shared objectives improve the implementation process, since the actions that need to be taken can be evaluated regarding their effectiveness in achieving the consensus objectives (Wasson et al., 2015). Secondly, by defining clear roles, stakeholders can become more engaged and supportive for the implementation process, and can improve the trust of stakeholders in each other, as well in the rigor and transparency of the process (Wasson et al., 2015).

To achieve collaboration between the stakeholders, it is an option to facilitate a process of communication among stakeholders and platforms on different scales were stakeholders can be brought together (Fidélis & Carvalho, 2015; Wasson et al., 2015). Wasson et al. (2015, p.66) recommend to organise small meetings that allow stakeholders *'to share perspectives among disciplines, increasing trust and understanding.'*. These small meetings were received positively by investigators and stakeholders during the estuarine restoration project of Elkhorn Slough, as it allowed for increase in productivity and mutual exchange of knowledge (Wasson et al., 2015). Larger stakeholder meetings were designed through the use of communication strategies to ensure that the multiple perspectives were represented equally and then were captured in a synthesis that evaluates the alternatives (Wasson et al., 2015). Stakeholder involvement can be thus facilitated through frequent possibilities for communication.

The obtainment and integration of the different perspectives is costly in time and resources. The availability of a long-term source for funding, as well as stakeholders that contribute a lot of their time are regarded as an essential factor to allow such an interdisciplinary approach (Wasson et al., 2015). The communication process is also dependent on human resources such as key individuals that function as neutral coordinators of the network of stakeholders (Wasson et al., 2015; Zedler, 2017). These individuals are able to identify and to synthesise information through their familiarity with ecological knowledge and the different approaches and perspectives. At the same time, the coordinators facilitate the flow of information: they design the meetings and group discussions, can develop communications

tools that capture and present the multiple perspectives and create nodes of expertise (Wasson et al., 2015; Zedler, 2017). The incorporation of different stakeholders takes thus time and (human) resources.

The way stakeholder involvement is organised can also interfere with the implementation process of ecological restoration projects in estuary. The ecological restoration project of the Nakdong Estuary was characterised by political intentions instead of ecological targets due to how the stakeholder involvement was organised (Lineman et al., 2014). Absence of the right stakeholders and miscommunication allowed that ecological targets were used for political purposes. The decisions taken focused on economic development of the area while the ecological functions or processes of the estuary were neglected. The entry of politics has resulted in that the project was influenced by the economic and urban development of the area. At the same time, changes in the goals and objectives of the national political parties meant that the implementation process of ecological restoration project also changed and was not able to fulfil the set goals (Lineman et al., 2014). A point of awareness is thus that the involvement of stakeholders can possibly lead to increased politicisation of the implementation process of the ecological restoration project.

Integration of knowledge & experimentation

Not only well-coordinated stakeholder involvement, but also the integration of scientific and technical knowledge based on empirics was frequently mentioned as an essential part for the implementation process of estuarine restoration projects. The integration of scientific knowledge is seen by Fidélis & Carvalho (2015) as a principle that need to be followed in the restorative planning and management of estuaries. Estuaries are considered as complex and dynamic systems as a result of natural and anthropogenic conditions and asks for specific knowledge. This specific knowledge on ecological processes and the context of socio-political values needs to be integrated in the ecological restoration project to guarantee the long-term sustainability (Fidélis & Carvalho, 2015; Lonsdale et al., 2015). The specific knowledge also needs to incorporate local specificities and functioning of the estuarine ecosystems, since it may lead to effective measures tailored for individual estuaries (Fidélis & Carvalho, 2015; Zedler, 2017). The cases of the Somme and the Seine showed that scientist were able to acquire knowledge in the field of restoration. The scientists, in cooperation with managers and policy makers, were then able to bring together scientific knowledge and socio-economics that contributed to the implementation of restoration practices in the estuaries (Ducrotoy & Dauvin, 2008).

Boerema & Meire (2017) argued that there is a lack of knowledge on secondary effects, both positive as negative. The impacts of implementation measures are not well-known which makes choosing between alternative actions problematic. By not considering the effects, the measures can have a deteriorating effect on nature, or alternative, compensative or integrated measures can be ignored (Boerema & Meire, 2017). Zedler (2016) discussed also the lack of knowledge. Zedler is therefore of opinion to allow field experimentation that test alternative methods to ecological restoration to recognise different ways of implementation and outcomes: *'Even a test that does not improve restoration leads to new knowledge'* (Zedler, 2016, p.13). This way of experimentation with restorative methods is called adaptive restoration and represents learning while restoring to increase the knowledge on alternative restoration measures. Large field experiments of adaptive restoration are already being implemented in for instance the Guadalquivir Estuary (ESP) and the Coos Bay's South Slough Estuary (USA). In Guadalquivir Estuary, an experimentation of creating almost a hundred of different ponds instead of one large lake was chosen to restore the local ecosystem. The ponds differed in size, depth and location, thus presenting different habitats. The diversity attracted many different species and increased knowledge that diversity plays in ecological restoration. In the South Slough Estuary, the creation of three intertidal elevations within a diked, subsided estuarine wetland led to the findings that the elevations influenced the formations of tidal channels that affected the growth of salt marsh vegetation and the density an species richness of marsh fish (Zedler, 2016). The experimentation in the estuary led to direct recommendations for further restoration by means of constructing mid-marsh elevations to favour colonisation by emergent marsh vegetation and allow vertical accretion, and low marsh elevation to enable habitat for fish (Zedler, 2016). Adaptive restoration as a form of experimentation can contribute to the restoration of estuarine habitats and gathers knowledge on (alternative) restoration measures.

Adaptability

The complexity that is associated with the many different dimensions that meet in estuaries brings uncertainty about environmental variation and humanity's understanding of this system. Moreover, restoration actions can influence the behaviour of the estuarine system which increases uncertainty (Carvalho & Fidélis, 2013; Wasson et al., 2015; Zedler, 2017). As previously mentioned, this asks for ecological restoration projects that are based on scientific knowledge. The scientific knowledge on the estuarine ecosystem processes is, however, still undergoing renovation or change in understanding (Carvalho & Fidélis, 2013; Wasson et al., 2015). It is therefore recommended that the implementation of ecological restoration in estuaries are characterised by a certain degree of adaptability to reduce the uncertainty related to the implementation. The limits of the understanding of the system should be acknowledged by integrating the possibility to adapt the implementation process that leaves room for change based on new findings as a result of experimentation, monitoring or evaluation (Carvalho & Fidélis, 2013; Wasson et al., 2015). Adaptation allows that actions are adjusted accordingly and that newly found knowledge can be used to improve the implementation process (Zedler, 2017).

The restoration project in Elkhorn Slough Estuary showed that the integration of adaptability during the implementation phase is an essential condition for a restoration project to become a success. The construction of a sill at the mouth of the estuary was considered as a way to reduce the extensive salt marsh die-back proposedly caused by the artificial harbour mouth. Further research, however, concluded that the causes of the marsh die-back were more complex and that also eutrophication contributed to the problem. At the same time, it was found that eutrophication impacted biodiversity and ecosystems at the same rate as tidal erosion resulting from the harbour mouth. Large scale restoration alternatives directed at solving the loss of ecosystems by tidal erosion seemed to worsen the eutrophication. New knowledge on the potential ecological benefits and costs of the placement of a sill led to the rejection of the construction of the sill as restoration measure for the estuary (Wasson et al., 2015). The shift in point of view of the stakeholders were not always easily changed from the original position by the new information, but the majority of the stakeholders were open to changing perspectives (Wasson et al., 2015). Adaptability is dependent on the willingness of stakeholders to change in response to new knowledge. The example of the Elkhorn Slough Estuary showed that new scientific findings can lead to shifts in understanding, but willingness of stakeholders to change in response to the new knowledge is key. The implementation process of ecological restoration projects need to be capable to respond to the new information to prevent them to be based on incomplete knowledge on ecosystems.

The implementation of ecological restoration in estuaries seemed to benefit when stakeholders are involved in the project and collaborate on different aspects. A well-organised platform of communication for the different stakeholders is, however, a necessity to facilitate the collaboration. This takes time and (human) resources. Knowledge on ecological processes need to be present and integrated in the implementation process to make the best possible decisions. The possibility to perform field experimentations can help with increasing knowledge on ecological restoration measures. The implementation process, however, needs to be designed in such a way that it can response to new essential findings and thus adapt accordingly to improve the process.

3.4 Ecological restoration in aquatic ecosystems

Aquatic ecosystems refers to the complete set of living and non-living components and their interactions that are located in different waterbodies. The waterbodies can be further classified, among one of them are estuaries. The other two types are marine waterbodies and freshwater waterbodies – in which further classification is brought according to the patterns of water movement (fast-moving water (rivers and lakes), slow-moving or stagnant water (lakes and ponds)). Lastly, there are wetlands, that often occur in the zones that connect land and large waterbodies, were the soil is (partly) saturated or inundated (Haak, 2016).

All the different categories of waterbodies know degrading stressors mostly as a result of human induced pressure, like population growth and increase land and water use changes (Verdonschot et al., 2013). Just as in estuarine areas, ecological restoration projects in other aquatic ecosystems are seen as a way to protect the nature in these areas from further degradation (France, 2016). Ecological restoration

projects in aquatic ecosystems take place worldwide. The need to develop effective governance approaches to successful implement ecological restoration projects is thus also a necessity (Dawson et al., 2017). Valuable insight can be gained from using a broader perspective on the implementation of ecological restoration in these different natural areas, but with the similarity that they are characterised by the abundance of water.

Project leaders & visionaries

Dawson et al. (2017) aimed with their study to contribute a better understanding of the governance and management challenges of ecological restoration projects in Sweden. Three cases studies, from which two are restoration projects of aquatic ecosystems (Rynningeviken, Lake Hjälmaren: regional scale wetland restoration, and Hedströmmen: local scale river restoration**),** are discussed and led to the identification of strategies used for successful implementation of ecological restoration projects. Dawson et al. (2017) recognised that exogenous and uncontrollable events mostly preceded the initial development of a vision to implement ecological restoration projects. In Rynningeviken, the municipality purchased a large area of degraded former wetlands for urban development and job opportunities, however a national economic crisis complicated the realisation. An alternative vision to restore the area involving long-term unemployed youth was created. In Hedströmen, the occurrence of a mechanical malfunction of the local hydro-electricity dam led to the flooding of the dry riverbed and an increase in stream flow. The event revealed that the stream had potential to function as habitat for fish and other focal species. The occurrence and convergence of critical and unpredictable ecological and social events can provide the right moment (windows of opportunity) to initiate the implementation of ecological restoration projects (Dawson et al., 2017).

A window of opportunity alone is not sufficient to initiate a vision for restoration. These windows need to be recognised and exploited by the right individual that is able to transform the event into an opportunity (Dawson et al., 2017). These so-called visionaries in the Rynningeviken and Hedströmen cases had both a professional and educational background – both biologists, and passionate to study the aquatic ecosystems and to restore them - that increased their ability to recognised these opportunities (Dawson et al., 2017). The visionaries were creative and focused on action that allowed them to overcome difficulties and doubts and to quickly go from thinking to implementation (Dawson et al., 2017). Besides being ecological experts, the visionaries were employed in positions that were beneficial to be deeply engaged in the ecological project and the relevant formal and informal networks, for instance as the leader of the project (Dawson et al., 2017).

The positions the visionaries had in the cases described by Dawson et al. (2017) were determining for the project. They were situated conveniently within the existing governance structures which enabled them to make use of their ability to access key stakeholders. The result was that they were able to directly lobby higher positioned individuals for support (e.g. political leaders; chairpersons) and to circumnavigate several interceding bureaucratic layers. This reduced the resistance and filtration the project could incur when it goes from level to level in decision structures with hierarchical characteristics (Dawson et al., 2017).

During the implementation of the ecological restoration, positive outcomes confirmed the possibility to restore the ecosystems. This led to a further desire of the visionaries to continue the implementation of the projects. The moment the ecological restoration project gained momentum is valuable for visionaries (Dawson et al., 2017). This is also true to increase the support for the ecological project.

Support for ecological restoration projects

The Swedish cases studied by Dawson et al. (2017) also identified the establishment of support as an essential part that contributes to the implementation ecological restoration projects. The support can come from a variety of sources. For instance, in the Rynningeviken and Hedströmen cases the projects received support from managers at the local municipality, local residents, nature groups and NGOs, landowners and local journalists. The establishment of the support is determent by several aspects and can take several forms.

Legitimacy & authority
Support for the implementation restoration projects seemed to be determined by the legitimacy and authority the project has gained. At the start of the project, the legitimacy and authority are for a large part driven by the educational and professional background of the leader of the project: he or she needs to be considered as an expert in this area (Dawson et al., 2017). When the implementation of the project progressed, the legitimacy and authority was influenced by the outcomes the project was able to deliver. Short delivery times, adherence to the budget and outcomes that were perceived as successful increased the confidence of stakeholders in the project. It strengthened their idea of the competence of the project leader to deliver promised outcomes and increasingly produced support among stakeholders for the project (Dawson et al., 2017).

Socio-economic benefits
The support for a project by stakeholders was also dependent on the visibility of the benefits that the project could deliver for them. Stakeholders evaluate if benefits outweigh disadvantages to determine potential support for the project. Moreover, stakeholders want to know if the projects fit with their own goals and values (Dawson et al., 2017). Stakeholders are also interested in the socio-economic benefits of the project such as recreation possibilities, job creation or community relations (Dawson et al., 2017). Friberg et al. (2016) identified, however, that ecological restoration projects insufficiently consider the needs of society and hardly identify the socio-economic benefits the projects potentially can deliver. At the same time, a lack of awareness on part of the public about aquatic ecosystems, especially marine ecosystems, was seen by Van Dover et al. (2014) as a difficulty to advocate the socio-economic benefits for ecological restoration. To create support for the implementation, transferring socio-economic benefits is essential.

Financial support
Support can also take the form of project financing. Financial resources are a core essential for an ecological restoration project to deliver change and are regarded as *'a vital expression of support'* (Dawson et al., 2017, p.35). Not only do the financial sources help with the execution of the implementation, it also helps with sustaining the feeling of forward momentum and legitimacy. Funding of any size from a divers set of public and private is vital for the projects (Dawson et al., 2017). It is however a challenge to obtain sufficient financial support for a longer period. The head of the project needs to be capable to secure and sustain appropriate funds (Dawson et al., 2017). Limited access to financial resources should however not be considered as a setback for the implementation: the implementation process can focus on progression in smaller steps, which may reduce the complexity of the project and result in lesser delivery delays and project momentum (Dawson et al., 2017). Implementation of ecological restoration projects remain dependent on stakeholders that provide financial input.

The implementation of ecological restoration projects is thus dependent on if there is enough stakeholder support and on the ability to obtain this support. During the implementation process it was of essence that trust and confidence was created.

Gaining and exchanging knowledge

Experimentation
An often mentioned way of achieving relevant knowledge for ecological restoration projects in aquatic ecosystems was by using an experimentation approach (Dawson et al., 2017; France, 2016; Zedler et al., 2012). Restoration of aquatic ecosystems knows low predictability. It is therefore that France (2016) argued that experimentation is useful to cope with uncertain outcomes. The use of experimentation as a strategy allowed to gain knowledge and experience while implementing the practice (learning-by-doing) (Dawson et al., 2017). The idea of the experimentation is that it helps with understanding causality between the taken measurements and the outcomes, while preparing for unexpected results. At the same time, when the existing knowledge on restoration was insufficient or when it was acknowledge that complete knowledge to progress was missing, experimentation provides opportunities to continue with the implementation and reducing delays (Dawson et al., 2017; France, 2016).

Dawson et al. (2017) and Zedler et al. (2012) further indicated that when the ecological restoration projects take on the form of experiments, the project can be divided into different practical and concrete objectives. The project then includes a learning approach in which knowledge will accumulate when progressing. Restoration measures will be developed and implemented to progress towards the objectives and will be at the same time carefully monitored. The active use of experiments allows the practitioners of the project to learn if targets are achievable based on scientific information. If during monitoring it becomes clear that a measure is not showing its potential effect in practice, practitioners can decide to change the measure. This is an iterative way that practitioners can use to identify the effect of measures and to adapt the project (Dawson et al., 2017; Zedler et al., 2012).

An experimental approach, however, asks for the availability of extra time and other resources that allow the practitioners to structure and monitor the experiments. This has its effects on the delivery time of the restoration project (Dawson et al., 2017). Another challenge of an experimental approach is that it can be risked that the project is too much characterised as techno-fix and loosing attention to social, governance issues (France, 2016). In the Hedströmmen river restoration, several stakeholders were concerned that the experimentations would need to follow a strict method and therefore excluding non-scientific perspectives and knowledge from the stakeholders (Dawson et al., 2017). A strict scientific perspective needs to be avoided so that it not transforms from a benefit to a barrier.

Knowledge sharing

Ecological restoration projects overlap both the ecological and socio-economic systems. This also means that the understanding of both these systems – natural and social sciences – need to combine. To link the environment of the aquatic ecosystems with society and vice versa, transdisciplinary knowledge need to be at the core of the restoration project (Friberg et al., 2016; Druschke & Hychka, 2015). Friberg et al. (2016) argued in their research on ecological restoration in freshwater ecosystems that the integration of the two types of knowledge is, however, hindered by the absence of an exact ecological restoration community who can mutual share knowledge (Friberg et al., 2016). They also found out that the actors that are involved in the restoration practice differ highly in their skill base and lack awareness of the wider socio-economic setting or non-environmental policies (Friberg et al, 2016). Exchanging knowledge is an option to fill this gap.

To integrate different kinds of knowledge relevant to ecological restoration, such as understanding of ecosystems, project planning, financing or communication, practitioners of the restoration project benefit from possibilities to exchange knowledge with experts and stakeholders (Dawson et al., 2017). The exchange of stakeholder knowledge can be facilitated by initiatives that allow the use of communication strategies (next section) in both formal and informal spaces and networks (Dawson et al., 2017). By actively inviting a wide variety of relevant actors for project site excursions and to participate in the practical fieldwork, workshops, conferences and meetings, knowledge was possible to be exchanged. Active involvement can encourage mutual learning and reduces the idea that the project has no room for non-scientific stakeholder knowledge (Dawson et al., 2017).

Other ways of facilitating the importation of different kind of knowledge can be done by forming an advisory committee or employing external consultants. France (2016) argued that the creation of an advisory committee comprised of stakeholders, such as businesses, NGOs, governmental branches and local citizens, leads to that expert knowledge and local experience relevant to the location of the projects can combine. Consultants can be used to increase the available knowledge and significant competences, but can bring the risk of increasing costs and the loss of knowledge after completion (Dawson et al., 2017).

The exchange of documented knowledge on the outcomes of ecological restoration projects is lacking. The results and data of past efforts of restoring aquatic ecosystems are almost never reported, in particular if the restoration project had negative outcomes. This hinders the ability to learn from both successful and unsuccessful ecological restoration efforts (Dawson et al., 2017; Friberg et al., 2016; Verdonschot et al., 2013). Reasons for the lack of transferring knowledge are related to shortage of

resources, certain individuals (e.g. project leaders or consultants) that retain project knowledge, and that the priority is not on the documentation of project processes for learning purposes (Dawson et al., 2017). Friberg et al (2016, p.5) therefore suggest *'a joint initiative to establish restoration communities across Europe (or elsewhere) that adhere to a similar set of basic principles and guidelines, independent of types of restoration measures or target ecosystem. Hubs for knowledge exchange needs to be at the core of such an initiative, maybe using restoration 'brokers.' Cooperation with actors outside the traditional restoration community is also imperative'* The presence of such communities can increase knowledge sharing within and outside the restoration community, which is of importance for the success of ecological restoration projects (Friberg et al., 2016).

Communication strategies

Communication is of key importance during the implementation of ecological restoration projects in order to increase the success of the project. The success of implementing an ecological restoration project requires stakeholder participation and support, but also creating and maintaining possibilities that enable exchange of knowledge. The development and use of the right communication strategies and educational tools to transfer the project plans in a striking and understandable manner, is essential to increase this stakeholder engagement and support, to build actor relationships, and to enable learning and knowledge processes (Dawson et al., 2017; Druschke & Hychka, 2015). Central to the communication are repeating mutual flows of information between actors with as goal to gain support, collaborate and to produce long term, open relationships with the actors involved during the implementation process (Druschke & Hychka, 2015).

The involvement of a lot of different actors in ecological restoration projects asks for communication strategies that are tailored for the right actors and situation. Ongoing communications with the actors during the implementation process allows the practitioners to spread information (Druschke & Hychka, 2015). It is therefore of importance that a divers set of pedagogical tools to inform, for instance governmental decision makers, stakeholders the public and the media, about the plans of the project. The pedagogical tools include visual materials (e.g. photographs, drawings and maps of the current and desirable situation), field excursions or workshops. These seemed to be important tools to let stakeholders understand and explore the complexity of long term restoration projects and to take in the perceptions of stakeholders. At the same time, the tools can be used to inform the media to generate positive publicity in order to gather political and public support for the project (Dawson et al., 2017).

During the implementation process, communication is also of importance to provide moments for stakeholder involvement, conversations and to exchange and integrate knowledge (Dawson et al., 2017; Druschke & Hychka, 2015). The presence of informal spaces like workshops, excursions or field trips allows to create these moments and to establish networks. While these moments allow practitioners to concretise the project plan, at the same time actors meet each other, can provide their perspective and exchange (local) knowledge. An increase in trust and a sense of community can result from these moments of communication (Dawson et al., 2017; Druschke & Hychka, 2015). Druschke & Hychka (2015) do admit that sustained and responsive communication asks for a good amount of time and resources, but it provides an opportunity to ease the implementation of the project.`

The literature on ecological restoration of aquatic ecosystems has taught that the presence of the discussed conditions can positively influence the implementation of these restoration projects. Firstly, individuals that have a vision seem to be essential to let the implementation of an ecological restoration project thrive. These individuals are able to see opportunities and are able to convince others when their position allows them to contact decisive stakeholders directly. Secondly, the support of stakeholders is also of importance for the implementation. The support can come from different sources and may take different forms. Support is dependent on the legitimacy and authority of the project and the visibility of socio-economic benefits. Thirdly, knowledge plays an essential part for the implementation. Experimentation during implementation allows to gain relevant, up-to-date information and experience while the project progresses. However, if the focus is too much on experimentation, stakeholders may feel excluded. This is unwanted, since stakeholders can contribute to the project with their own practical, local knowledge. A balance between experimentation and knowledge exchange is key. Lastly, the

implementation of a project profits when the communication with stakeholders are appropriately tailored. Pedagogical tools help with increasing understanding and support, while the creation of formal and informal moments to communicate allow for stakeholder involvement, building trusts and a sense of community.

3.5 Project management

Scientific literature on project management is used to complement the previous discussed theory. Project management comprehends how the process towards achieving the set objectives is coordinated. The implementation of ecological restoration can also be understood as the implementation of a project. Literature on project management can therefore provide general insight in which conditions need to be considered for the implementation of a project to become successful.

The performance of the project management determines the success of a project (Asad Mir & Pinnington, 2014). In the past, the success of a project was understood through only three criteria: the management needs to deliver a project that delivers the specified objectives well (quality), within the approved time and budget (costs). The understanding of project management has evolved and the performance is seen as something that is dependent on the presence of more than three conditions (Joslin & Müller, 2015; Tabish & Jha, 2012; Turner & Zolin, 2012).

Project team

Tabish & Jha (2012) concluded that human related conditions influence to a great extent how successful a project can be implemented. These conditions are related to the participants of the project and their characteristic, such as their competences and behaviour. First of all, the project is influenced by the presence of project managers with leadership characteristics. A project benefits from a project leader who is able to develop and spread the recognition that the project is a measure that will lead to the pursued change in order to develop project-centred culture within the project team (Asad Mir & Pinnington, 2013). These individuals are competent to create and maintain human relationships that are open and considered as a two-way partnership with stakeholders. The relationships between stakeholders should lead to shared project language culture (Asad Mir & Pinnington, 2014; Tabish & Jha, 2012). The leader needs to have the appropriate technical knowledge on the project subject and is able to coordinate the management of the project through the right methodologies and to manage the team to increase the team spirit (Asad Mir & Pinnington, 2014; Tabish & Jha, 2012).

Secondly, the project staff also have a key role in reaching successful implementation of a project. The management related to the staff needs to be arranged that the potential of the human resources can be maximised. To potentially achieve this, the organisation that is implementing the project needs to guarantee that training relevant to the project implementation is available for the staff. The availability of trained human resources determines partly project success (Asad Mir & Pinnington, 2014; Tabish & Jha, 2012). At the same time, it is beneficial for achieving success if responsibilities for different aspects of the project are clearly defined. Clear responsibilities can ensure that everyone in the staff knows their role and that objectives are achieved, while staying on schedule and within budget (Papke-Shields et al., 2010). When the staff is aware of their role within the project, the implementing organisation avails by incorporating a way to reward the performance of the staff on activities related to the project. Staff appraisal for their work has a positive influence on creating success (Asad Mir & Pinnington, 2014).

A project team that has the perception that the performance of the project is successful leads to more successful results (Asad Mir & Pinnington, 2014). When the implementation of a project is going well and the staff is appraised for their work, the motivation of the team increases. The motivated members of the team will feel more engaged and committed to the project and the team. The project creates momentum of positive influence through motivated and committed team members which leads to great results (Asad Mir & Pinnington, 2014; Tabish & Jha, 2012). The use of team-building events can further increase the staff commitment to the project, but also increases the cohesion of the group. Members of the team will learn to know each other and will collaborate more effectively leading to positive effects on the results (Papke-Shields et al., 2010). The use of performance frameworks that measures the progress is recommended as it allows to communicate the performance of the project to the staff

members (Asad Mir & Pinnington, 2014). Well-trained and committed project team staff are an essential condition that knows a relationship with successfully implementing of projects.

Monitoring
Successful implementation of a project is dependent on monitoring of the implementation progress. Monitoring is a management action that therefore should get attention by the project practitioners (Tabish & Jha, 2012). Asad Mir & Pinnington (2013) found that project success can be enhanced by measuring the performance of a project through a set of indicators. The indicators can be used to show the results that are attained in relationship with meeting the necessities of stakeholders. Moreover, project management can be improved by measuring its performance against the indicators (Asad Mir & Pinnington, 2013). The indicators that will be used for a project needs to be in line with the implementation strategy and therefore it is of essence that the perspective of all stakeholders, on a short and long term, are taken into account during the design and use of the indicators (Asad Mir & Pinnington, 2013). By investing financial resources, time and effort into the development of a measure method of these indicators, the implementation of a project can become even more successful.

Good stakeholder relationships
Communication with the stakeholders is necessary to reach successful implementation (Papke-Shields et al., 2010; Tabish & Jha, 2012). Firstly, an analysis of the stakeholders is a way to find out what the positions and expectation are of the stakeholders. Communication with the stakeholders makes it possible to recognise the requirements set by stakeholder. The communication increases the mutual understanding, but makes it also possible to meet delivery times and costs. Communication leads to the gathering and exchange of necessary information and increases the trust stakeholders have in the project (Papke-Shields et al., 2010).

Studies on project management provide information on required conditions for successful implementation of projects. An implementation is successful if it delivers the set objectives, within the approved time and budget. The implementation is, however, also dependent on human related conditions, such as a project manager with strong leadership capacities and a well-trained, disciplined project team. By communicating the gained progress and appraisal towards the project team increases the motivation and commitment to the project. A positive momentum will be created resulting in good results. Monitoring via the use of indicators plays also a role in the implementation as it allows the performance of the project to be measured. Lastly, communication with the stakeholders is a mean to create good relationships based on trust.

3.5 Conclusion: theoretical conditions

The implementation of ecological restoration projects is understood as the process of translating abstract decisions on recovering a degraded ecosystem into real actions. The implementation process of ecological restoration project in estuarine areas with coastal defence structures was defined as successful when the management of a coastal defence structure is (1) changed to benefit the ecology of the estuarine area, (2) is backed up by actor satisfaction, and (3) advance the knowledge for future implementation processes. The theoretical framework has discussed several studies that presented different conditions that positively contribute to the implementation of ecological restoration projects. After discussion these conditions, section 3.5 provides an overview of the conditions formed in a framework. The framework answers the first sub question of the research: *What conditions are theoretically relevant for the implementation of ecological restoration projects?*

The discussion of the theory led to the finding of several different conditions. It is however possible to recognise a set of themes along the theory. The conditions are therefore categorised in five condition-categories, within each category several subthemes are indicated in bold and the colour blue. These five conditions form the framework of theoretical conditions for a successful implementation process of ecological restoration projects in estuarine areas protected by coastal defence structures.

Subthemes
- **Increase knowledge**
- **Adapt**

Experimentation

Experimentation makes it possible to gain context specific information on the ecological processes of the estuarine area that will be restored, as well on the efficacy of the measures (Evans et al., 2017; Naylor et al., 2012). Experimentation allows to continue the implementation progress when necessary knowledge is missing. It increases the knowledge on restorative measures and alternatives, while implementing the restoration **(Increase knowledge)** (Dawson et al., 2017; France, 2016; Zedler et al., 2012). It leaves room to adapt the restoration accordingly to new findings and improves the ability to cope with uncertainty (Carvalho & Fidélis, 2013; Wasson et al., 2015; Zedler, 2017. The implementation process of the estuarine restoration project will be tailored to the situation that positively contributes to the restoration of the ecosystem of the estuary **(Adapt)** (Evans, et al., 2017; Fidélis & Carvalho, 2015; Naylor, et al., 2012; Zedler, 2017). The collection of evidence increase actor support for the project and can be used for future projects (Bulleri & Chapman, 2010; Evans, et al., 2017; Naylor, et al., 2012).

Subthemes
- **Moments**
- **Interaction / Dialog**

Communication

Communication is an essential condition for successful implementation. The use of the right communication strategies is necessary to gain project support, stakeholder participation and is key for the exchange of knowledge (Druschke & Hychka, 2015; Evans et al., 2017). Communication strategies allow that the transfer of knowledge is tailored per actor and situation and allows to clearly explain the implementation process. These communication strategies facilitate formal and informal moments of communication between actors **(Moments)** (Dawson et al., 2017; Druschke & Hychka, 2015). The communication should also allow the stakeholders to exchange perspectives, knowledge and interests in a process of interaction. The stakeholders are provided with the opportunity to recognise other interests and requirements set by stakeholders to build long term actor relationships. The goal of regular communication is to share knowledge, increase stakeholder engagement, mutual trust and creates a sense of community **(Interaction / dialog)** (Dawson et al., 2017; Druschke & Hychka, 2015; Papke-Shields et al., 2010; Tabish & Jha, 2012).

Subthemes
- **Visionary**
- **Background**
- **Position**

Role of key individuals

Individuals play a key role in the implementation process of estuarine restoration projects. These individuals have the capacity to recognise windows of opportunity to start the implementation process of the restoration project: they are able to translate their vision into practical action **(Visionary)** (Dawson et al., 2017). These individuals have a professional and education background and therefore the right natural, social and technical knowledge **(Background)** (Asad Mir & Pinnington, 2014; Dawson et al., 2017; Evans et al., 2017; Naylor et al., 2012; Tabish & Jha, 2012; Wasson et al., 2015; Zedler, 2017). By employing these key individuals in positions which allows them to be deeply engaged in the ecological restoration project is crucial. The positions are central in the network and must provide access to key stakeholders to convince them of the possibilities and relevance of the project. Their position allows them to function as a knowledge broker to exchange knowledge and facilitate interaction **(Position)** (Dawson et al., 2017; Evans et al., 2017; Naylor et al., 2012; Wasson et al., 2015; Zedler, 2017). The key individuals are necessary to maintain the actor relationships and to coordinate the management of the project (Asad Mir & Pinnington, 2014; Tabish & Jha, 2012).

Subthemes
- **Interests**
- **Finance**
- **Internal support**

Project support

An important condition that contributes to improve the implementation process of ecological restoration in estuarine areas with hard coastal defence structures is expression of support for the project. Support can come in different forms and from different sources. The implementation process needs to clearly show the benefits the project delivers for the stakeholders related to their interests. It provides the stakeholders with that feeling their interests are considered during the implementation process. The stakeholders will make the execution of the project possible by cooperating **(Interests)** (Dawson et al., 2017; Naylor et al., 2012). While the delivery of the outcomes need to be perceived as positive, they also need to be within time and the reserved budget. Stakeholder can provide resources such as knowledge, but can also provide financial funds to support the ecological restoration project. The financial budget makes it possible to execute the project **(Finance)** (Dawson et al., 2017). Internal support is also necessary for the implementation of the ecological restoration project. The availability of trained human resources determines partly project success. The motivated members of the team will feel more engaged and committed to the project and the team. The project creates momentum of positive influence through motivated and committed team members which leads to good results **(Internal support)** (Asad Mir & Pinnington, 2014; Tabish & Jha, 2012).

Subthemes
- **Proactive involvement**
- **Shared vision**

Active stakeholder & knowledge integration

For ecological restoration projects in estuarine areas to become successful, it is a vital condition that different types of knowledge can be used by the practitioners during the implementation process. The possibility to exchange knowledge and interests with experts and stakeholders need to be pro-actively integrated into the implementation process. Stakeholders contribute to the implementation process through their own knowledge, understanding and information on the estuarine area (Wasson et al., 2015; Zedler, 2017). This means that the involvement of stakeholders needs to be facilitated to allow interaction (Evans et al., 2017; Dawson et al, 2017). Active involvement is perceived by stakeholders as willingness to collaborate and to open up for non-scientific, practical (local) knowledge **(Proactive involvement)**. The integration results into a shared vision based on different interests, mutual trusts and a rigor and transparent implementation process. The shared vision can form the basis of the project in which the different perspectives are combined and the stakeholder feel represented **(Shared vision)**. Stakeholders become more engaged and supportive for the implementation process (Dawson et al, 2017; Druschke & Hychka, 2015; Wasson et al., 2015; Zedler, 2017).

Chapter 4 | The Haringvliet

4.1 Introduction

The struggle between man and water marks Dutch history. It has led to many years of human intervention, like flood defence measures and the reclamation of land, that have transformed the Rhine and Meuse delta in the southwest of the Netherlands (Paalvast & Van der Velde, 2014; Smits et al., 2006). In the 20th century, floods still threatened the reclaimed land and the safety of the people. In 1953, a storm surge led to the breaching of coastal defence dikes. Large areas of land in the southwest of the Netherlands were flooded: 1,835 humans became casualties, many farm animals drowned and innumerable damage was done to human goods and the built environment (figure 3) (Nienhuis, 2008; Smits et al., 2006). The disaster led to fundamental discussion about flood risks in the Rhine and Meuse delta and trigged the implementation of the Delta Works in 1957 (Nienhuis, 2008; Paalvast & Van der Velde, 2014; Smits et al., 2006).

Figure 4.1: *Location of the Rhine-Meuse-Scheldt delta in the southwest of the Netherlands (Adapted from Paalvast & Van der Velde, 2014).*

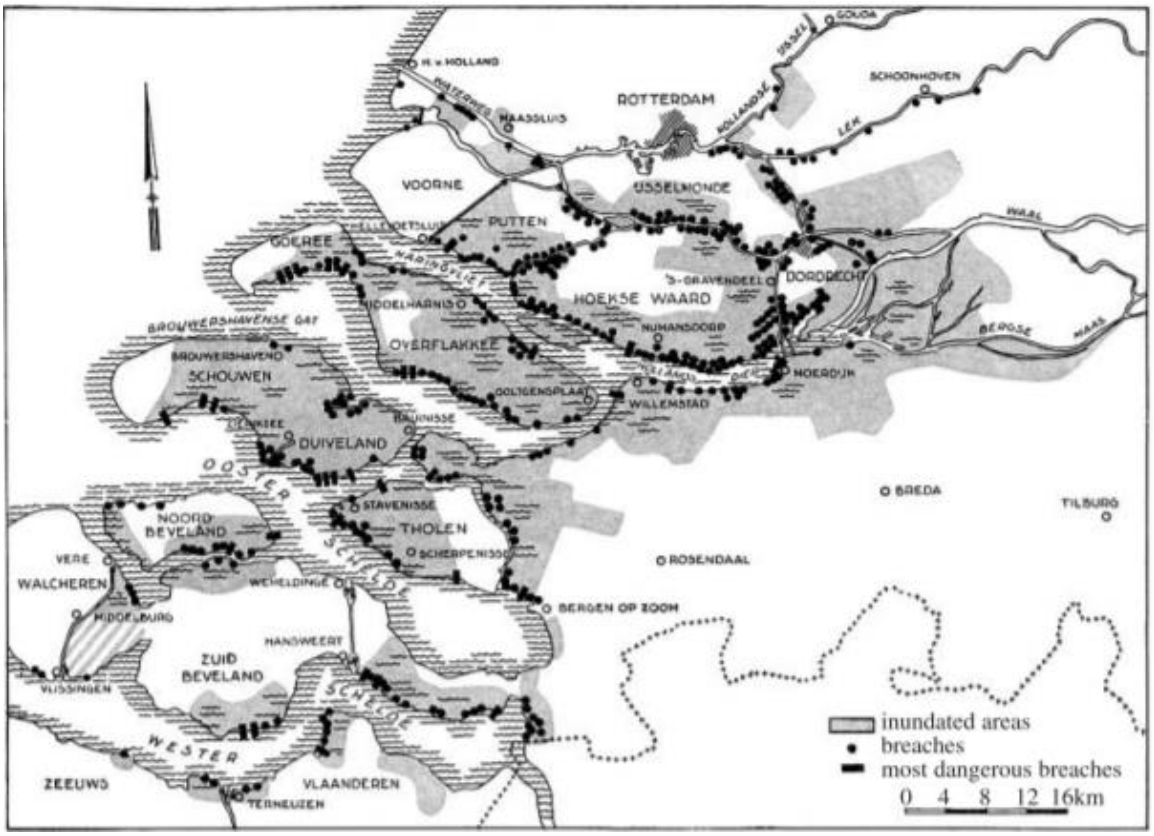


Figure 4.2: *The effect of the storm surge in 1953 – the map shows the extent of inundations (Gerritsen, 2005).*

The Delta Works led to the closure of the inlets of the estuaries in the southwest of the Netherlands. From the 1960s and onwards, almost all the Rhine-Meuse estuaries, one by one, got closed off by the means of dams and sluices, or a storm surge barrier (in case of the Eastern Scheldt and Nieuwe Waterweg canal) (Nienhuis, 2008; Paalvast & Van der Velde, 2014; Smits et al., 2006). One of the estuaries that became closed off from the North Sea is the Haringvliet in 1970 (figure 4). Sluices were constructed and thereby increased the safety of the inland area, improved the fresh water catchment for agriculture and drinking water facilities, and improved the infrastructural connections (Van Meerkerk et al., 2013; Nienhuis, 2008; Rijkswaterstaat, 2016; Storm et al, 2006).

The goal of the Delta Works was to provide a safe coastline in the Southwest of the Netherlands by building *'a large, solid and inflexible 'wall against the sea''* (Nienhuis, 2008, p.269). This decision is understandable when considering the cultural and temporal context: the reaction on a disaster and the historical tradition of Dutch water management (Smits et al., 2006). The human intervention, however, by constructing these hard coastal defence structures have ensured that the delta has changed from its natural state (figure 3). The Haringvliet became an enclosed estuary, functioning as freshwater compartment, with reduced dynamics and ecological instability (Van Meerkerk et al., 2013; Syvitski & Saito, 2007; Vergeer & Van den Bremer, 2016).

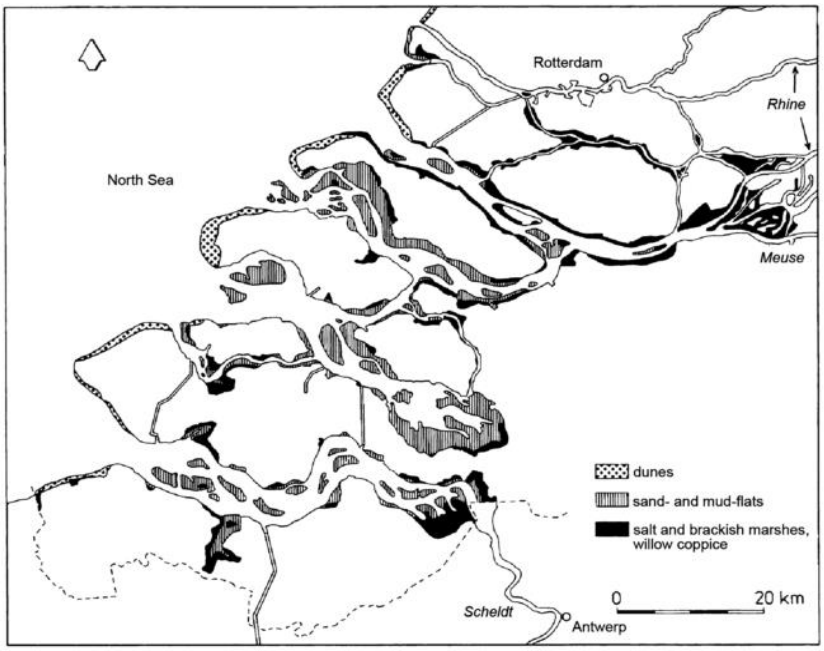
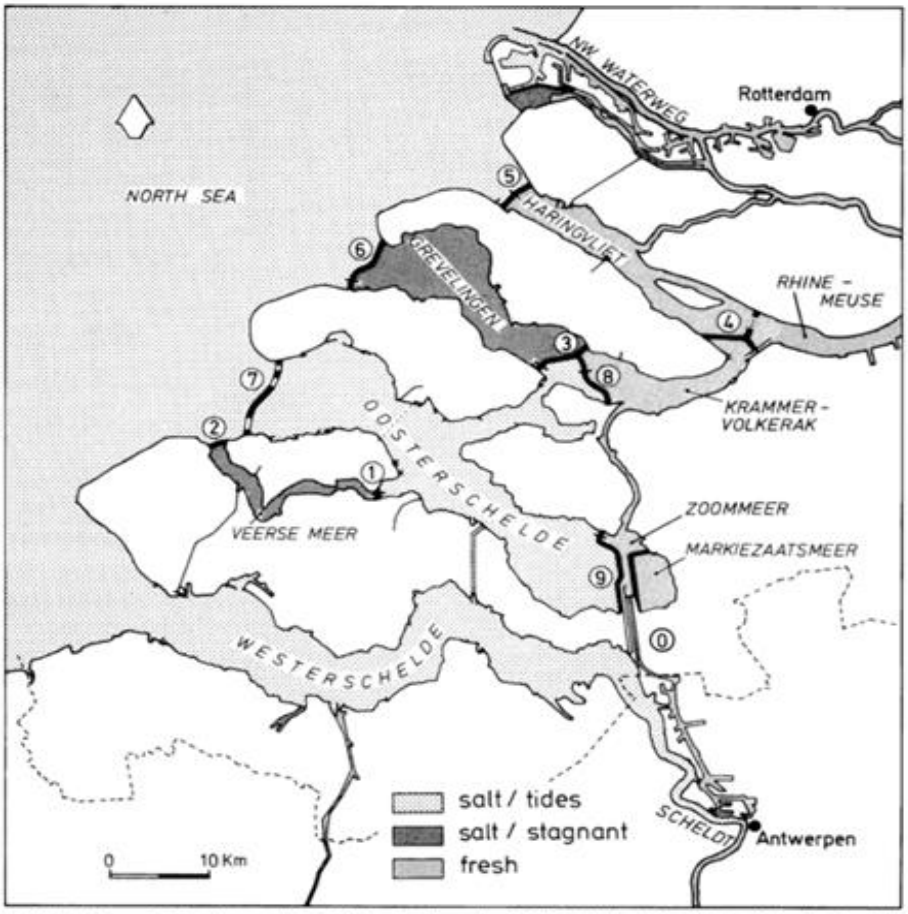


Figure 4.3: *The Rhine-Meuse-Scheldt delta between 1900-1950, showing the former dynamic natural system of the area (Smits et al., 2005)*



1 = Zandkreekdam, 1960; 2 = Veersegatdam, 1961; 3 = Grevelingendam, 1964; 4 = Volkerakdam, 1969; 5 = Haringvlietdam, 1970, 6 = Brouwersdam, 1971; 7 = Oosterschelde storm surge barrier, 1986; 8 = Philipsdam, 1987; 9 = Oesterdam, 1986. Markiezaatsmeer has been closed off from Zoommeer by Markiezaatsdam in 1983. The connection between Oosterschelde and Westerschelde was already closed in 1867 (0 = Kreekrakdam). Projects preceding the Delta act of 1957, such as the closure of the Brielse Maas (1950), the Braakman (1952) and the construction of the flood barrier in the Hollandse IJssel (1958) near Rotterdam, have not been indicated

Figure 4.4*: Current situation of the southwest delta in the Netherlands. The map shows the various waterbodies resulting from the implementation of the Delta Works (Smits et al., 2005)*

The construction of the sluices had severe impact on the natural environment of the delta mouth. The estuary changed into a system dominated by river dynamics and lost its unique features (Van Meerkerk et al., 2013; Smits et al., 2006; Storm et al., 2006). The dynamic tidal gradient and the mixing of seawater and river water have been drastically reduced (Van Meerkerk et al., 2013; Nienhuis, 2008; Storm et al., 2006). The Haringvliet sluices also hindered the unrestrained discharge of river water (Smits et al., 2006). Moreover, the loss of tidal dynamics and hindered discharge led to the accumulation of polluted sludge that have a polluting effect on the sediments in the Haringvliet (Van Meerkerk et al., 2013; Smits et al., 2006; Storm et al., 2006).

The implementation of the Delta Works led to a major loss in estuarian natural area: a total area of 890 km^2 was lost or no longer part of the estuary[1]. In 2011, more than 93% of the total area of the Rhine-Meuse estuary was lost compared to the situation in 1950 (Paalvast & Van der Velde, 2014). The divers estuarine habitats deteriorated and got disconnected from each other, while for a lot of species the quality and connectivity of the habitats are essential for '*their life cycles and fulfil important nursery, feeding, or reproductive functions'* (Ysebaert et al., 2016, pp. 46). For instance, the construction of the Haringvliet sluices has disrupted the migration route of certain fish species and the gradual transition zones in salinity necessary for the fish to adapt. The ecological value of the Haringvliet decreased to a low level (Van Meerkerk et al, 2013; Van Wesenbeeck et al., 2014; Ysebaert et al., 2016).

4.2 Decades of negotiation: process analysis of the Haringvliet case

Environmental motives played no part in the decision when the Delta Works were constructed (Nienhuis, 2008). During the 1980s, environmental concern began to rise within the Dutch government. *Rijkswaterstaat* (the technical Waterway and Shipping Administration of the Ministry of Transport, Public Works and Water Management) underwent a shift in paradigm as more positions were claimed by people with a natural science background. The concept of integrated water resource management got embraced within Dutch governmental bodies. The management and policies became more focused on integrating and coordinating the interests of society in relation to water systems and their functions. Moreover, emphasis was put on ecological objectives to restore natural dynamics (Marks et al., 2014; Van Meerkerk, 2010; Van Meerkerk et al., 2013). Influenced by this change in vision, the national government began to investigate if changes in the management of the Haringvliet sluices were possible to reintroduce estuarine dynamics due to the rise of environmental concern. The idea of possibly opening the sluices was also linked to the Rhine Action Program for Ecological Rehabilitation (1987) of the International Commission for the Protection of the Rhine to restore the migration of certain fish species (Van Meerkerk et al., 2013; Storm et al., 2006).

1991-1994

In the beginning of the 1990s, Rijkswaterstaat realised that they were not individually capable to bring regional bodies together that were necessary to initiate the ecological restoration of the Haringvliet. Rijkswaterstaat involved the Province of South Holland as the chair of the consultation procedure with the regional bodies. The consultation was aimed to determine how proposed measures to restore the ecological dynamics of the Haringvliet could be combined with its other complex socio-economic functions. Rijkswaterstaat facilitated the process, took on the role of secretary and provided expertise (Bank & Tromp, 2009; Marks et al, 2014). Different variation of management of the sluices were discussed, but the restoration of the natural dynamics of the Haringvliet became a controversial subject. The construction of the sluices in the Haringvliet allowed for the development of freshwater infrastructure for the regional agricultural and industrial sector. The supply of freshwater could however become endangered when tidal dynamics return into the Haringvliet due to fluctuating water levels and change in salinity. This is a rather sensitive subject for the regional parties such as the water boards, agricultural sector and municipalities. These parties have their criticism and concern about the change in management and the lack of knowledge on the effects it would have on the ecological system of the Haringvliet (Bank & Tromp, 2009; Van Meerkerk, 2010). The gathered parties therefore conceived an alternative variation for the reintroduction of the tidal dynamics to restore the estuarine ecology. The

[1] *Deep tidal water (446 km^2); Shallow water (97 km^2); sand and mud flats (188 km^2); salt and brackish marshes (94 km^2); extensive reed and rush beds (40 km^2); and tidal willow coppices (25 km^2) (Paalvast & Van der Velde, 2014, pp. 51)*

alternative would only restore the saline gradient to such an extent that it would benefit the migration of fish species (*Broken Tide*) (Marks et al., 2014).

1994-1999

After the agreement to explore the alternative of Broken Tide, Rijkswaterstaat started the "*Milieu Effect Rapport (MER)"* as an official Environmental Impact Assessment (EIA) medio 1990s. The process of the EIA was again leaded by the Province of South Holland, but in collaboration with the Province of North Brabant (on behave of the upstream region) (Banks & Tromp, 2009; Marks et al., 2014; Storm et al., 2006). The MER was focused on researching the negative effects the current management of the sluices had on the estuarine nature surrounding the Haringvlietdam compared to the situation before 1971 (Bakker & Tromp, 2009). A public consultation procedure was organised, but the formal responses – mostly coming from parties already involved in the process - where all negative on the intention to restore the estuarine dynamics in the Haringvliet. The arguments of the regional actors all concerned the already discussed negative effects the decision could have on, for instance, the freshwater retraction and supply for drinking water and the agricultural sector (Bakker & Tromp, 2009). Rijkswaterstaat, supported by the Province of South Holland, argued to that the concerns would be leading in the MER. An advisory group, mostly consisting out (regional) actors already involved, was installed to ensure that the actors were actively involved and to hopefully reduce counteracting actors (Bakker & Tromp, 2009). Rijkswaterstaat further organised eight expert groups focused on different themes: 'water and saline movement', 'morphology and quality', 'ecology and landscape', 'freshwater supply for agriculture', 'freshwater supply for consumption', 'fisheries', 'recreation' and 'shipping and other uses' (Marks et al., 2016).

Four scenarios were research in the MER to assess their effect on the nature and use of the Haringvliet. The difference between the four is mostly based on to what extent sea water may intrude the Haringvliet during high tide (Aarden, 1998; Bakker & Tromp, 2009; Storm et al., 2006):

- *Base Case (current management):* The sluices are closed during high tide.
- *Broken Tide*: This alternative was preferred by regional actors during the consultation procedure at the start. The management of the sluices will be adapted to allow now and then the entrance of salt water into the Haringvliet during high tide and migratory fish species may pass the sluices.
- *Tamed Tide*: The management of the sluices allows for the return of moderate tidal dynamics. The sluices will be open for 95% of the time. Salt water will permeate the Haringvliet further upstream till a certain point (The *Spui*) to safeguard the supply of fresh water by pumping stations.
- *Storm Surge Barrier*: The sluices will only be closed during heavy storms.

In 1994, when writing the MER report, Rijkswaterstaat had experimented with opening the sluices to analyse the effects. Two of the seventeen sluices were opened (De Ruiter, 1995; Storm et al, 2006). The results were that saltwater did not intrude the Haringvliet further than 7 kilometres. At the same time, fishnets were placed at the sluices and these made it possible to analyse an increase in fish species that wanted to pass the sluices. The test showed that the return of the estuarine dynamics had an positive effect on the possibility of fish species to enter the Haringvliet (De Ruiter, 1995; Seeters, 1995; Storm et al, 2006). To further reduce uncertainty about the possible effects of opening the sluices in the Haringvliet, Rijkswaterstaat wanted to experiment in practice by opening the sluices during high tide for a maximum of three weeks in March 1997 (Bakker &Tromp, 2009; Storm et al, 2006). The idea was criticised by a drinking water company as it was argued that it would temporarily effect the supply of fresh drinking water. Rijkswaterstaat reacted by mentioning that the plans of experimentation were already discussed with the involved actors during an earlier stage. The experiment did however took place for only five days, because Rijkswaterstaat felt the need to reduce the time period due to pressure (Bakker & Tromp, 2009).

The MER concluded in 1998 that the alternative of Broken Tide fell short in achieving the ecological standards set in national policy. The report suggests the alternative of Tamed Tide as both the ecological system of the Haringvliet would benefit and disadvantages can be (financially) managed. The alternative would be complemented with an extensive monitoring scheme and room for an experimental approach to introduce learning-while-doing (Bakker &Tromp, 2009; Marks et al., 2014; Storm et al., 2006). The

conclusion of the MER report was partly the result of the change in (management) vision regarding ecological restoration at national governmental level. The idea to restore the estuarine ecology of the Dutch Southwestern Delta was embraced by WWF-The Netherlands and other national non-governmental organisations (NGOs). The field of stakeholders in the Haringvliet case expanded with the introduction of the environmental lobby (Marks et al., 2014).

The conclusion of the MER led to the creation of a concept decision. The Province of South Holland became overseer of the implementation process as Rijkswaterstaat retreated. Stakeholders were ensembled and they again expressed their concerns with the implementation regarding the freshwater supply. At the same time, the creation of new nature that resembled former estuarine natural state, was proposed in the MER. This was questioned by local governments due to the involved public costs and the loss of the current nature (Aarden, 1998; Marks et al., 2014). The concept was named "*Kierbesluit"* and was developed to function as the first step towards the implementation of the scenario of Tamed Tide. The decision looked similar to the scenario of Broken Tide and the execution of this decision was planned for 2002 (Bakker & Tromp, 2009; Marks et al, 2004).

In September 1999, the "*definite design decision on the alteration of the regime of the sluices of the Haringvlietdam"* was published. This version of the decision showed two changes. First, the date of realisation was postponed to 2005. Secondly, the Ministry of Agriculture, Nature and Fisheries (ANF) became involved in the implementation process due its desire to develop 3.000 hectares of additional delta nature in the area and the ability to contribute financially. The budget of €7 million that was earmarked for the change in the management of the sluices and the learning approach was enlarged by ANF with €24 million through the Delta Nature policy programme to recreate wet nature areas. The publication of the design decision made it that the Dutch national government had to take a formal decision on the change in management (Mark et al., 2014; Van Meerkerk, 2010).

2000-2004

The Kierbesluit needed to be subjected to public consultation by law. This meant that the political debate on the decision reached the Dutch national parliament and that a majority of the already stated arguments returned. The Kierbesluit seemed to be only favoured by a small minority after the debate, however the key decision was made in 2000: *"Besluit beheer Haringvlietsluizen (Kierbesluit)"* (Decision to change the management of the sluices of the Haringvlietdam) (Marks et al., 2014). The change in management of the sluices according to Tamed Tide was seen as a big step. It was estimated that the social support was not yet high enough to allow changes in the coastal defence structure. It was therefore decided by the Dutch government that the best approach was an step-wise approach to change the management. This approach should made it possible to learn from practice and to eventually implement the Tamed Tide alternative most sufficiently. Moreover, the step-wise approach was seen as an opportunity for the involved stakeholders to have more time to find and realise solutions to compensate for the risks of salinization and to safeguard the freshwater supply in the Delta area (Marks et al., 2014; Van Meerkerk, 2010; Van Meerkerk et al., 2013; Storm et al., 2006).

The first step was to open the sluices slightly (at a maximum width of 10%), both during high and low tide, in 2005. Some tidal movements would be restored to realise a limited section of brackish environment in the Haringvliet, but the restoration of true estuarine dynamics would not be achieved. The decision would also allow migratory fish species to pass the dam. This would be in line with international agreements that were made with the International Commission for the Protection of the Rhine (Marks et al., 2014; Van Meerkerk et al. 2013; Storm et al., 2006). The opening of the sluices would be minimal to reduce the negative effects associated with higher levels of salinity in the Haringvliet. It should prevent the intrusion of salt from crossing an imaginary line at the mouth of the *"Spui*.. At the same time, intakes for freshwater need to be relocated before opening of the sluices in order to safeguard water supply for drinking and agriculture. The decision included that the sluices could be closed when water would reach dangerous high levels. These measures are seen as a compensation to guarantee the supply of freshwater. These compensation measures need to be realised before the sluices may be partly opened (Marks et al., 2014; Van Meerkerk et al., 2013; Storm et al., 2006; Van Seeters, 1995). Despite this approach, the regional parties keep questioning the decision. They have

doubt about the independency of the MER report and several actors asked for further research. A lot of the regional actors also still believed that the scenario of Tamed Tide would be implemented (Van Meerkerk, 2010).

The Kierbesluit was accompanied with the plan to realise 3.000 hectares of mostly brackish and salt ecotopes representing delta nature. The realisation of the new nature led to concerns with several stakeholders regarding the freshwater supply. The local water boards were afraid that it would restrain the freshwater management and the drinking water companies wanted to keep supplying safe water in the most cost-effective way. The agricultural sector were concerned with the risk of salinization, the loss of arable land in exchange for nature to develop and the change in landscape (Marks et al., 2014). The environmental lobby that is in favour of creating new nature in the Haringvliet were joined by the water board of Goeree-Overflakkee. The agricultural production of Goeree-Overflakkee is vulnerable for salinization and the compensating measures were seen as a solution to secure the supply of freshwater, at least if it took the form of an open freshwater canal. This idea was only not in interest for the drinking water company, since they preferred a closed pipeline as solution. The water board and drinking water company saw opportunities to combine the compensation measures with their own agenda (Bakker & Tromp, 2009; Marks et al, 2014). The Province of South-Holland was in favour of the idea of an open fresh water canal as part of the project of Delta Nature. The price of the compensating measure of the open canal would exceed the budget of €32 million. The Province of South Holland requested an extra €7,5 million from Ministry of Transport, Public Works & Water Management in order to realise the idea. The idea of a fresh water canal was seen as integral management option that would be able to combine multiple societal functions in an area, such as fresh water supply, nature development, water storage and retention, and recreation (Bakker & Tromp, 2009; Marks et al., 2014). In 2000, the press found out the discussion between the Ministry and the Province of South-Holland on the financial issue and this initiated a debate in the national parliament. This almost ended the ecological restoration of the Haringvliet due to a decrease in political support (Marks et al., 2014).

In 2003, more detailed estimations of the costs showed that there was a need for an additional financial investment for the Kierbesluit to be fully implemented and to be sure to safeguard the freshwater supply. This was announced before the start of an extremely warm and dry summer in the Netherlands. The summer made it necessary that extensive measures were used to secure the freshwater supply. This event restarted the political debate on the Kierbesluit since one of the most important freshwater bodies of the Netherlands would be influenced by the intrusion of saltwater. The water boards – also of Goeree-Overflakkee – refrained from supporting the Kierbesluit as the consequences of the decision in relation to climate change were not fully comprehended. They also are afraid of the negative effects long lasting droughts in combination with the Kierbesluit have on the regional horticulture and industry (Marks et al., 2014; Trouw, 2003). This all led to an appeal in the national parliament to reconsider the Kierbesluit, but it did not gain a majority. The deputy of South Holland however had a hard task in maintaining stakeholder support for the implementation process and needed her individual political skills to come to a new consensus (Marks et al., 2014).

In 2004, the Dutch government and the Province of South Holland agreed upon the *"Bestuursakkoord uitvoering Besluit beheer Haringvlietsluizen"* (Adminastrive Agreement on the Realisation of the Decision on the Management of the Sluices of the Haringvliet). The agreement delegated one part of the implementation process to Rijkswaterstaat and the other part to the Province of South-Holland. Rijkswaterstaat, as manager of the sluices, became responsible for the installation of proper monitoring to assure that salt water will not intrude the Haringvliet further than the agreed maximum border (Kuijken, 2010; Van Meerkerk et al., 2013). The responsibility for the relocation of the intake locations of freshwater, owned by the water board and drinking water company, and the development of the new freshwater infrastructure became the responsibility of the Province. These compensation measures need to be realised on Goeree-Overflakkee and Voorne-Putten to guarantee the freshwater supply (Atsma, 2011; Kuijken, 2010; Van Meerkerk et al., 2013). The maximum financial support by the national government for the realisation of the Kierbesluit was determined to be €35 million (Atsma, 2011; Bakker & Tromp, 2009).

A new research report was published in October 2004 on the compensation measures. The research was the result of assigning a new steering committee and advisory group both consisting out of the different stakeholders. The local water boards and water companies would object the Kierbesluit when it cannot be guaranteed that the Haringvliet will function as a freshwater basin (Bakker & Tromp, 2009). The research report concluded that the involved stakeholders approved the new compensating measures by relocating the freshwater extraction points. The new plan was focused on a multifunctional solution in order to benefit multiple interests and thus to possibly acquire more financial support. The compensating measures however needed more time to be effectively realised. This meant that the date of realisation needed to be delayed again. The Kierbesluit would be fully realised in 2008 (Marks et al., 2014; Storm et al., 2006).

During this period, Rijkwaterstaat and the Province of South Holland researched different alternatives in which the compensation measures are combined with the broader area and to combine functions. The compensation measures are mostly related to the construction of alternative freshwater infrastructure. The Province preferred the alternative of creating open freshwater canals on Goerree-Overflakkee and Voorne-Putten which would become part of the Delta Nature project (Van Meerkerk, 2010; Van Meerkerk et al., 2013). The Kierbesluit and the compensation measures became more connected with the project of Delta Nature. The link happened at project level as a result of the overlap in area and the goal of restoring the natural dynamics in the Haringvliet, but both were considered as independent from each other (Van Meerkerk et al., 2013). Many of the regional parties opposed the construction of the freshwater canals, because they and their agendas were excluded from the planning process. The construction of a fresh water canal surrounded by delta nature meant that agricultural land would be sacrificed. At the same time, there were concerns about that a high water quality for safe drinking water and agricultural use could not be guaranteed. An open canal meant that the water would be very vulnerable for external influences that lower the quality of the water (e.g. stagnant water, algae growth, natural waste entering the water) (Expert 1, 2017; Expert 7, 2017; Van Meerkerk, 2010; Van Meerkerk et al., 2013).

2005-2008

The Province of South Holland continued the implementation process in 2005. Negotiations with farmers and their democratic and sectorial representatives became central to the implementation process since the compensating measures asked for the procurement of necessary land. The result was a procedural struggle between the Province and the stakeholders (Van Meerkerk et al., 2013). The suspicion about the effects of the Kierbesluit was still present and has led to a lack of stakeholder support for the project and the compensation measures as drafted by the Province. The resistance against the Kierbesluit increased. Municipalities refused to change their planning policies and the distrust the agricultural sector had in the project grew (Van Meerkerk, 2010; Schreuder, 2010A).

Other obstacles were also present for the Province of South Holland. First of all, the compensation measures intertwined with the realisation of delta nature in polders at Goeree-Overflakkee. This led to two different results. In the Palland polder, the process was provided with forward momentum due to European funding and strict deadlines (Bakker & Tromp, 2009; Marks et al., 2014). In the Zuiderdiep polder, an alternative for the delta nature was proposed by a local agricultural enterprise. This alternative was taken into account in the new EIA as proposed by the local government. The alternative did however not meet the water-environmental objectives and was therefore disregarded in the EIA in 2007 (Marks et al. 2014).

Secondly, on the northern shore of the Haringvliet, the process was put under pressure due to the slow organisation and the extensive procedures of the involved municipalities. Local stakeholders were not interested in the solution of the province and water board that combined the freshwater measures with ecological objectives, since it would require a large area to be realised. The stakeholders favoured the realisation of a simple underground pipeline that would costs less (Marks et al. 2014). The discussion became more and more turbulent. Eventually, the local government council of Bernisse rejected the compensation measures and the relocation of the water extraction points. The Province of South Holland wanted to bypass the local government by reacting through procedural steering mechanisms. This

worsened the relationship between the Province and regional stakeholders and resulted in more delays and procedural and juridical struggles (Marks et al., 2014; Van Meerkerk et al., 2013).

At the same time, there was the discussion of allowing salt water into the adjacent Volkerak Lake to solve the unexpected problem of blue-green algae growth in the freshwater basin. It was not known what the influence of this measure was for the salinity of the other end of the Haringvliet (Marks et al., 2014; Van Meerkerk et al., 2013). This increased the urgency of the issue of reassuring a safe freshwater supply during the Kierbesluit. The implementation process suffered from this new debate. The drinking water company now argued that it was necessary to analyse the freshwater supply in the whole delta area (Marks et al., 2014).

These developments led to the realisation that it would not be possible to realise the compensatory freshwater facilities by 2008. In 2007, the Kierbesluit was therefore postponed to 2010 (Marks et al., 2014; Van Meerkerk, 2010). From this moment on, the Delta Nature Program was excluded from the implementation process, because it grew from an impulse in the beginning (extra finances) to an obstacle threatening the realisation of the project and compensation measures (increased resistance) (Marks et al., 2014; Van Meerkerk et al., 2013). The national parliament came to the conclusion that in order to restore the tidal dynamics in the Haringvliet through the Kierbesluit needed more time. This decision did not led to major debates. The State Secretary was the only one concerned with this decision, because she needed to report the International Commission for the Protection of the Rhine about the incapacity of the Netherlands to allow migratory fish species to reach their spawning ground and that upstream efforts that accommodate fish migration were lost investments (Marks et al., 2014).

2009-2012

The relationship between the Province and the regional stakeholders changed at the end of 2009. The plans were reconsidered by the Province and an interactive process with the different regional stakeholders was facilitated at Voorne-Putten. Multiple moments of interaction were organised to develop the location and form of the freshwater route, while listening to each of the regional stakeholders. This process increased the support of the stakeholders for the project, since they were listened to and had a certain influence on the implementation process. This process went on till medio 2010 (Van Meerkerk et al., 2013).

The year 2010 was the year in which the national government (Administration Rutte-I) reconsidered the decision to change the management of the Haringvliet sluices and cancelled the implementation process (Van Meerkerk et al., 2013; NRC, 2010; Schreuder, 2010B; Schreuder, 2015; Trouw, 2011A). The announcement was made by the State Secretary of Infrastructure and Environment. The reasons for not continuing the implementation of the Kierbesluit was that the realisation would be financially too expensive and the lack of societal support, mostly expressed through the negative reactions of the agricultural sector (Atsma, 2011; Meerhof, 2010; Schreuder, 2015; Trouw, 2011B). The involved governmental actors expected that the project - and therefore the relocation of the freshwater extraction facilities - would require €6 à €7 million more than expected (Calmthout, 2010; Kuijken, 2010). Moreover, the possible salinization of arable land would lead to financial losses of the farmers and claims for compensation (Meerhof, 2010). The State Secretary argued that the extra financial costs would not be appropriate in a time of governmental budget cuts (Calmthout, 2010). The result was that the Kierbesluit was directly stopped and that involved stakeholders no longer payed any attention for the project. Years of negotiation were immediately stopped (Expert 1, 2017).

Other countries, such as France, Germany and Switzerland, that had invested in measures to improve the situation for different migratory fish species reacted agitated to the decision of the Dutch government, because their measures all depend on the possibility of the fish to pass the sluices in the Haringvliet. The neighbouring countries would react through increasing diplomatic pressure and eventually by threatening to go to the International Court in The Hague (Janssen, 2010; Marijnissen, 2010; Trouw, 2010A; Trouw, 2010C; Trouw, 2011A). The Dutch House of Representatives ("*Tweede Kamer")* reacted also indignant about cancelling the decision, since it would disrespect the relation with Germany, France and the Province of South Holland (Calmthout, 2010). At the same time, the question arose about if the Netherlands could guarantee its commitment to international agreements on

environmental topics (NRC, 2010; Trouw, 2011B). The Dutch Senate ("*Eerste Kamer"*) voted in favour of continuing the Kierbesluit as international agreements would otherwise be neglected (Trouw, 2011A).

The State Secretary chose to investigate the financial and juridical consequences of slightly opening the sluices, as insurance claims loomed and the Netherlands was bounded to international agreements (NRC, 2010; Trouw, 2011A). The research would also investigate alternatives for the passage of migratory fish species: the possibility if the fish could migrated through the "*Nieuwe Waterweg"* and "*Hartelkanaal"* towards the Rhine and Meuse. The State Secretary wanted to know if these alternative routes would help the Netherlands in meeting international agreements and avoid claims (Trouw, 2010B; Trouw, 2010C; Trouw, 2011B).

The international agreements influenced the decision to change the management of the sluices in 2000. Again, they were an important reason why the Dutch government decided to continue the implementation process of the Kierbesluit in 2011 (Meerhof, 2011; Van Meerkerk et al., 2013; Rijkswaterstaat, 2016; Schreuder, 2015). International pressure from Europe has changed the position the Dutch government had on implementing the Kierbesluit (Meerhof, 2011; Schreuder, 2015; Expert 5, 2017). Cancelling the Kierbesluit became financially more unattractive then continuing the implementation due to the expected claims: a condemnation by the European Court and a fine of €269.568 per day, with a minimum fine of €3,704,000 (Meerhof, 2011).

The national government also argued that it would benefit the freshwater supply upstream. Moreover, the cancellation of projects that would have returned reclaimed land to nature (e.g. *Hedwigepolder)* and the guarantee that the Haringvliet would still be able to supply freshwater has increased the support for the decision. It is decided that the sluices would close if the discharge of the Rhine would reach levels lower than 1,500 meter per second during high tide to increase the freshwater in the Haringvliet. The sluices therefore may be closed over a longer period during prolonged drought (Meerhof, 2011).

The environmental lobby was pleased with the decision (Meerhof, 2011; Schreuder, 2011). They however expressed that the argument of guaranteed freshwater supply has always been present. The environmental lobby therefore thought that the decision is not based on new insights (Meerhof, 2011).

In 2011, the Province of South Holland was not the leading actor anymore. Rijkswaterstaat became the new project leader as the original plan was originally initiated by the national government. The representative of Rijkwaterstaat changed. The regional water board had also a change in their representative. The setting after the new decision became different (Expert 1, 2017). The Kierbesluit could be restarted. The idea was however to bring the decision back to its original core, namely that of only slightly opening the sluices of the Haringvliet to allow fish migration. The development of natural areas was not combined with this decision anymore. This would be more financially feasible (Expert 1, 2017; Expert 5, 2017).

2013 - Current

In 2013, the Minister of Infrastructure and Environment Melanie Schultz van Haegen was able to agree on a decision in principle with the stakeholders to realise the Kierbesluit by 2018 (Waterforum, 2013). The Minister was able during a consultation process with the regional water board, the water company Evides and several local municipalities (Goeree-Overflakkee, Hellevoetsluis and Bernisse) and the Province of South Holland to establish support for the compensation measures that must safeguard the freshwater supply (Waterforum, 2013). The compensation measures would cost €75 million (Schreuder, 2015; Waterforum, 2013).

The agreement of implementation was signed in 2014. The realisation was planned to take four years and started at the end of 2014. It is planned as a four-year project (see figure 4.5) (Rijksoverheid, 2016; WSHD, 2014B). The new freshwater infrastructure on Voorne-Putten is being realised by the Province of South Holland as part of the nature development project "*Beningerwaard"*. The compensation measure improves the supply of freshwater in the area. The regional water board was therefore willing to contribute financially (Rijksoverheid, 2016; Waterforum, 2013). The other compensation measures are being realised on Goeree-Overflakkee. A freshwater canal and a separate pipeline are being realised

by respectively the regional waterboard and the water company Evides. A separate supply and drainage line are being realised as this was seen as more robust and efficient for the freshwater and ecology. In addition, the water extraction facility is being relocated eastward towards an area where the Haringvliet stays fresh. The water board contributes with €1,58 million and Evides with €1.5 million (Rijksoverheid, 2016; Waterforum, 2013; WSHD, 2016). During the realisation of the measures, Rijkswaterstaat monitors the level of salinity in the Haringvliet as manager of the sluices (WSHD, 2014A). The Ministry of Infrastructure, the regional Water Board (*Hollandse Delta*) and the water company Evides showed trust in each other when starting the realisation of the compensatory measures (WSHD, 2014B). The Ministry is pleased that the Kierbesluit restores the historical function of the Haringvliet as a migratory route for fishes. The regional water board and the water company agreed to be satisfied with the trust the ministry has in them and that the importance of the fresh water supply in the region is recognised. The compensation measures are developed in collaboration with the project partners and are supported by local stakeholders in the area (WSHD, 2014B).

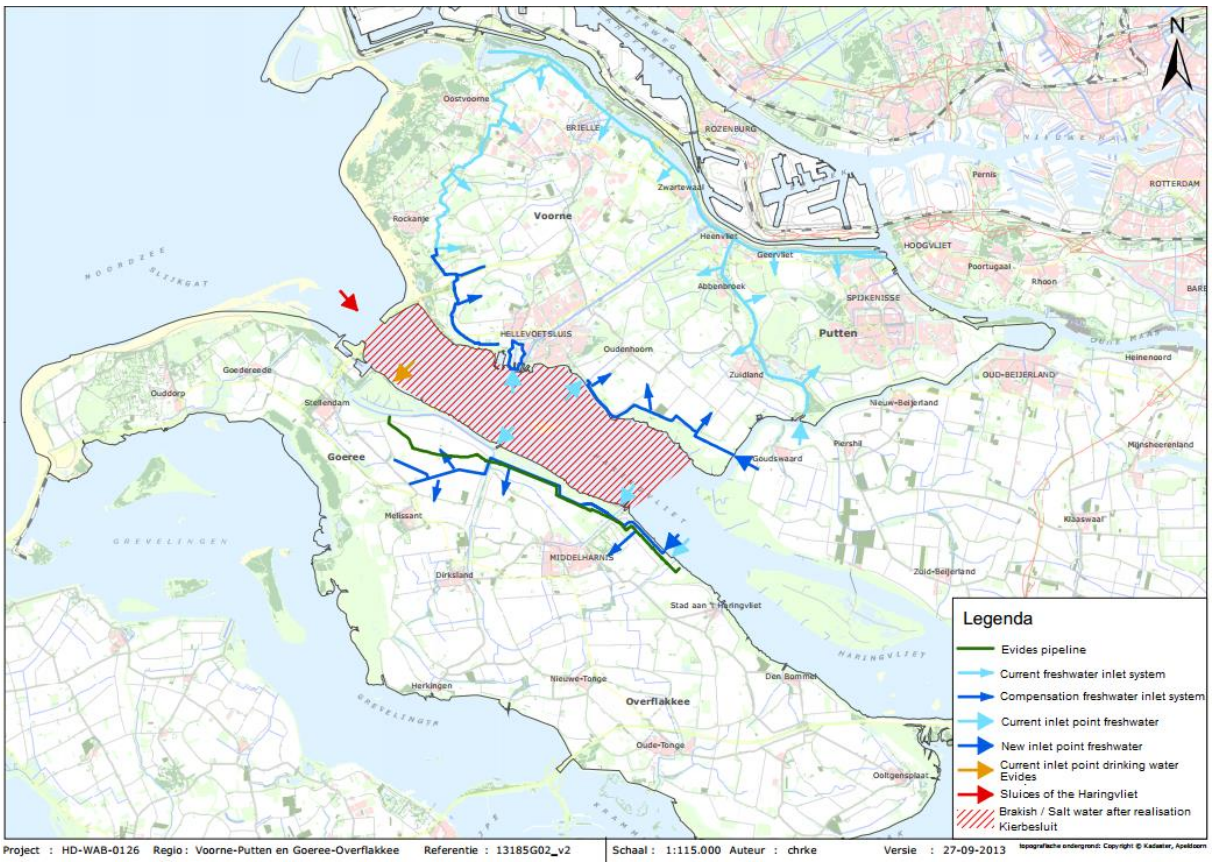


Figure 4.5: *Map of the compensation measures Kierbesluit on Voorne-Putten and Goeree-Overflakkee (WSHD, 2017).*

The decision to change the management of the Haringvliet sluices is used by six collaborating environmental organisations (*Ark Natuurontwikkeling, Natuurmonumenten, Sportvisserij Nederland, Staatsbosbeheer, Vogelbescherming Nederland* and *WWF*) to initiate a project that focuses on the nature and tourism development of the estuarine area. In 2015, it was announced that the project would receive €13.5 million funding through the foundation of the "Nationale *Postcode Loterij" (*a Dutch charity lottery) (Janssen, 2015; Van Limpt, 2016; Schreuder, 2015).

The project is named the *Droomfondsproject Haringvliet* and anticipates on the partial opening of the sluices in 2018 by using ecological restoration measures that provide an impulse that further reinstates the dynamic ecology of the area (see figure 4.6) (Droomfondsproject Haringvliet, 2016; Marijnissen, 2015; Met De Stroom Mee, 2014). The project focuses on the ecological restoration of the Haringvliet, but must also profit the local economy through tourism and recreation. The project also contains negotiations with fisheries to secure balance between the carrying capacity of the Haringvliet and

economic functions (Van Limpt, 2016). The three year project is divided in six sub projects in which each of the project partners work together with their own expertise (Droomfondsproject Haringvliet, 2016; Met De Stroom Mee, 2014):

1. *Nature development:* the closure of the Haringvliet led to the disappearance of tidal influences and the water in the area transformed from salt to fresh. The quality of the water degraded, the riverbanks calved and migratory fish species are not able to pass the sluices. Both flora and fauna left the area as a result. The subproject aims to boost the return of the specific delta nature of the area by creating new green hems with natural riverbanks that are favoured by animals and plant species that are part of the estuarine ecosystem. Nature areas will be improved and land areas are bought up for nature to develop. The improved nature areas need to function as an area where migratory birds and fish may spawn, hatch and grow (Droomfondsproject Haringvliet, 2016)

2. *Recreation*: The subproject is focused on attracting (inter)national tourist to the area by creating waterways, cycling-, hiking-, and strolling trails, educational excursions and several outlook points that make it possible to experience the newly developed nature of the Haringvliet area. The subproject is made possible in collaboration with local entrepreneurs and individuals. The recreation plans will fit the existing plans and stimulates initiatives for catering facilities and overnight stays. The recreation plans need to stimulate the local economy of the area (Droomfondsproject Haringvliet, 2016; Met De Stroom Mee, 2014).

3. *Monitoring*: The goal of the monitoring is to closely follow the sustainable development of the bird and fish populations. The project starts with a baseline measurement and is followed-up by the inventory of the populations. The measurements makes it possible to measure the effect of the taken actions, learn from the actions and provides opportunities to adapt when necessary. The monitoring is done in cooperation with the Dutch government, scientists, fishers and bird lovers (Droomfondsproject Haringvliet, 2016; Met De Stroom Mee, 2014).

4. *Fisheries*: Different migratory fish species in the Haringvliet may profit from the slightly opening of the sluices. To restore the migratory fish populations, it is of importance that the fisheries are in balance with the carrying capacity of the Haringvliet ecosystem. The subproject focuses on the facilitating a sustainable transition of the fishery sector in cooperation with Dutch government and fisheries (Droomfondsproject Haringvliet, 2016; Met De Stroom Mee, 2014).

5. *Shellfish banks*: the presence of shellfish banks has influence on the biodiversity of the area. The shellfish banks will filter the water, provide areas for fish to rest and to breed, and also food for many fish and bird species. This subproject is a pilot project in which several locations in the Haringvliet are transformed into shellfish banks to follow the developments and to gain knowledge on shellfish banks. The project must provide information on the efficacy of the development of shellfish banks in the Haringvliet (Droomfondsproject Haringvliet, 2016; Met De Stroom Mee, 2014).

6. *Sturgeon*: the European Atlantic Sturgeon disappeared from the North Sea and the Rhine Delta as a result of pollution and overfishing during the 1950s. The subproject aims to reintroduce the sturgeon in the Haringvliet and the Rhine. The subproject has facilitated experimental deportations of tagged sturgeons to examine if the return of sturgeon is possible, but also to find bottlenecks in the Rhine riversystem and to tackle them. The project establishes a breeding centrum for research, breeding and deportation of young sturgeons next to Rhine river to let the sturgeon acclimatise with the natural habitat. The reintroduction of the sturgeon will be accompanied with workshops, excursions and expo in the Rotterdam Zoo to inform (young) people on the Haringvliet nature and the importance of the sturgeon (Droomfondsproject Haringvliet, 2016; Met De Stroom Mee, 2014).

When the Kierbesluit will be realised in 2018, the Droomfondsproject Haringvliet is almost fully implemented and will begin with the last realisation phase of the project.

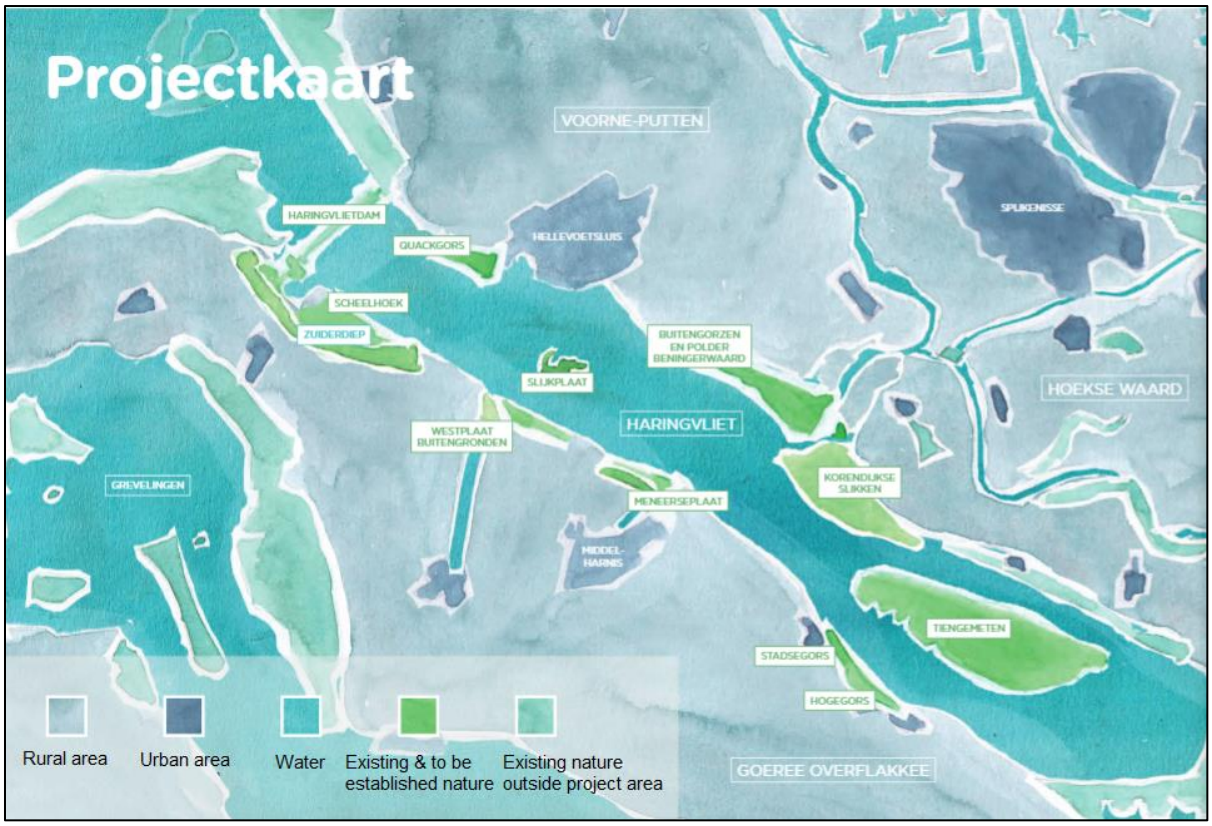


Figure 4.6: *Map of the project area of Droomfondsproject Haringvliet*

4.3 Conclusion

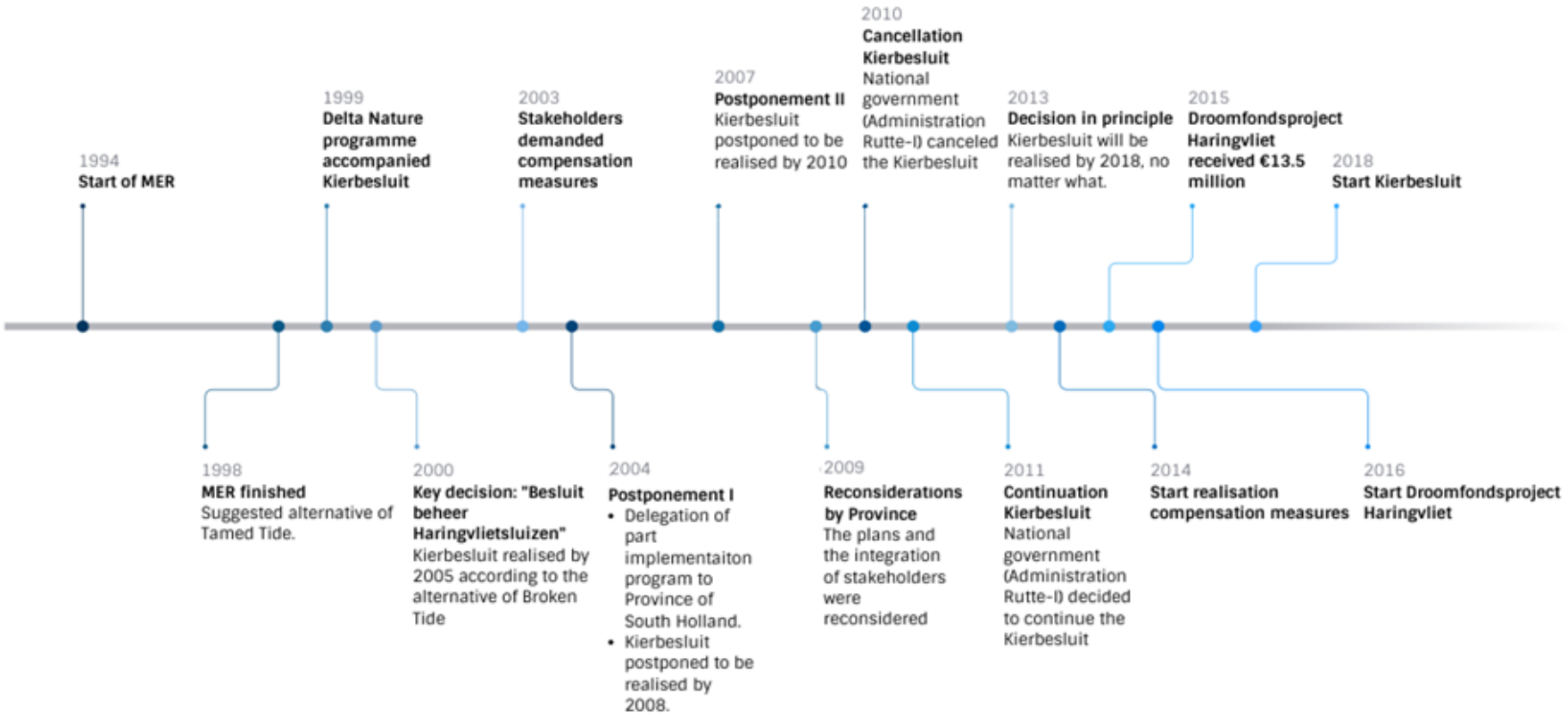
The decision to change the management of the sluices in the Haringvliet has brought multiple decades of discussion between the involved actors. The proposed change was seen as necessary to improve the ecosystem of the Haringvliet, but it became clear that this conflicted with other societal interests (Kok, 2010). The result was a dynamic actor environment due to stakeholder disagreements and difficulties to find consensus for the decision (Marks, et al., 2014; Van Meerkerk et al., 2013). The support for the decision to restore the ecology of the Haringvliet minimalised with some actors and the Kierbesluit fell in a process of delays (Kok, 2010; Marks et al., 2014; Van Meerkerk et al., 2013).

The Haringvliet case can be regarded as an key example of how the development and implementation of an decision to ecological restore estuarine area can be dominated by inertia. The timeline in figure 4.5 shows key moments of the case and makes clear that it took multiple decades to change the management of the sluices of the Haringvliet. The proposed change in management of the sluices of the Haringvliet was seen as a necessary step to restore the estuarine dynamics and the migration routes of certain fish species. The ecosystem of the Haringvliet would benefit from the change, however it became clear that the decision would conflict with other socio-economic interests. This led to a process characterised by a dynamic actor environment due to multiple decades of stakeholder discussion, disagreements and difficulties to reach consensus. Regional actors were of opinion that their interest were not taken into account and the decision would negatively affect the freshwater supply for agricultural practices or drinking water, and would lead to the loss of good arable land. The regional support for the measure could be considered as low.

During the process, the change to slightly open the sluices of the Haringvliet seemed however to be overshadowed by the realisation of the compensation measures and the related project to realise delta nature in the area. Disagreement and discontent about the realisation of these projects led to several postponements and even the cancellation of the Kierbesluit. It was until the national government became to realise that the consequences of not realising the Kierbesluit were even less favourable. The Kierbesluit was restarted, but it was decided to return to the base: slightly opening the sluices to allow

fish migration. The realisation of delta nature was no part of the decision anymore. The leading actor of the Kierbesluit changed and agreement was found on the realisation of compensation measures. Finally, the Droomfondsproject Haringvliet was initiated to provide an impulse to further reinstate the dynamic ecology of the area through different ecological restoration measures.

Figure 4.5: ***Timeline displaying key moments in the process of the Kierbesluit***



Chapter 5 | Assessment of the conditions in the Haringvliet

5.1 Introduction

It became clear that the process, with as goal to restore the ecology of the Haringvliet, was characterised by many years of discussion between the involved actors and multiple moments of delay. Chapter 5 focused more in-depth on the Haringvliet case. The theoretical conditions found in the theoretical framework are the base of the analysis. The analysis discusses which theoretical conditions on successful development and implementation of ecological restoration were present in the Haringvliet case and what the differences are. This is followed-up by the presentation of perceptions on the conditions extracted from the expert interviews. This made clear which conditions were found relevant by the experts and how this differed from the theory. The analysis eventually led to an assessment of the relevance of the theoretical conditions that contribute to the successful development and implementation process of ecological restoration projects.

5.2 Experimentation

The condition "Experimentation" was defined as a way to gain context specific information on the ecological processes of the estuary, as well as on the restorative measures. It is a way of increasing the knowledge during the implementation process. This knowledge can then be used to adapt the restoration to fit better to the reality and as a way to cope with uncertainty. This should positively contribute to the restoration of the ecosystem, increase the support for the project and gain knowledge for the future.

During the starting phase of the Haringvliet case, the MER was initiated to research the negative effects that the enclosure of the Haringvliet had on the estuarine ecosystem. The MER also researched several different scenarios to assess the effects they could have on the estuarine nature and the use of the Haringvliet (Banks & Tromp, 2009; Marks et al., 2014; Storm et al., 2006). The MER was a necessity to determine the possible consequences a change in management could have on the Haringvliet. The research performed in the MER suggested the scenario of Tamed Tide and it would be complemented with extensive monitoring and room to adapt based on findings (Bakker &Tromp, 2009; Marks et al., 2014; Storm et al., 2006). The initial idea of implementing the Kierbesluit in order to restore the ecology of the Haringvliet took into account the possibility to learn from new findings.

The implementation process of the Kierbesluit was also accommodated with an step-wise approach. The management of the sluices would be changed step-by-step, with as first step the realisation of the Broken Tide alternative. This approach was chosen to learn from practice and to provide useful information to realise the next step of the alternative Tamed Tide suggested by the MER and favoured by Rijkswaterstaat and the Province of South Holland (Marks et al., 2014; Van Meerkerk, 2010; Van Meerkerk et al., 2013; Storm et al., 2006). It seemed however that another reason to follow a step-wise approach was more predominate. The support for the implementation of the Kierbesluit was not high and the step-wise approach was chosen as a way reduce resistance from stakeholders. The Kierbesluit was proposed as a smaller, more cautious change. A drawback of this approach was that the Broken Tide alternative grew from a step in a larger plan towards an end in itself. The opportunity to learn from the effects per step was no longer a part of the process.

The MER was based on scientific models, but these models can never fully guarantee that change in management in the sluices of the Haringvliet indeed are followed by the presumed effects. Rijkswaterstaat therefore performed two practical experiments to win information and to reduce the uncertainty (Bakker & Tromp, 2009; De Ruiter, 1995; Storm et al, 2006). The second experiment in 1998 was however not performed to the extent that was planned due to pressure from regional stakeholders (Bakker & Tromp, 2009). One could therefore argue that the experiment could not have been performed to its fullest potential. It is not clear if after the starting phase other experiments were performed as a mean to achieve more information about the implementation.

Integration of the compensatory measures with the restoration of estuarine nature via the Delta Nature programme could be regarded as an experiment to learn more about integrating multiple functions in an

area. The compensation measures would be enhanced with a secondary function that would restore estuarine nature of the Haringvliet. The idea however did not leave the drawing table due to an increase in complexity and stakeholder resistance.

Assessment: all in all, it seemed that the implementation process of the Kierbesluit was provided with some room for an experimental approach, however this room was minimal. The initial idea of the decision to allow a step-wise approach to increase the knowledge per step was stopped as a result of lack of support. The idea to integrate the compensation measures with the restoration of delta nature could be considered as an experimental approach, but also suffered a lack of support. Beyond the two practical experiments during the 1990s, experimentation seemed to not have played a major role in the process. The room for experimentation was hampered by resistance of several stakeholders.

5.3 Communication

Communication between the actors need to be facilitated, maintained and tailored to the right situation to positively contribute to the implementation process. The moments in which communication takes place are important. The communication should be characterised by an interactive approach in which each stakeholder participates and could exchange their perspectives on the project. The Haringvliet case was therefore analysed if and how the communication about the implementation process took place between the stakeholders.

Different moments of communication were recognised in the Haringvliet case. It was mentioned that communication took place through information meetings and consultation groups consisting out of a small group of representatives of the stakeholders (Expert 1, 2017; Expert 3, 2017; Expert 5, 2017; Expert 7, 2017). During the beginning of the process, newsletters were used as a mean of communication. The results of the MER were presented through newsletters. Different stakeholders were also given room to speak to produce a more nuanced image of the project (Expert 3, 2017). Despite this possibility for different actors to speak, a newsletter only delivers information instead of facilitating constructive interaction.

During the period when the MER was produced, several information evenings were held in which the region got informed on the decision by representatives of the initiating governmental actors. There was room for discussion, but the main objective was to provide, for instance, the chair of the local water board with the right information that could be used during discussion at the organisation (Expert 3, 2017). Several information meetings were also organised further on during the implementation process. The meetings were held in large halls, were open accessible for different actors out the region and were headed by the Province of South Holland. The information meetings were mostly focused informing the region the plans for the project in the Haringvliet. It could however be said that the meetings were firstly felt as counterproductive. The meetings were accompanied by a lot of resistant and anger of local actors against the Kierbesluit and the creation of new delta nature. Local actors (mostly related to the agricultural sector) were of opinion that the decision would only bring negative consequences for them. The discussions were hard and not constructive (Expert 1, 2017; Expert 5, 2017; Expert 7, 2017). It was mentioned that the negative atmosphere did not worked in favour for the project as some of the stakeholders were influenced in their perspective by it and it was signalled that other stakeholders were not looking forward to work on the project (Expert 1, 2017; Expert 5, 2017). The involved actors also were confronted with different project leaders and communication advisors during the information meetings meaning that they needed to re-explain their perspectives on and position in the project (Expert 5, 2017). This was not in favour for the sense of community for the project. After the last information meetings, there was still a feeling of accomplishment with some stakeholders as they experienced less resistance to the project (Expert 7, 2017).

There were also moments of communication outside the context of the Haringvliet case or more informal moments. Several stakeholders had personal contact with each other. They discussed aspects of the case in different more informal settings that were less tied down by the tense or stagnant situation of the Kierbesluit (Expert 1, 2017; Expert 6, 2017). At the same time, stakeholder met each other during other cases in which they needed to collaborate. Collaborations were fruitful and this increased the trust the

stakeholders had in each other and created a form of momentum for the Haringvliet case (Expert 6, 2017).

The communication about the goal of the Kierbesluit has led to uncertainty about the future of the Haringvliet for the actors of the region (Kuijken, 2010). In 2000, the "Besluit Beheer Haringvlietsluizen" was formulated as a first step in the ecological restoration of the Haringvliet. The decision would lead to the restoration of the migration route of certain fish species and would partly restore the transition between salt water and fresh water. The first step is similar to the scenario of Broken Tide and functions as mean to reach the scenario of Tamed Tide. This however changed during the implementation process and it was communicated that the decision would not automatically lead to Tamed Tide. It was however for some actors still unclear that the measure would not lead to the Tamed Tide alternative (Van Meerkerk, 2010). Core aspects of the Kierbesluit needed to be constantly repeated, namely that the safety of fresh water in the Haringvliet was guaranteed, that the salt intrusion would not exceed the promised levels and that the sluices would close during heavy storms (Expert 3, 2017).

The underlying thoughts of the Kierbesluit, that is facilitating possibilities for migratory fish species to pass the Haringvliet sluices, were not clear for the region (Expert 4, 2017). This could however be related to that different other projects, such as the realisation of the delta nature and the compensation measures, accompanied the Kierbesluit. The context of the decision changed constantly due to the inclusion of other measures that affected the regional stakeholder and their interest in different ways. The resistance against the measure grew as the allocation of the costs were felt as more and more uneven for regional stakeholders, mostly for the local agricultural actors. It seemed that the original goal of the Kierbesluit was lost out of sight due to regional emotions over the consequences of other related interventions. The loss of land to wet nature interplayed also with the (historical) sentiment of the region in which (arable) land and fresh water are of great value and should not be given back to the sea (Expert 2, 2017; Expert 4, 2017; Expert 6, 2017). These emotions could almost be considered as a barrier for the communication as it made it harder for content to reach the regional stakeholders if it contradicted with their interests (Expert 6, 2017).

Another way of communication between different stakeholders were small consultation groups consisting out of some representatives of the region. The goal of this form of communication was to integrate the stakeholders into the process and to exchange knowledge: to optimise the project through cross-talk. On the other hand, the communication was meant to inform the stakeholders with detailed information on the project (Expert 7, 2017). The communication between stakeholders became however more limited after the decision of the Kierbesluit was made in 2000 and were mostly only concerned with informing on the state of affairs. Interaction with the stakeholders in the region seemed to be less of a priority as the decision was already made (Van Meerkerk et al., 2013). Local stakeholders had a similar experience as the feeling was that decision were already made and they were being informed (expert 5, 2017). This made the communication function more as only sending information instead of an interactive process in which collaboratively is worked to a shared goal. Moreover, the communication developed more towards convincing each other of their perspectives instead of searching for a shared solution (Expert 4, 2017; Expert 6, 2017).

Later on in the process, around 2010 and onwards, the communication developed more towards an interactive approach in which more actors were integrated in the communication process, as well as that the Province and national government visited the region to talk with involved actors to better understand the resistance (Expert 4, 2017; Expert 7, 2017). The communication however had to deal with the past experiences.

Assessment: altogether**,** the communication between the different actors can be criticised on that it was mostly characterised by a one-way stream of information instead of a constructive interaction process. The initiating actors, Rijkswaterstaat and the Province, facilitated moments of communication, but these were arranged to notify regional actors on the state of affairs of the project. An interactive process was missing in which actors could collaboratively work on a shared vision and find solutions for (felt) problems. The exact goal and underlying thoughts for the decision were lost in the communication

process. Core aspects of the Kierbesluit related to the safety of the freshwater supply needed constant repetition. This is related to the increased complexity accompanying the project due to the integration of the Delta Nature project. The communication was not adjusted to the situation in which sentiments of regional stakeholders were forming a barrier to receive content. A restart of the project led to a revision of the communication approach. It became clear in the Haringvliet case that communication between stakeholders outside the context of the project had a positive effect for progression.

5.4 Role of key individuals

Another condition that should contribute to the success of implementing an ecological restoration project was the presence of key individuals that are capable of managing the course of the implementation process through their professional background and their vision on the project. These individuals are situated in positions that allow them to deeply engage in the project and grants them access to other stakeholders.

Many different stakeholders were involved in the implementation process during the Haringvliet case. There are however individuals mentioned in the case that played a main role during the process. At the same time, it was observed that the setting within some organisation changed due to change in directors or representatives.

Two mentioned individuals when analysing the Haringvliet case are characterised by a political background and were during the case employed on influential positions. Firstly, Lenie-Dwarshuis-Van de Beek was the representative of the Province of South Holland. As representative of the head manager of the project she was deeply engaged in the project. She knew her way in the divided field of stakeholders and was more than able to communicate and defend the state of affairs both during the large information meetings as well as in political spheres (Bakker & Tromp, 2009; Expert 2, 2017; Expert 7, 2017). Secondly, the Minister of Infrastructure & Environment Melanie Schultz van Haegen played as politician a role in the process after the decision to continue with the Kierbesluit (2010). The Minister was determined to realise the Kierbesluit and the compensation measures. She was able to acquire the necessary financial funds for the project. In 2013, the Minister was also able to proclaim that the Kierbesluit would be fully realised in 2018 (Expert 1, 2017; Schreuder, 2015; Waterforum, 2013). Both individuals that played an extensive role are characterised by their political experience and their position in the project.

In 2005, several local water boards (Goeree-Overflakkee, Brielse Dijkring, Groote Waard, IJsselmonde and partly Hollandse Eilanden &Waarden) fused into the water board Hollandse Delta. During the first five months, Daan Monster, the former chairman of Brielse Dijkring on Voorne-Putten, was the chairman of Hollandse Delta. He was known as a strong opponent of the decision to change the management of the sluices (Bakker & Tromp, 2009; Expert 4, 2017). His successor was Jan Geluk, a former politician in the House of Representatives. Jan Geluk was also no proponent of the Kierbesluit and had questioned the decision several times in the House of Representatives (Bakker & Tromp, 2009). As a former politician he had access to a large network (Expert 2, 2017). The setting of the water board did however shifted, regardless of the history of Jan Dijkgraaf, as the willingness to cooperate became more present (Bakker & Tromp, 2009; Expert 1, 2017).

The setting also changed at the involved water company Evides. Evides was formed after the fusion of two separate regional water companies and the two former directors became co-directors of the company. Evides has as a water company a strong position since their task of supplying high quality drinking water is a legal-assured task. They therefore have a strong legal position if they are obstructed in any way of performing that task and are able to enforce their interest. This has influence on the setting of the company (Expert 2, 2017). The attitude of the directors was – even before the fusion - not well enough adapted to the situation. It was too much focused on opposing the Kierbesluit. The necessity to negotiate with governmental officials and a strategic approach focused on creating sustainable relationships with regional stakeholders was overlooked. It was after the foundation of Evides that this was slowly being realised, but the representative of the Province announced that the project was already

running (Expert 1, 2017). The director of the company has changed two times since the start of Evides. The new directors had a more open vision and had a better view on the interest of others. They were more involved with the region. This had also its effects on the setting of the company as it became better prepared in terms of skill and knowledge (Expert 1, 2017). Individuals at Evides were able to deeply engage in the case for long time periods, increasing their knowledge on the case (Expert 2, 2017). Within the company these individuals were able to directly discuss the case with the director, while also being able to directly reach other stakeholders during the process (Expert 1, 2017).

Assessment: The Haringvliet case provided insight on which role individuals could play during the implementation of a project. The case showed that the position of these individuals were of decisive influence. The higher positions made it possibly to take key decisions and provides a certain freedom of movements to reach other stakeholders. Moreover, individuals in a high position had also influence on the whole setting of an organisation. If such a position is taken by an individual with a more open vision, this translated itself also to the position the organisation took during a project. The political background of most key individuals provided useful skills and a large network to appeal to. However, it seemed that during a large part of the Haringvliet case, there were no individuals that were really able to connect the different stakeholders and could overrule the difference in perspectives. From 2010, individuals that were involved were better prepared for the project and able to collaborate.

5.5 Project support

Support for the project was seen as essential for a project to be successfully implemented. The Haringvliet case was analysed on if the decision to change the management of the sluices was supported by the involved stakeholders: if they were willing to collaborate on the project and if the decision was in line with their own interests. The financial situation during the implementation process is also analysed.

The decision to restore the Haringvliet ecologically meant the initiating actors (Rijkswaterstaat and the Province of South Holland) were dependent on the regional actors which were responsible for the water management in the region (water boards) and who owned the necessary land for the project (municipalities and private users) (Van Meerkerk et al, 2013). The decision however would have different consequences per stakeholder.

The change in management of the sluices is beneficial from an ecological perspective and is favoured by Rijkswaterstaat, the Province of South Holland and the environmental organisations, but would interfere with the interest of regional stakeholder such as the agricultural sector, water boards and drinking water sector. The support of the local stakeholders for the plans to restore the ecological dynamics in the Haringvliet was limited (Edelenbos & Van Meerkerk, 2010; Expert 4, 2017; Marks et al., 2014). After the enclosure of the Haringvliet, the area developed along a path in which interest associated with the Haringvliet as freshwater basin became more and more important: the economic value of the fresh water is of most importance on the regional scale and beyond. This made it very hard to gain support for a new direction for the area which interferes with the already settled regional interests (Expert 2, 2017; Expert 4, 2017; Expert 5, 2017). The strong regional (economic) interests are also connected to the history of the region and the associated emotions. The region knows a sentiment in which there is awe for the water, and land and water are by any mean separated from each other (Expert 2, 2017; Expert 4, 2017; Expert 6, 2017). Core interests of the region were to some extent being hit by the change in the sluice management, making it difficult for regional stakeholders to support the Kierbesluit in anyway. The value of these core interest and the associated emotions were underestimated by the initiating actors during the Haringvliet case. The national government and the Province of South Holland had their focus mostly on the ecological value of the Kierbesluit and lost track of creating sustainable connections with the other interest and values associated with the Haringvliet as freshwater basin: regional support decreased.

There was also confusion about the project that limited the support of regional stakeholders. From the beginning on, stakeholders in the region were questioning the decision about the effects the opening of the sluices would have on the ecology, the agriculture and freshwater supply of the area (Bakker &

Tromp, 2009; Edelenbos & Van Meerkerk, 2010; Van Meerkerk, 2010). The goals and the associated argumentations changed during the process. For instance, the Kierbesluit changed from intermediate step towards Tamed Tide into an end goal of its own and again into an intermediate step towards the restoration of the estuarine dynamics (Kuijken, 2010). More importantly, it remained unclear for the local stakeholders what the socio-economic risks were of the decision. The local stakeholders did not want to support the decision to restore the Haringvliet when the supply of freshwater could not be guaranteed and risking handing in their own economic activity. The local stakeholders felt wronged due to the fact that their interest of food production and supplying water – also considered as public interests – needed to be sacrificed to serve the top-down defined public interest of ecological restoration. The local actors disagreed with the Kierbesluit as they do not agree on the necessity of changing the current state of the Haringvliet (Expert 5, 2017; Kok, 2010; Van Meerkerk et al., 2013). This led to a long process of resistance by local stakeholders during the majority of the implementation process.

There was not only resistance against the Kierbesluit. During the process of the Haringvliet case, the plan of changing the management of the sluices became overshadowed by the project of creating delta nature and the compensation measures. These to related projects created resistance for reasons on their own.

Firstly, the creation of delta nature in the Haringvliet was in need of a lot of space and this meant that agricultural land needed to be sacrificed in order to restore the estuarine nature (Expert 1, 2017; Expert 4, 2017; Expert 7, 2017; Marks et al., 2014). This conflicted with the regional agricultural sector and individual farmers as first they were confronted with measures that would interfere with the Haringvliet as a freshwater source and then with the prospect that they would lose arable land. The regional agricultural community felt if they could only lose in the Haringvliet case. This led to more resistance against the different projects (Edelenbos & Van Meerkerk, 2010; Expert 4, 2017; Expert 5, 2017; Kuijken, 2010).

Secondly, there was a continuous uncertainty about the realisation of the compensation measure due to multiple changes in plans leading to delays in the implementation (Kuijken, 2010). The compensation measures involved the construction of alternative freshwater infrastructures. The Province preferred the alternative of creating open freshwater canals on Goerree-Overflakkee and Voorne-Putten which would become part of the Delta Nature project. They were supported by the environmental lobby, because they were in favour of creating nature. The water board of Goerree-Overflakkee supported the compensation measures as it would better the supply of fresh water on the island. The water board of Goerree-Overflakkee however slightly changed its perspective during the process when it became clear that the agricultural sector was not supportive for the measure (Bakker & Tromp, 2009; Marks et al, 2014; Van Meerkerk, 2010; Van Meerkerk et al., 2013). The alternative of an open canal in a natural area was however also opposed by regional stakeholders. Farmers opposed the construction of the freshwater canal because the construction of the canal meant that the function of agricultural land changed. Several water boards and the water company did not support this alternative due to concerns that the quality of the freshwater would be reduced. The water in the open canal was vulnerable for external influences, partly coming from the surrounding nature, that lower the quality (Expert 1, 2017; Expert 7, 2017; Van Meerkerk, 2010; Van Meerkerk et al., 2013). After that the project of creating delta nature was abandoned in 2007, a second alternative of only creating a straight freshwater canal without nature was proposed. The water company did still not support the open canal, because the quality would be affected even more. The nature surrounding the canal could have worked as some form of a buffer, while the second alternative meant that the water would be directly in contact with the meadows. The water company therefore preferred a closed pipeline which would be most cost-effective and better in line with legal standards of supplying fresh water (Expert 1, 2017; Marks et al., 2014).

The creation of delta nature and the compensation measures interfered with the interests of several regional stakeholders. Regional stakeholders felt their interests were not integrated into the process and were unsure about the future of the Haringvliet (Kuijken, 2010; Van Rijswick, 2010). There was therefore resistance which also reflected on the Kierbesluit with several delays as a result (Expert 4, 2017). The support for the project stayed low. Negotiations with farmers and their democratic and

sectorial representatives became central to the implementation process since the compensating measures asked for the procurement of necessary land. The result was a procedural struggle between the Province and the stakeholders (Van Meerkerk et al., 2013). The suspicion about the effects of the Kierbesluit was still present and has led to a lack of stakeholder support for the project and the compensation measures as drafted by the Province. The resistance against the Kierbesluit increased. Municipalities refused to change their planning policies and the distrust the agricultural sector had in the project grew (Van Meerkerk, 2010; Schreuder, 2010A).

It was until 2010 that the support for the Kierbesluit slightly increased. This was mostly the results of that the process was restarted. The Kierbesluit was adapted and brought back to a basic level: only slightly opening the sluices and realising the necessary compensation measures (Expert 7, 2017). The compensation measures were now being discussed in a different setting. Agreements were reached in 2014 and stakeholders such as the water board and the water company became responsible for a large part of the realisation. The collaboration with the stakeholder was better.

The support for the project in form of a financial budget was also analysed. It became clear that the financial situation of the Kierbesluit was several times subject to discussion. The financial budget of the Kierbesluit was not secured during the Haringvliet case. At the same time, the estimated costs changed multiple times during the process. This meant that the budget was constantly part of the trade-off within the implementation process and under influence of political affiliations (Expert 3, 2017). The enlargement of the budget by the ANF to realise the project has led to the accompany of the plan to realise delta nature in the area. The Delta Nature policy programme has led to much controversy in the Kierbesluit. On the one hand, the connection with the Delta Nature policy programme did increase the financial budget for the ecological restoration of the Haringvliet. On the other hand, the connection led to a decrease in stakeholder support: the resistance of regional actors made the implementation process difficult. The financial situation became a reason for cancelling the Kierbesluit in 2010 as it was regarded to be a too expensive measure and not appropriate in a time of governmental budget cuts (Calmthout, 2010; Kuijken, 2010; Meerhof, 2010; Schreuder, 2015). At this moment, the support for the Kierbesluit through financial measures by the national government was at its low. It was however also finances that led to the continuation of the Kierbesluit, because it became clear that the costs of not implementing the Kierbesluit would be very high. The estimated financial expenses of the Kierbesluit were reduced when decided to continue the process in 2011.

The realisation of delta nature was no longer part of the plan in order reduce the costs of the project. The realisation of delta nature in the Haringvliet became however still possible after a large financial fund was made available through the foundation of the Nationale Postcode Lotterij. Six collaborating environmental organisations would receive €13.5 million funding for the Droomfondsproject Haringvliet which is an extensive ecological restoration project. This financial support makes it possible to execute the project and provided a positive momentum for ecological restoration in the area (Expert 2, 2017; Janssen, 2015; Van Limpt, 2016; Schreuder, 2015). The Droomfondsproject became a given element in the Haringvliet case.

In 2014, new discussion on the compensation measures had taken place between the national government, Province, Evides and water board Hollandse Delta. It became clear that the financial costs would be high if the measures were realised separately. It was decides that the national government would provide circa €76 million (Rijksoverheid, 2016). The water board Hollandse Delta and Evides contributed also financially to the compensation measures, because the compensation measures brought some benefits for them. The water board profits from the new water infrastructure and was therefore willing to contribute financially. Evides became aware of the contribution of the water board and followed with a financial contribution because they would become owners of a new water extraction facility in the area (Expert 1, 2017; Rijksoverheid, 2016; Waterforum, 2013; WSHD, 2016).

Assessment: The project to change the management of the sluices in the Haringvliet was supported by Rijkswaterstaat, The Province of South Holland the environmental organisations because of the ecological benefits. The support was however very low with the regional actors, while their support is decisive to be even able to realise the project. The project interfered too much with core interests of

regional stakeholders. The governmental actors lost track of the socio-economic interests of the region and underestimated the value and emotions related to these interest. The increasing integration of the Delta Nature project and compensation measures with the Kierbesluit meant that the core interest were even hit harder. Resistance increased and reflected on the separate projects. The projects led to confusion with the regional stakeholders about the placement of their interests within the process, as well as about the expected consequences and the future of the Haringvliet.

The estimated costs were not certain during the process and the financial budget became part of the trade-offs within the project. The financial support of ANF made execution financially better possible, but it came with a cost: decreasing stakeholder support. The costs were even seen as to high by the national government leading to the stop of the project. It was however also a financial trade-off that led to the restart of the Kierbesluit, but also the abandonment of creating delta nature. The reduction in complexity during the restart also increased the stakeholder support. Financial support for the compensation measures were the result. Financial support made also ecological restoration also possible through the Droomfondsproject Haringvliet.

5.6 Integration of stakeholders & knowledge

The involvement of stakeholders in the project was described as is an essential condition that would benefit the development and implementation process. It is therefore analysed to what extent the integration of stakeholders has actively took place. It was also analysed if there was a shared vision representing the integration of stakeholder interests that could form the basis of the project.

In the beginning of the process, Rijkswaterstaat tried to create, in an intensive trajectory of meetings and consultation groups, an atmosphere of collaboration. They wanted to create the feeling that not only Rijkswaterstaat wanted to a change, but that they wanted a change together. For instance, forerunners of subprojects were invited to present on information markets during information meetings. Other organisations were also allowed to introduce and profile themselves during this trajectory (Expert 3, 2017). There was however a gradation in the integration of the different stakeholders. The co-initiators such as the Province of South Holland and later on ANF were integrated from the start.

During the development of the decision, however, only a small representation of regional stakeholders were invited to be part of this process. Each group of stakeholders was only formally represented by one person, for instance one mayor represented the different involved municipalities. This decision was made out of the desire to reduce the administrative complexity during the process (Van Meerkerk et al., 2013). The discussion between experts and some of the representatives of regional stakeholders were limited. The process of interaction between Rijkswaterstaat and the regional stakeholders involved mostly only informing and consultation instead of integrating them in a constructive interaction process. (Expert 4, 2017). Rijkswaterstaat and the Province took regional stakeholders into account during the discussions of the several alternatives for the management of the sluices (Bank & Tromp, 2009; Marks et al, 2014; Van Meerkerk, 2010). The Kierbesluit was studied on the effects it would have on other domains in the Haringvliet (e.g. the agricultural sector). The focus was mostly on the water and the ecology of the Haringvliet, but almost not on the surrounding area and other socio-economic interest of regional actors (Expert 4, 2017; Expert 6, 2017). The several alternatives were already produced without consultation of regional actors, so it felt again as only informing and not collaborating. Some water boards and the water companies did work on the data for the MER rapport, but they were holding back because they were not in favour of the change and had their concerns (Expert 3, 2017). It were eventually the critique and concerns of regional stakeholders that led to the integration of the proposed alternative of Broken Tide.

In the beginning of the 1990s, The Province of South Holland was integrated into the project by Rijkswaterstaat. Rijkswaterstaat realised that they would have not been able to bring regional bodies together on their own (Bank & Tromp, 2009; Marks et al, 2014). The Province was seen as closely related to the region: if you integrate the Province you are already halfway there in also integrating regional stakeholders. This was however a misconception. The province became already detached from the region. At the same time, there was a strong playing field of actors with different interest per actor

and a strong historical sentiment (Expert 4, 2017). It was thus not a simple equation of that the integration of one stakeholder would automatically lead to a fluent integration of stakeholders on a lower scale in the Haringvliet case.

Both Rijkswaterstaat and the Province of South Holland were focused on the ecological restoration of the Haringvliet. One should expect that the collaboration based on a shared goal between the two governmental actors would be well developed, but both actors mostly acted on an individual basis. They mostly worked individually on their responsibilities and most of the activities were therefore not matched. They hardly developed a collaborative communication strategy aimed at the regional stakeholders. Both Rijkswaterstaat and the Province did not try to solve this deficiency, despite the made agreement in 2004 that promoted strong cooperation (Kuijken, 2010; Van Meerkerk et al., 2013). The Province of South Holland became administratively responsible for the implementation of the Kierbesluit and the compensation measures, despite the fact Rijkswaterstaat is responsible for the management of the Haringvliet and the sluices. Moreover, Rijkswaterstaat as initiator moved away from the project during the process and often it seemed that the Province was standing by itself. The communication between the two managing actors Rijkswaterstaat and the Province of South Holland was infrequent (Edelenbos & Van Meerkerk, 2010; Kuijken, 2010). An integrated and collaborative approach between the two initiating actors was missing.

A reoccurring theme during the process of the Haringvliet case was that the decision was felt in the region as a top-down construction. Regional stakeholders had the feeling that they were never fully integrated in the project and that the decision was simply dictated from higher up (national government) without considering the interest of the region (Expert 4, 2017; Expert 6, 2017). This feeling could be seen as partly true. Rijkswaterstaat and the Province were mostly concerned with the ecological part of the project and partly lost sight to integrate the interests of regional stakeholders (Expert 6, 2017). To reach the goal of ecological restoration, the Delta Nature project was integrated into the Kierbesluit. This was however done without consensus with the regional stakeholders, while regional interests related to agriculture would be hit hard. The stakeholders and their different interest were however hardly involved in the process. Proposals to also include interests related to the agricultural and economic development of the region were also avoided by the Province (Expert 4, 2017; Expert 5, 2014; Van Meerkerk et al., 2013, Van Rijswick, 2010). The addition of the Delta Nature project integrated next to ecological interests also extra complexity to whole process of the Haringvliet case.

Relevant regional stakeholders were also not fully involved during the development process of the compensation measures. The collaboration between the Province and Goeree-Overflakkee translated only into interaction with one stakeholder, namely the local water board. The compensation measures were mostly developed at provincial level and were then communicated as formal procedures to the local governments (Van Meerkerk et al., 2013; Van Rijswick, 2010). In the beginning, the water companies were also not fully integrated, but it was argued that this was partly because of the detached position the companies had taken in. The water company realised this after the fusion in 2004, however this made it harder to become more involved (Expert 1, 2017). Some regional stakeholders also developed and proposed their own alternatives for the realisation of the compensation measures. These ideas were however not included in the implementation process. The Province regarded these plans as to closely related the agenda of the regional stakeholders (Expert 5, 2017; Van Meerkerk et al., 2013; Van Rijswick, 2010).

The integration of stakeholder was limited during the process, however this changed around 2009. The Province of South Holland reconsidered its plans and approach. The Province started to facilitate an interactive process in which the different regional stakeholder were actively involved (Expert 4, 2017; Van Meerkerk et al., 2013). Before 2009, the Province designed the project individually, with some consultation of one of the local water boards. They did not take the step to also incorporate municipalities or local parties in the project. The Province altered its stance in the project (Expert 4, 2017). The Province began to realise that it was necessary to integrate the local municipalities and local parties to work towards a shared vision for the project. To increase the acceptation of the decision, the development of the compensation measures was done collaboratively with the regional stakeholders. The new approach based on constructive interaction led to that local stakeholders were more supportive

of the compensation measures as they had influence in the process (Expert 4, 2017; Van Meerkerk et al., 2013).

The integration of the regional stakeholders was restarted in 2011. Rijkswaterstaat became the new project leader of the Kierbesluit and therefore better integrated in the project. A new consultation process with regional stakeholders on the compensation measures was started. The result was that The Province, the water board and the water company all were integrated in the realisation of the compensation measures. They became responsible for tasks lying in their field of expertise (Rijksoverheid, 2016; Waterforum, 2013; WSHD, 2016B). The regional water board collaborated with the representatives of the agricultural sector. They formed a shared vision to create a sustainable freshwater supply for the area. Both agreed to produce a robust water infrastructure that would be functional for a long time period. This had its effect on the local farmers in that the trust they had in the project and their willingness to cooperate (Expert 5, 2017). The integration of interests and knowledge after the restart of the Kierbesluit in 2011 led to a smoother implementation process. The realisation of delta nature was however no longer part of the Kierbesluit and the integration of natural values was lessened in the project. The task of further ecological restoration of the area was now reserved for the six collaborating environmental organisation in the Droomfondsproject Haringvliet. The project has an integrated approach in which the six collaborating actors share their skills and knowledge. At the same time, economic interests of the region are part of the project: tourism and recreation are reoccurring themes and the involvement of the fishing sector is facilitated to create a sustainable transition in the fishing industry.

Assessment: The integration of the stakeholders and their knowledge was limited during a large part of the Haringvliet case. There was intention to facilitate the integration, however this was not well done in practice. There was a gradation in integration of stakeholders observable in the Haringvliet case: the regional stakeholders were mostly left out. This is partly result of a misconception that when the Province of South Holland was integrated in the project, that the region was automatically also integrated in the project. The project was therefore mostly based on the vision of the initiating actors without consensus of the regional stakeholders. The project can thus be characterised by a top-down construction and this was also felt by the regional stakeholders. The project was developed at provincial level and send to the region as a set of procedures. There was a lack of attention to incorporate the perspectives of the regional stakeholders and proposals of regional stakeholders were avoided by the Province. At the same time, the integration at the governmental actors was lacking. An integrated approach was initiated by the Province and taken over by Rijkswaterstaat around the restart. It could be said that the first a process of resistance and a restart of the project was necessary before it was realised that integration of regional stakeholders is indispensable to realise a intervention with effects on the region.

5.7 Perception of experts

The expert interviews provided insight in the Haringvliet case. The interviews also complement the analysis in another way. The interviews were also used as a source to assess the relevance of the theoretical conditions as experts perceptions on the conditions were extracted from the interviews. Table 5.1 shows an overview of each theoretical condition and per expert if the condition was found of interest for the successful implementation of ecological restoration projects in estuaries. Each of the theoretical conditions was further divided in characteristics of the conditions based on the theoretical description given in chapter 3. This allowed for a more detailed insights in which characteristic of the interviews would be perceived as more relevant by the experts. Each of the conditions was analysed and the results complemented with several quotes to substantiate them. The results are presented below.

Communication

Communication was perceived as important by many experts, but what was mentioned mostly was that this should not be regarded as a one-way transfer of information from the initiating actors to the other relevant actors: *"It is about creating a process of interaction. That is more than only sending information, but also welcoming information and collaboratively working towards a goal."* (Expert 4, 2017)

The communication should be based on a process of interaction in which stakeholders can share their values, ideas and concerns and are acknowledged by the other stakeholders. This should be the starting position of communication which should lead to a collective exploration to find the common denominator of the restoration project. Communication should be understood as an dialog in which the involved actors all participate to the same extent.

"*That a constructive dialog takes shape. That is also an important component that I would like to stress. This means that it is not only a matter of exchanging perspectives, but also about collaboratively developing a shared vision in which different interests and values are recognised and connected with each other."* (Expert 4, 2017).

"It is always an iterative process in which you are exchanging information and try to raise each other to the same level of knowledge. But it also works the other way around. If you better explain why you are performing the measures, there will be more understanding. Moreover, you will get more detailed information on how you should do it. That remains very important. I have experienced myself in different projects where things need to be achieved while local actors are against it. Then there is only one solution namely putting a lot of energy in the communication. Yes, that sound very marketing-like. Interaction and participation are very important. For both you need to be prepared – and get space – to optimise the process." (Expert 7, 2017).

"It requires a different type of interaction then when you are talking about 'a battle between interests' and 'convincing each other'. It is about 'searching for a common denominator' with each other which you could include into a coherent plan to further the process." (Expert 2, 2017).

The moment of the communication was also perceived as relevant. Mostly the communication should take place at the location where the project would take place as the consequences are felt the most in this area. *"Eventually people of the Province and national government went to the targeted area and sat down with the people. This provides a different approach, then just deciding from a central location [The Hague]. This started a better collaborative approach with a number of people who knew each other, also between levels of governance."* (Expert 4, 2017).

	Experimentation		Communication		Role of key individuals			Project support			Active stakeholder & knowledge integration	
Expert	Increase knowledge	Adapt	Moments	Interaction / Dialog	Visionary	Background	Position	Interests	Finance	Internal support	Proactive involvement	Shared vision
1	✓		✓	✓	✓	✓	✓	✓		✓	✓	
2		…	…	✓	✓	✓	✓	✓	✓		✓	✓
3	✓		✓				✓	✓	✓	✓	✓	✓
4	✓		✓	✓	✓	✓	✓	✓			✓	✓
5			✓	✓				✓	✓	✓	✓	
6	…	…		✓	✓		✓	✓			✓	✓
7	✓		✓	✓	✓	✓		✓	✓		✓	
Results per subtheme	**4/7** (57%)	**0/7** (0%)	**5/7** (71%)	**6/7** (86%)	**5/7** (71%)	**4/7** (57%)	**5/7** (71%)	**7/7** (100%)	**4/7** (57%)	**3/7** (43%)	**7/7** (100%)	**4/7** (57%)
Results per condition	**4/14** (28%)		**11/14** (79%)		**14/21** (67%)			**14/21** (67%)			**11/14** (79%)	

Table 5.1: *Overview of the theoretical conditions and perceived relevance per expert*

✓ = perceived as relevant by expert
… = mentioned by expert, but with critique

Communication from the initiating parties to the other relevant parties on location did take place for instance in the form of large information evenings, however the experience on the performance of these information evenings differed between experts, as can be compared in the following quotes:

"We had an intensive process of information evenings with knowledge markets, presentations and interactive conversations (…) We did our best to allow others also to speak. To allow an constructive discussion." (Expert 3, 2017).

"The information evenings were always accompanied with pronounced opinions. You can notice that there was distance between actors. Information evenings are, in any case, different than one-on-one discussions. There was resistance on the information evenings." (Expert 7, 2017).

"*I went to a couple of public meetings. These were in large halls, where everyone was present (...) That was almost counterproductive. It sometimes felt more as a protest. And the atmosphere in the room that was not really constructive (…) Then once in a while, a new project leader was introduced and a new communication advisor. This did not always worked in favour of the project. The involved actors were faced again with a new persons. They had to explain again why they are not in favour and why they not agree with the project."* (Expert 5, 2017).

Interesting was that some experts addressed that communication also takes place outside the setting of the project in their own network or a different project. These are different setting which could increase the mutual trust as actors know with who they are working and what their cooperation is worth in other projects, or that the project are discussed in a less tense atmosphere: "*There were sometimes personal contacts between some parties: where people also knew each other in other for a. This has on some moments caused progress in the project. They had learn to know each other in a different case where it did work out. I know that this has caused the project to progress on certain moments (…) Thus they already knew each other in adjoining cases. They trusted each other in different settings. Have built a different network. This has led to less tense situation. Personal contacts in another case can lead to an easier progression of the process. You see this more often."* (Expert 5, 2017).

Active stakeholder & knowledge integration

Active integration of stakeholders and their knowledge was also perceived as mostly relevant by the experts. The most notable is that all the experts indicated - in some way or another - the relevance of proactively involving all the other stakeholders from the start of the implementation process, if not even earlier, to reduce the amount of resistance the project could run against. It was mentioned that local values are possibly overlooked earlier when local stakeholders are not part of the implementation process of the project. This automatically creates resistance against the projects as it is interpreted as a decision dictated on the region by a group of outsiders: a fait accompli that is top-down implemented. There would be a high chance that the project would be felt by the other stakeholders as 'their' vision and 'their' story that affects the stakeholders own individual interests:

"Local actors experience it as fait accompli – This is apparently something we are required to do. This is what is going to happen, while people felt like they were never involved and never heard. A fait accompli, a top-down construction. You see this more often at large projects: One decides something, which is in favour of national interests or other goals, but thereby forgets that you affect interests of individuals. These things happen too often." (Expert 6, 2017).

"Without active discussion with [stakeholders in] the region and collaboratively working towards an integrated vision, you can expect to create a situations in which it is 'their vision' and 'their' story. The region will experience this as if the decision is dictated by The Hague [the national government or Province]. That is an typical example of top-down planning in regions, where local interests and networks play a strong role. You can definitely expect it to come back around." (Expert 4, 2017).

"You need to have some form of integrated trade off. You need to be able to think outside the box. You possibly need to seek for a combination [of different goals] to reach your goal. I find it relevant that

you have an open process. An integrated approach is very important. Try not to realize your project at the expense of other goals that there might be. This is something that need to be kept in mind during the whole process." (Expert 7, 2014).

"It is necessary to initiate the conversations sooner. When everything is already decided upon and then only you are going to involve the local actors, you will experience a lot of resistance. But when people can think alongside and contribute to the project, and can benefit from the measures, it will have a positive effect on the project" (Expert 5, 2017).

Several experts therefore argued the importance of actively creating a shared vision for ecological restoration projects with the different stakeholders. Stakeholders are provided with room to contribute to a shared vision with their own knowledge and values. This vision would be collectively formed based on shared ground and functions as the basis of the implementation process on which also can be fell back when possible disagreements arise. A shared story contributes to a smoother implementation process of the project: *"The importance of collaboratively working towards a vision in which local actors are highly involved. Then you get a better shared story. This in turn progresses the implementation process. You will always have to deal with opponents. However, if you keep them into account during the process. Then you not only view them as opponents, but provide room for alternative ideas and visions."* ***(Expert 4, 2017)***.

Project support

A third condition that was also perceived as important by the experts is "project support". The conditions shares a similarity with the previous mentioned conditions as project support can also be traced back to the different stakeholders that are involved. Most noticeable is that all the experts appointed the importance of making sure that the stakeholders feel represented in the projects through their interests.

"A project is successful when all the interest of the different stakeholders are properly secured. That one has listened to those interests and are held into account. You do not have to secure every interests you have as a party, but that at least the most essential need to be kept into account." (Expert 1, 2017)

"The first basis for successful implementation is that everyone has the idea that they are properly represented in the project (…) That it is a well-supported plan on which the parties agreed upon. And if there are disputes, the parties are able to overcome these in good faith. To be able to step to a higher level: 'If we agreed on this part, then I should maybe compromise on the next part to progress the project." (Expert 6, 2017)

Water systems are characterised by multiple different actors and interests which means that multiple parties need to be sympathetic of the project in order to be implemented well. *"There are always multiple functions to a delta (…) The delta is economically attractive, so you will always have harbours and mobility, you have water management, you have agriculture, there is always recreation and nature. There are also fisheries, industry, fresh water supply and cooling water. So if you want to do something from the perspective of water management of nature development, you always have to deal with the other functions – with that spectrum of interests (…) You have for each function a network of actors and many interest that are related. Support of many parties is necessary. At the same time, all the parties need to be on the same page. That makes for difficult tasks."* (Expert 2, 2017).

The underlying reasons for the ecological restoration need to be clear for the stakeholders, but more important the stakeholders need to be able to trace benefits in the project. If the measure is not at the expense of individual interest and is even able to meet interests of the stakeholders, the resistance would be reduced.

"Many important interest are connected to the water system. People make a living thanks to the water and sustain their households. If you do not show any feelings for this, then you are going to play a difficult game due to resistance." Or *"If you are not aware of the situation of the targeted region, the sentiment, the underlying story of the region and the related interests. Then you will have almost no*

allies in the region that it becomes an obstruction – that all possible means will be used to counteract the decision." (Expert 4, 2017).

"If you want to win people over, you need to provide some sort of benefit for those people: a win-win situation should be created. That really helps." (Expert 5, 2017). To have access to a financial budget was noticed by four experts as relevant form of project support. Stakeholders play a role in this support. A financial contribution of a stakeholder simply opens more possibilities for the implementation process and provides a more secure situation. *"Finances are important. It helps when nobody is being difficult over the budget. Elsewise, you get inferior solutions when not enough funds are allocated. Then you will just get a situation in which funds are just being shifted between different parts. Or that not the right solutions are being chosen leading to regret. That applies to everything."* (Expert 1, 2017). Moreover, it was mentioned that the financial support is able to produce an positive atmosphere in the project and could lead to other stakeholders to also invest.

Three experts also mentioned the relevance of internal support through members of the organisation. What needs to be prevented is that only the top levels of administration of the initiating and involved organisations are aware of the details of a project, while lower and supportive levels lack understanding. Or as was noticed by one of the experts: "*The deputies were mostly very driven about the project, but the people at lower levels often just did not understand it" (Expert 1, 2017).* The availability of trained human sources was thus even regarded as self-evident: *"I almost find it natural that you [as an organisation] possess the right expertise and right knowledge."* (Expert 1, 2017). The team should also contain an amount of mixture in people as these can complement each other.

As an organisation, you also deal with internal support through your adherents. This could sometimes place the organisation in a divided position: on the one hand the organisation needs to form compromises with other stakeholders to progress the project, but on the other hand the organisation wants to secure the interests of the adherents. When these adherents are resistant to the project, the organisation is placed in a delicate situation. This was formulated by some experts as:

"On the one hand you need to make the interest of your adherents clear, and not only by campaigning or yelling that we want nothing. But it is also an act of making compromises or deals with governmental actors or other organisations to make progress. You can compare it with a balance: On the one hand, you want to start the conversation . On the other hand, you need to act tough: 'this far and no further'." (Expert 5, 2017).

"This is not in our direct interest. If society however wants is, then we find it of importance (…) We have social responsibility, so we will participate. The societal interest does also count." (Expert 1, 2017)

"As a director, I will be in some form affected by it [the adherents]. I can say that this is not the case, but this is the case. So, yes they [the adherents] do have influence in the process. That is for sure. That is how it works in society. Then it becomes the art of choosing for the public interests – the public interest of your party – But not only calling out or doing nothing. This does sometimes work and sometimes it does not. We also want to vouch for our members." (Expert 5, 2017)

Role of key individuals

The "role of key individuals" was just as the condition of "project support" mentioned by more than half of all the experts. These individuals could be decisive in the progress of the implementation process of the project and could push the project forwards. Mostly mentioned was that these individuals should have an open vision on the project and have the courage to translate this in actions. The person would be aware of the feelings of the other parties and are able to translate between different values of stakeholders.

"What can matter is if there are people who have a feeling for what is important for the other parties. Someone who is able to make the translation between different perceptions (…) A set of key figures that are able to connect people. That is partly about the design of the process, but that is also about certain persons that are aware of sentiments in the region. People who are able to interpret the others and are trusted by the regional actors." (Expert 4, 2017).

"What can help is to involve an independent party (…) Some sort of independent coordinator. Especially, one that is able to switch off the political agendas of the respective parties that are involved. To ensure that not every party is only focused on their own domain. That is not only about the individual goals, but what they want to reach together. This, instead of one of the involved organisations or representatives. That can really help, I think." (Expert 6, 2017)

Also the position these individuals have within the project was by five experts revealed as relevant. The position is relevant because it could grant these individuals freedom to advise and take decisions within the project, but also to have direct access to the other stakeholders to negotiate. Interesting was that some experts mentioned that key individuals could sometimes be placed on a position that also makes it possible for them to meet the other stakeholders outside the ecological restoration project. The individuals could for instance meet outside working hours to negotiate. Moreover, the individuals could collaborate with other stakeholders in other projects. The collaboration could increase mutual trust as stakeholders learn to know what the others are worth in a project. The right position of an individual within a network of different actors could possibly make a difference in the implementation process.

"Probably also an intensive connection with deputies, chairs of the water boards or others about the topic. You see them later on, but about a different topic and this changes the agenda (…) It is necessary to have the freedom to see others. I saw some deputies three times a week, but each time on a different topic." (Expert 3, 2017)

"There were sometimes personal contacts between some of the parties. Here, people knew each other also in other fora and this has sometimes led to further progression. People learn to know each other in a different case and that just works fine (…) A different adjoining case where they know each other. Where they trusted each other in a different setting. Personal contacts in different cases can lead to smoother processes. You see that more often. That people are able to contact each other without barriers, that you leave your own specific interests on the other case for a moment. Things are then able to move again." (Expert 6, 2017).

Experimentation

The condition of "experimentation" was also discussed by several experts, however this was not without critique. Research and experimentation could lead to useful knowledge and insights that possible benefit the implementation process of the project. The experts nevertheless indicated issues related to this condition. A criteria for experimentation is that the execution is done in a closed system that minimises external influence to precisely research cause-effects of measure. This is however a difficult task due to the size and complexity of the water system which is hard to exactly imitate to allow research. It is, at the same time, also difficult to implement the measure in the targeted location itself. External influences would not be limited, interventions would be large and the costs would be high: both financial costs and the possible negative effects of the experiment in the water system. Moreover, the experiment should be execution over a long time period as effects of ecological restoration measures take a long time to become visible. There exist the possibility to first start with a smaller pilot experiment to reduce the risks. It should however be noted that these pilots sometimes do not scale up larger executions (pilot paradox) (Expert 2, 2017; Expert 6, 2017).

The development of new knowledge could also lead to a higher diversity in information. By constantly adding new information the possibility can arise that this contradicts the current story. This means that the uncertainty surrounding the implementation process of the project increases. The uncertainty can be informational, but can also be only felt uncertainty by the different stakeholders as information changes.

"If you constantly provide new information, parties will begin to think: 'Wait a minute, this is again a different story and how can this new information contribute.' This will lead to contradictions in information. Then you create uncertainty. New information should help to clarify things, not to lead to uncertainty." (Expert 6, 2017).

The new information does not connect with the story that the stakeholders have of the project which would make it hard for the new information to pervade. The diversity in information can also be used

by the different stakeholders to fit their own perspectives which disrupts the search for consensus. The parties would use different information to get their own right in the process. Some experts therefore call into question experimentation as a possibility to adapt the restoration accordingly to new findings and reducing uncertainty.

"Information is also used as a weapon. The moment you have new and right information, others could say that it was false [according to other sources]. It was used to defend their positions." (Expert 6, 2017).

The production of new knowledge is to some extent related to the field of stakeholders. It was therefore mentioned by experts to involve the stakeholders in the experimentation. The experimentation should then be designed that is becomes a collective learning process. It should become more than an individual task and announcement of results. Stakeholders should be taken along in the experiment to create transparency and trust in the production of information. It should thus be kept in mind when it is decided to experiment with measures to make it a collective process.

"It is very important with such a trajectory [experiments] that you integrate the other parties. That you create a join knowledge and learning process. The design should be more than, for instance, 'one organisation performs experimentations and produces results'. Take along other parties to show the process (…) to create trust in the knowledge." (Expert 6, 2017).

All by all, the analyses of the expert made it clear how the experts perceived the theoretical conditions. Communication and active stakeholder & knowledge integration were perceived as very relevant. Almost all of the experts agreed that within communication it is important to have an interactive process focused on exchanging information, sharing interests and visions. All the experts shared the opinion that it is essential to proactively involve the stakeholders to increase the support for the project and reduce the feeling that the decision is dictated from higher up. This should help with forming a shared vision that takes local interests into account.

The conditions of 'project support' and 'the role of key individuals' were also considered as very relevant by the experts. All the experts were of opinion that interests of stakeholders need to be represented in the project. The benefits for the local stakeholders need to be visible to increase the local support. The access to financial budgets and internal support were discussed to a lesser extent. The role of key individuals was address by more than half of the experts: people that have the courage to fully deploy themselves to the project and are able to connect the different actors are necessary. The positions these people have within the project can make a difference.

Experimentation was a condition that was discussed in the theory as very relevant. The experts however had a more critical perspective on this conditions and discussed several disadvantages of this condition, namely: the difficulty of performing good experiments in water systems or the risks of uncertainty due to a diversity of information. The condition of experimentation seems to be less relevant.

5.8 Relevance of the conditions

The analysis of the Haringvliet case along the theoretical conditions showed to what extent the conditions were present during the implementation process of the project to change the management of the sluices. The interviews provided information on how the conditions are perceived by several experts. The results of both analysis are combined to determine the relevance of the five conditions alongside a scale: *very relevant – relevant – moderately relevant – slightly relevant – not relevant.*

First of all, three conditions were seen as very relevant, namely: Active stakeholder & knowledge integration, Project support and Communication. This is related to the key theme within these three conditions, namely: stakeholders and their interests. For ecological restoration projects which core interests is nature-focused, the involvement of stakeholders and their interests has shown to be of massive influence on the implementation process. These three conditions are able to determine the course of the stakeholder influence: The absence of these conditions increases resistance against the project and stagnates the progression. Communication is necessary to understand the different interest related to the project. Integration is required to secure the inclusion of different interest in the foundation of the projects. Project support shows if the interests are well represented. Moreover, interplay between the three conditions is observable, in which one condition determines the effect of the other and vice versa. For instance, communication makes it better possible to integrate the stakeholders in the process. At the same time, the integration of the stakeholders means that more interaction is possible. It is for these reasons why active stakeholder & knowledge integration, project support and communication are considered as very relevant conditions.

The role of key individuals is seen as a moderately relevant condition for successful implementation of ecological restoration projects in estuaries. Key individuals can indeed play and important role. It appeared that this was mostly related to the attributes related to the higher position they had, namely the direct access to other stakeholders and the influence to change internal settings of the organisation. It could be argued that the relevancy of the key individual is variable in relation with the former three mentioned conditions. While the presence of the previous three conditions was considered as very relevant, key individuals seem to be working in functions of these conditions. The key individuals could strengthen the integration of stakeholders, the communication process and the support of the project. When the conditions of active stakeholder & knowledge integration, project support and communication are however already widely present, the relevancy of key individuals would appear to become of lesser importance. This makes the relevancy of the conditions dependent on the situation the project is in related to the previous three conditions. It was therefore considered as moderately relevant.

Lastly, the condition of experimentation is regarded as slightly relevant. Experimentation could provide useful information which could benefit the ecological restoration of an estuary and would help with future projects. An experimental approach could however bring uncertainty on different aspects that influences the conditions too much. The realisation of an experimental approach in practice is a difficult task due to requirements it needs to be even able to provide accurate results: the complexity of estuaries as large water system and the many different interest hinders this. Moreover, experimentation means already letting the effects occur in an early stage. This discourages stakeholders to support the project due to possible risks. At the same time, constant new information as result of experimentation could create diversity - even more if the experiments are not done in collaboration with the stakeholders – which is exactly the opposite that is needed for the project.

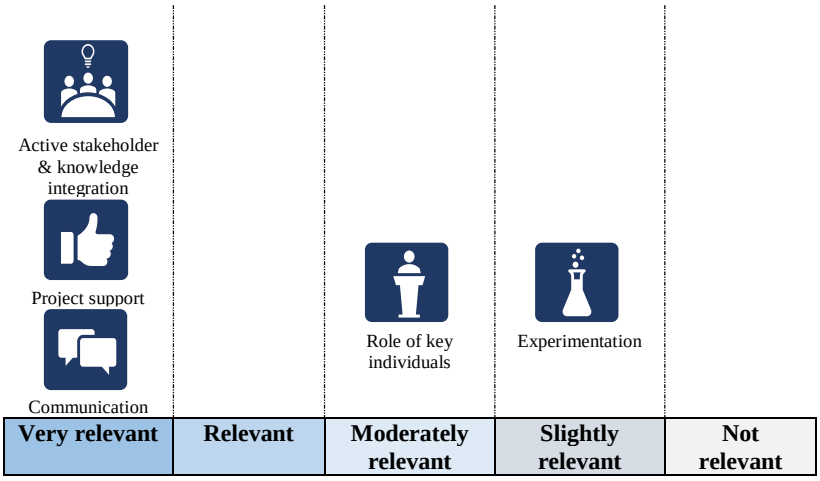


Figure 5.1: *Relevancy of the different conditions for successful implementation of ecological restoration projects in estuarine areas*

Other relevant conditions

Other conditions that were not extensively discussed in the theoretical literature were observed during the analysis of the Haringvliet case and expert analysis. Moreover, the Haringvliet case and the expert interviews showed similarities in these conditions. It was therefore decided to shortly discuss these conditions.

First of all, during the Haringvliet case several events that had taken placed influenced the process. These events all had in common that they could not be controlled in any way. These conditions coincidently collide with the implementation process of the ecological restoration project, but their effects can have major influence on the further progression of the project. For instance, there was already an extensive discussion about how the change in management of the sluices would interfere with the function of the Haringvliet as freshwater basin. In 2003, an extremely warm and dry summer in the Netherlands showed the vulnerability of the freshwater supply and the uncertainty it could bring for a secured national supply of fresh water. The drought strengthened controversy about the measure at national level as it would affect the supply of valuable fresh water and the related socio-economic interests (Expert 2, 2017; Marks et al., 2014; Van Meerkerk et al., 2013). Another external event was the growth of blue-green algae growth in the adjacent Volkerak Lake. The discussion to allow salt water into the freshwater lake to solve the algae problem started a new debate on how to secure fresh water in the area. The salt intrusion in the Volkerak Lake could have had effects on the salinity of the water in the Haringvliet at the opposite site of the sluices. This debate slowed the implementation process down (Marks et al., 2014; Van Meerkerk et al., 2013). Both are externally-driven changes in the physical system that formed obstacles for the process to continue.

Another type of events are related to national and international politics. A majorly determining event during the Haringvliet case was the Dutch general elections of 2010. A new national government was elected. This changed the political setting and the stance the national government took in the project. The new national government decided to cancel the project to change the management of the sluices in the Haringvliet. The reasons being that the realisation would be financially too expensive - certainly in a time of governmental budget cuts – and the lack of societal support for the project. The result was that years of negotiation were immediately stopped (Atsma, 2011; Expert 1, 2017; Expert 2; Van Meerkerk et al., 2013). It was the same national government that reconsidered the cancellation and restarted the Kierbesluit, but minimalised to be only focused on the possibility of migratory fish species to pass the sluices (Expert 1, 2017; Expert 5, 2017). The decision of the Dutch national government to restart the Kierbesluit was driven by another political setting. The Netherlands made international agreements with other European countries to make the migration of certain fish species possible through the Haringvliet. The role the Netherlands play in these agreements is thus crucial since The Haringvliet is the start of the migration route. If the sluices are kept close other taken measures in all the other parts of the rivers are worthless. After the Dutch national government took the decision to cancel the Kierbesluit, increasing

international diplomatic pressure was put on the Netherlands by other European countries. As a result the Netherlands were threatened with high financial costs due to claims and loss of credibility in international matters. The international pressure led to that the Netherlands restarted the Kierbesluit in 2011 (Expert 1, 2017; Expert 2, 2017; Expert 6, 2017; Expert 7, 2017; Van Meerkerk et al., 2013). There is thus a certain dependency on the (international) political setting in which ecological restoration projects are implemented.

A third condition that was observed within the Haringvliet case and was discussed by almost all the experts was "complexity". At certain moments in the Haringvliet case, it was decided to increase the scale of the project and to create momentum in a stagnant process by integrating other interests through a different project (Delta Nature project) (Expert 4, 2017; Expert 6, 2017). This decision backlashed and created increasing complexity in the project. The resistance against the creation of delta nature reflected on the Kierbesluit and vice versa. Moreover, the original goals of the Kierbesluit to restore estuarine dynamics and to allow the migration of fish species were lost out of sight. The discussions about loss of land and the supply of fresh water became dominant and led the process (Expert 2, 2017; Expert 4, 2017; Expert 7, 2017; Kuijken, 2010; Van Rijswick, 2010). The different projects did not strengthened each other as more regional interest were negatively affected. (Expert 2, 2017; Expert 4, 2017). During the Haringvliet case, the creation of delta nature got decoupled from the Kierbesluit and the project was brought back to its original core. The prerequisites that came with the Delta Nature project were no longer relevant and stakeholder interest were to a lesser extent affected. This reduced the complexity of the project and provided room for alternative solutions for the much valued supply of freshwater that were more supported by regional stakeholders (Expert 1, 2017; Expert 5, 2017; Expert 7, 2017). From this perspective it is thus relevant for ecological restoration projects to not blindly scale up the project to create momentum. This could create complexity which should be kept to a minimum to progress the project.

All by all, the analyse of the Haringvliet case and the expert interviews made several other conditions observable that were hardly discussed in the theory on ecological restoration projects. The conditions of external events, the political setting and complexity all had a certain influence on the implementation of ecological restoration in the Haringvliet case. The difference is that the condition of complexity is determined within the project itself, while the other two are external conditions which are not influenced by governance within the project. This makes it however not less relevant to keep an eye on these conditions during projects to be able to anticipate when necessary.

5.9 Conclusion

The Haringvliet case is assessed along the theoretical conditions for the successful implementation of ecological restoration projects. The results of the analysis made clear that a majority of the conditions were missing during the ecological restoration project in the Haringvliet. Several conclusion on the case can be made: (1) The initial idea to follow an experimental approach was left out due to absence of support; (2) Moments of communication were facilitated, however the communication did not take form of a constructive interaction process and was limited to a one-way stream of information; (3) Some key individuals were present in the Haringvliet case. It was mostly their high position that was critical; (4) Support for the project of the regional stakeholders was missing, because the project was unable to embody the interests of the regional stakeholders. The financial situation was multiple times a point of discussion, but played a significant role; (5) The integration of stakeholders and their knowledge was limited. The project could be characterised by a top-down structure. It was after the restart in 2011 that the five conditions were more present. The case makes clear that the absence of the five conditions does not lead to success.

The analysis of the interview provided insight in how the theoretical conditions are perceived by the experts. An overview is provided in Table 5.1. Firstly, The majority of the experts indicated that active stakeholder integration and communication were very relevant conditions. This was based on that it is essential to interactively exchange perspectives and to integrate these perspectives into the project. Secondly, project support was found relevant mainly because the experts agreed that projects should to some extent include the interests of stakeholders. Key individuals were also relevant if they are able to

connect different actors. The position within the project can make a difference. Lastly, the condition of experimentation was perceived more critically and seemed to be found less relevant.

Based on the analyses, the relevancy of the different conditions was assessed as follows:

Very relevant
- Active stakeholder & knowledge integration
- Project support
- Communication

Moderately relevant
- Role of key individuals

Slightly relevant
- Experimentation

In short, the relevancy of the conditions shows that conditions that are strongly related to stakeholders should not be misjudged. The influence of stakeholders in the Haringvliet case was a decisive and conditions that are able to manage this influence in favour for the ecological restoration should be valued. Stakeholders determined their position within the project mostly based on their personal interests. Communication leads to understanding the interests, the integration secures the interests and if the interests are well represented it is translated in support.

The relevancy of key individuals was assessed as moderately relevant. The characteristic of this person are of value, but are not useable if the individual is not placed on a critical position. The critical position is high in the hierarchy of the organisation and provides the individual with privileges, such as direct access to other stakeholders. The theory endorse the ability of individuals to translate their own vision into practice. In practice however an individual who is able to transcend their own vision to connect stakeholders on basis of common ground was more valued.

Experimentation as a condition was assessed as slightly relevant. This is a difference with the scientific literature in which experimentation was regarded as essential. The theory discussed mostly how the experimentation could provide new information and allows to progressively change the project according to this information. The Haringvliet case and the experts contradict this. To be able to follow such an approach, there should be room within the project that allows this. This room however not be guaranteed, because the experiments have demanding requirements which are not always supported by the physical and social-economic system of estuaries. The positive influence the condition of experimentation could bring was questionable, because it could negatively affect the support for the project.

Lastly, the analyses of the Haringvliet case and the expert interviews made clear that conditions are not limited to what is written in theory. Three conditions were hardly mentioned in the literature: complexity, political setting and external events. The last two conditions showed that conditions that are relevant are not always determined by the situation within the project. This makes them impossible to influence from within the project.

Chapter 6 | Discussion

6.1 Introduction

Chapter 6 contains the discussion of the research. The discussion offers space to reflect upon the found results. This allows the results to be placed within a broader context. The discussion ends with a reflecting the limitations of the research.

6.2 Mutual relations between conditions

During the research of the several conditions that contribute to the successful implementation of ecological restoration, it was observable that the conditions are to some extent related and therefore have effect on each other. For instance, when the interaction between stakeholders increases this could lead to the effect that the stakeholders become more involved within the project. The opposite could also be true in that the proactive involvement of stakeholders also increases the interaction. The conditions seem to show positive correlation in which high presence of one conditions is accompanied with the high presence of the other. Statistical research on the presumed relationships between the conditions could provide more details on if these correlations are significant. The findings of such a research could be relevant in that it would provide insight how the conditions interact. A better understanding of the interactions could translate into better strategic approaches that ensures that the success conditions are present within an ecological restoration project.

6.3 Dominance of socio-economic interests

Ecological restoration projects have as goal to assist the recovery of degraded ecosystems that are put under the influence of anthropogenic pressures (Airoldi et al., 2005; Borja et al., 2010; Ducrotoy, 2010; Clewell & Aronson, 2013; Worthly et al, 2013). Ecological restoration projects have their core interests focused on nature, however it became clear that these interests can become quickly overshadowed by the other socio-economic interests. The success of an ecological restoration project seems to be dominated by to what extent the involved actors are satisfied with the project. The centre of gravity shifts towards the axis of stakeholder success that was recognised by Palmer et al. (2005) as one of the three types of success to ecological restoration projects. The stakeholders involvement then becomes more influential in the restoration process at the costs of the ecological interests. The original goal is overshadowed by different interests. This makes is necessary to critically look at projects that are recognised as restoration success, because it should not be expected that the project then also has led to ecological success.

The dominance of the socio-economic interests could maybe be related to that many of the involved actors during ecological restoration projects consisted out of public bodies. The public bodies are democratically chosen by the local public and therefore mostly represent the interests of these local public. In the Haringvliet case, the local interest were mostly linked to the agricultural sector it socio-economic value. This influenced the position the public bodies took within the ecological restoration project. The public bodies should make broad trade-offs between the different related interests, however these trade-off are influenced by the local public interests.

An independent coordinator can become a central part of the ecological restoration project. The coordinator is not bound to any of the involved interests and can therefore keep an birds-eye view on the process. The process led by the coordinator initiates interaction on creating a shared vision for the area. During the process, different interests are made clear and these interest become central to ecological restoration project. These interest are translated in a set of goals. The process then consist out collaboratively determining who contributes to this goal and how you can reach those goals via the most effective approach. This should create a collaborative strategic approach that can prevent dominance of socio-economic interest at the costs of ecological interest – the interests for which the project is actually initiated.

6.4 Limitations of research

Every research has its limitations. The characteristics of the design and the chosen methodology have an influence on the interpretation of the results. The acknowledgment of the limitations of the research provides room to reflect.

There are possible limitations in the methodology of the research. First, the research made use of a single case study, which may influence the validity or generalisability of the research. The Haringvliet case was analysed in depth, however the results are only based on one specific case within its own context. The results are therefore difficult to be placed in a broader perspective. Case-specific characteristics of the Haringvliet could have been decisive in the assessment of the relevancy of a theoretical condition. Moreover, the Haringvliet case showed that the absence of the conditions does not lead to success. This single case however cannot confirm if the presence of the conditions would indeed create success. It is therefore relevant that more empirical research that is quantitative and comparative need to be performed. The framework with theoretical conditions could provide the starting base.

The use of expert interviews did also offer limitations. The interview phase is dependent on the selection of the experts: the experts should be available and willing to participate. This dependency has restricted the research and resulted in a limited amount of experts. The limited number of experts could influence to what extent the interviews are able to function as verification material. Although, the results of the different interviews showed consistency and similarity to the results of the analysis of the Haringvliet case. To increase however the possibility to generalise the results of the interview analysis, it is recommended that a quantitative interview research should be performed. An larger population, preferably with different (stakeholder) backgrounds, should make it more possible to make generalisable conclusions. At the same time, the process of the Haringvliet case has taken several decades. This characteristic had also influence on the interviews. The long time period means that related individuals (e.g. directors, or representatives) changed during the process. The amount of experts that were closely involved for the whole duration of the case are minimal. Interviewed experts relate to a certain time period within the case and their experiences could be mostly based on this period, while other information is based on sources. Moreover, the results were then also dependent on the memory of the experts and to which extent they were able to correctly recall the information.

The recognised limitations influence the explanatory range of the results, but are still able to be raised to a more abstract level that contributes to the knowledge on ecological restoration projects in estuarine areas protected by coastal defence structures.

Chapter 7 | Conclusion

7.1 Introduction

The construction of hard coastal defence structures have affected the natural dynamics and ecosystems of estuarine areas. This human induced pressure has led to ecological degradation of the nature of estuaries. Estuarine areas are reduced in size. The loss of habitats and biodiversity is therefore a major problem in estuaries. The need for ecological restoration practices that may assist the recovery of the degraded ecosystems in estuaries has increased. There are however recognised challenges that need to be overcome for ecological restoration in estuarine areas. There is a lack of knowledge on ecological restoration practices in estuarine areas. Moreover, estuarine areas are complex systems and implementing ecological restoration practices means the involvement and interplay of the different actors and their interests. Successfully developing and implementing ecological restoration projects is thus dependent on the governance procedures. Governance conditions that contribute to the successful development and implementation of ecological restoration projects in estuarine areas are not widely researched. The goal of the research was therefore to increase the knowledge on the governance process related to the development and implementation of ecological restoration in estuaries, primary with the presence of hard coastal defence structures, that can contribute to the reduction of environmental degradation in estuarine areas. The research therefore focused on the following question:

"What are relevant governance conditions for a successful development and implementation process of ecological restoration projects in estuarine areas protected by hard coastal defence structures?"

7.2 Governance success conditions for ecological restoration projects in estuaries

A set of five conditions was identified that theoretically would benefit the development and implementation process of ecological restoration in estuaries. These conditions were: (1) experimentation; (2) Communication; (3) Role of key individuals; (4) Project support (5) Active stakeholder & knowledge integration. These conditions were assessed against the Haringvliet case and several expert interviews. The analysis made clear that Haringvliet case can be regarded as a key example that showed how the development and implementation of ecological restoration projects in estuaries can become a problematic process. The insight gained from the Haringvliet was combined with the knowledge and experience experts in the field.

Stakeholders that are involved with the ecological restoration project play a decisive role through their influence. Collaboration of the stakeholders is necessary for the project to be realised. The three conditions mostly related to stakeholders are therefore of the most relevance. The communication should take form of a constructive interaction process in which the exchange of perspectives is central. The stakeholders need to be proactively integrated and not confronted with a top-down regulated process. When the feeling arises with stakeholders that they are excluded from the process and therefore decision are made over them instead of with them contributes to resistance. A shared vision based on mutual values that recognised core interests of stakeholders is key to increase support for the project. These three conditions increase the actor satisfaction greatly and play therefore a very relevant part to the success of ecological restoration projects. If the conditions related to the stakeholders seemed to be missing, a key individual that is highly positioned and equipped with non-limited stakeholder access step up to improve the conditions. Key individuals can play a role when they are in function of the previous three conditions.

The success of an ecological restoration project was partly determined when the knowledge for future implementation advanced. The condition of experimentation was however regarded as slightly relevant to achieve this. An experimental approach based on finding the most effective measures for the nature to restore is too much accompanied with complexity to be part of large scale ecological restoration projects in estuarine areas. The condition may complicate an already difficult implementation process and could negatively influence the condition of support.

The ecological restoration of estuarine areas protected by hard coastal defence structure cannot be isolated from the presence of other more socio-economic functions the estuary serves. It will always be a process full with multiple actors and interests. Ecological restoration are thus governance issues as much as ecological issues. A comprehensive understanding of the related governance process already determines the success of ecological restoration in estuarine areas even before the initial project is fully realised.

7.3 Recommendations

The research has shown that the implementation process of ecological restoration projects can a difficult activity. The research therefore concludes with a set of recommendations for future restoration projects in estuarine areas based on the findings:

1) Before the start of the development and implementation process of the ecological restoration project, it is recommended to have already performed an empirical research on the target area. It is essential that the geographical context of the area is understood and how this can be integrated in the development of strategies. The setting of the area should be well understood. Perform the research on location. The research should be focused on the regional stakeholders, in particular the individual actors that live and work in the area. Try to understand how the different actors enter into the local dynamics related to ecological restoration. Excavate the underlying sentiment that can be found in the region of the ecological restoration project. An extra option could be to involve someone in the research process (and during the development and implementation process) whose origin is in the research area. They are better capable of identifying and understanding sentiments related to the project area. The findings of the research make it possible to anticipate on the socio-economic dynamics in the area. These dynamics can be taken into account before initiating the project and governance strategies can be adapted accordingly.

2) It should be avoided that moments of communications take place during large meetings accompanied by many people. The large scale meetings are not well-suited to start interaction processes based on constructive dialogs. The resistance against a project can grow during these meetings and can influence the setting. The moments of communication need reduce in scale to small groups consisting out of several individual stakeholders. The small meetings should have an interactive setting in which the stakeholders participate actively. The meetings can be designed as workshops or around a serious game. It is within these smaller workshops that the constructive dialog can take form. Each individual is more involved in meeting, is provided with more time to interact and information is able to be exchanged. The workshop should be focused on identifying shared goals, strategies and solutions. Moreover, the meetings are moments in which stakeholders can experience the ecological restoration project on a smaller insightful manner. These meetings should take place multiple times with different people. The results of the meetings can be compared for similarities and used during the development and implementation process. Disadvantages to this approach are that they require more resources (finances or time). The approach does however contributes simultaneously to the three most relevant conditions of communication, active integration and project support.

3) It should become almost mandatory that an extensive process journal is kept. The process is then actively monitored and saved for future references. The journal makes it possible to look back on the process and to critically evaluate each taken step. Reflecting on the process allows that lessons for the future are learned and can be used in other projects. After the realisation the journal should be able to be shared publicly. The scientific literature analysis made clear that a lack of information on the actual practice of ecological restoration projects is scares. The journal may provide insightful lessons for other projects. The learned lessons can then be adopted and lead to improved ecological restoration.

4) The development and implementation process should be accompanied by an independent coordinator. The coordinator should lead the process and facilitates the interaction within the project. The independent coordinator is not bound to any of the involved interests and able to keep overview

of the process. The independency should lead to more trust the stakeholders have in the coordinator. The coordinator leads the search for a shared vision that becomes the basis of the project.

5) The planning of ecological restoration needs to be done on landscape scale. The large scale allows a better development of natural dynamics. It is however suggested to not directly start the implementation of a large scale ecological restoration project. It could be a possibility to make use of multiple small scale projects which will over a longer time period cover the same area. The smaller scale of the projects allows complexity to be reduced to a minimum. The amount of stakeholders that would be involved in the smaller project is smaller and makes it better possible to oversee the dynamics in the stakeholder playing field. The small scale makes the project also look less interfering with the current situation of the target area and should keep resistance low. Moreover, the first small scale projects will function as an example. The realisation and outcomes of the projects will become visible and tangible. The project can then provide context related information that is usable for the next small scale project in the area. The succession of the small scale projects should be able to cover the large target area on long-term.

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Appendix

Appendix 1: List with key terms used in literature analysis

Conditions	Implement*	"Ecological restoration project"	Estuarine areas	"Hard coastal defen?e structure*"	Coastal areas
Criteria Circumstances Terms Obligations	Achieve Start Carry out Complete Enforce Reali?e (realise/realize) Enable Execute Perform	"Nature restoration project" Plan Program Scheme Strategy	Estuar* Inlet River mouth	"coastal defen? Structure* Dam* Barrier*	Coastal zones Coastal environment Marine areas Marine zone Marine environment

Appendix 2: Interview guide

Inleiding

▪ Introduceren van het onderwerp en het doel van het interview
▪ Verwachte tijdsduur interview: (30 min)
▪ Toestemming voor opname en vermelding naam vragen
▪ Vragen of alles duidelijk is en of er nog vragen over het interview zijn

Kern

▪ Hoe is de respondent betrokken bij (te relateren aan) de Haringvlietcasus (Kierbesluit)?

Succesvolle implementatie

▪ Wat is volgens de respondent zijn/haar definitie van een "**succesvol implementatie proces"** van ecologische herstelprojecten.

Haringvliet & Kierbesluit

▪ Beschrijving van het implementatie proces van het Kierbesluit in het Haringvliet in de woorden van de respondent

Tijdens de beschrijving aandacht voor de volgende thema's:

Communicatieproces	- Hoe vond de communicatie tussen de actoren plaats? - Wat was het voornaamste doel van de communicatie?
Mogelijkheid tot experimenteren	- Was er tijdens het implementatieproces ruimte voor een 'experimenterende aanpak' (Leren-door-te-doen)?
De rol van individuen	- Kunt u beschrijven of er individuen aanwezig waren die een belangrijke bijdrage hadden in het implementatieproces? *(visionair; knowledge broker; coördinator?)*
Steun voor het project	- In hoeverre was er steun voor het implementatieproces? - Hoe is er geprobeerd om steun voor het implementatieproces te faciliteren?
Integratie van stakeholders & kennis in het proces	- In hoeverre werden stakeholders (& hun kennis) betrokken bij het implementatieproces?

Aanvullende condities

▪ Kan de respondent aanvullende condities bedenken die het implementatieproces positief kunnen beïnvloeden?
▪ Wel / niet aanwezig in de Haringvlietcasus?

Afsluiting

▪ Interview kort samenvatten en belangrijkste punten herhalen.
▪ Vragen of respondent een bepaalde vraag had verwacht. Ben ik iets in de ogen van de persoon vergeten te vragen? Vragen of de respondent zelf nog aanvullingen heeft?
▪ Dankwoord

Appendix 3: Codes used in interview analysis

Experimentation	▪ Increase knowledge ▪ Adapt
Communication	▪ Moments ▪ Interaction / Dialog
Role of key individuals	▪ Visionary ▪ Background ▪ Position
Project support	▪ Interests ▪ Finance ▪ Internal support
Active stakeholder & knowledge integration	▪ Proactive involvement ▪ Shared vision
External events	▪ Political events
Complexity	