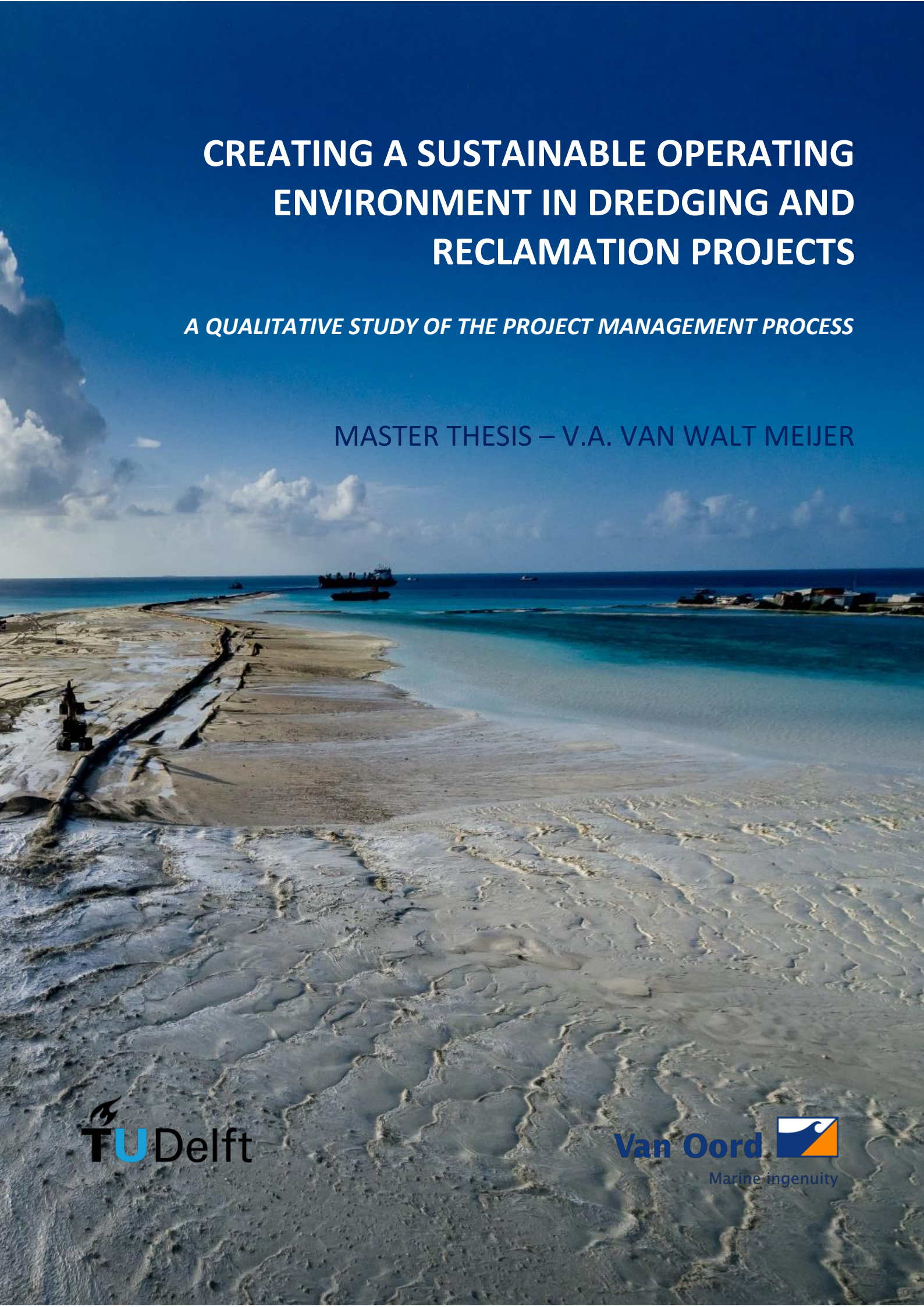
CREATING A SUSTAINABLE OPERATING ENVIRONMENT IN DREDGING AND RECLAMATION PROJECTS

A QUALITATIVE STUDY OF THE PROJECT MANAGEMENT PROCESS

MASTER THESIS – V.A. VAN WALT MEIJER



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Creating a Sustainable Operating Environment in Dredging and Reclamation Projects

A Qualitative Study of the Project Management Process

By

V.A. van Walt Meijer

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Preface

This report is the result of my thesis research as final part of the master degree Construction Management & Engineering at Delft University of Technology.

As I am finishing my thesis research I can reflect on a great journey. I started my research motivated to look into sustainability in relation to large construction projects as I am additionally completing the graduation annotation 'Technology in Sustainable Development'.

Throughout the research, I had a great committee by whom I felt supported along the way. I would like to thank my professor Marcel Hertogh for introducing me to the topic. After our initial conversation, you had the great idea of linking me with Van Oord. Thanks to your idea and support a whole new world of hydraulic engineering opened up to me. Daan Schraven, I would like to thank you for your enthusiastic guidance and great collaboration. You always managed to encourage me to dive deeper into the subject and explore more. When I think back at our meetings, I appreciate the overviews you drew for me on the board and the great metaphors you would use to sum up our conversations. As my final committee member from the university, I would like to thank Lisa Scholten. Your support and advice on the qualitative research techniques taught me a lot. I would also like thank Erik van Eekelen, my supervisor at Van Oord, for including me in Van Oord Environmental Engineering Department and guiding me in the hydraulic engineering sector. You helped me find a balance between the university and Van Oord. Sander Dekker thank you for your guidance. You always helped me think of the bigger picture.

Finally, I would like to thank my friends and family for support. Dad, Q and David you were my constant soundboard and support through everything, for which I want to thank you very much. Then mum, I think the biggest change was for us. Due to circumstances you were in The Netherlands all summer and therefore always nearby to support me. I want to thank you for this time together and I will never forget it.

Valerie Anne van Walt Meijer
Delft, October 2018

Abstract

Sustainability is one of the most important topics of our time. Businesses need to respond to the risks and impacts that are related to this topic, resulting in a growing focus on sustainable development. Aside from the end result, contracting firms are also focussing on the way they operate and how their processes are influencing the operating environment. Companies (in general and in the dredging sector) are striving towards more sustainable operations. However, problems arise in the change from current practices to projects that operationalize sustainability goals. Therefore, an understanding is needed about the process of project managers when integrating sustainability.

The objective of this research is to describe the operational process of creating a sustainable operating environment for dredging and reclamation projects through an in-depth analysis of a dredging and reclamation project in the Maldives of Van Oord. To deliver the research objective, the main research question is answered.

How does project management create a sustainable operating environment in an international dredging and reclamation project?

The axes along which sustainability can be assessed in the research are determined. Elkington's TBL definition of sustainability is used to set sustainability outcome criteria and a list of eleven relevant criteria is formulated. Along with this, thirteen potential factors are identified. The methodology of the case study is outcome driven process research. This is done by, first identifying the outcome of a project and then build backwards in time and identify the process that led to a certain outcome (van de Ven, 2007). To get an in-depth understanding, a single case study approach and qualitative research methods are used. The Maldives project was selected as case study because of its accredited (internal and external) approach that incorporated sustainability.

The case study research brings forward an explanation of the project management process by telling the story of how the sequence of events unfolded producing the sustainable outcome. The case study project shows that most initiatives occur in five sustainable outcomes. These are economic performance, indirect economic impact, materials, biodiversity and local communities. The events, from the five outcome criteria, have been set in a timeline indicating how they evolve over time (the total visual map of the project management process of the Maldives project can be found the fold-out on the final page of this thesis report).

The visual representation is used to indicate where in the project process of the case study the thirteen factors, from literature, become visible. Although all present, there were several factors who had a more significant role than others in the project management process. Overall the Project Manager's (PMs) experience was a big driver in the case study project. The PMs experience was based on environmental and social considerations but also the economic perspective that aims at a competitive advantage resulted in his commitment towards sustainability. Additionally, external accountabilities required the PM/team members to incorporate environmental and social aspects in the execution of the process. These requirements were integrated in the project because of the dependency with short term necessities to execute a project such as permits, but eventually contributed to the projects long term outcome. Knowledge and awareness as well as the early and broad stakeholder involvement had a significant role in the case study process. Knowledge was needed in the case study to integrate sustainability. The case study illustrates the importance of incorporating local knowledge in a project (which can be set up through stakeholder involvement). Additionally, seeking knowledge from other experts in the organisation was proven to be beneficial. The PM in the case study was guided in the stakeholder involvement approach by an Environmental Engineer with much experience in this field. Consequently, the stakeholder management approach in the case study was successful as it also opened doors for collaboration with locals and after the project there were almost no complaints. Awareness is

created to encourage bottom-up integration of sustainability. Several attempts were done by the PM in the case study that resulted in a team which was aware of why they operated in a certain way. Also, knowledge is needed about the execution works (monitoring of water turbidity etc.). This was used for mitigative actions (adaptive management) but also for the stakeholder management.

To conclude, a sustainable operating environment in international dredging and reclamation projects is created by integrating social and environmental considerations, along with economic considerations in a project. This integration takes place in the general project management process and not as a separate plan. The visual map of the project management process for a sustainable outcome (fold-out) shows the complex interaction when integrating sustainability during a project process.

The most significant role when integrating sustainability in a project is the PM. The decision-making of the PM in the case study was influenced by previous experience which resulted in commitment towards sustainability. This commitment is also brought on by change encouraged by the evolution change model. Competitors as well as companies who set external accountabilities are incorporating sustainability. Contracting companies see business opportunity and motivation to keep improving their sustainability standards. This drives actions to integrate external accountabilities but also to go beyond requirements and search for opportunities (proactive). The PM and his team also increase the added value that goes beyond executing the technical requirements. This is done by integrating environmental mitigation actions, such as sand search and coral relocation, but also broad stakeholder management. The stakeholders are engaged by approaching them in the project preparation and communicate open about the project. A separate team member is given time and budget to focus on stakeholder management. When informing the stakeholders, issues can be resolved and thus contribute to the social criteria of the project.

To facilitate the motivation to action, the PM creates a team where employees are aware of sustainability and have the ability to initiate action. For this, resources are needed including knowledge from multiple disciplines (local and internal) and the support (if necessary financially) from the organisation.

Finally, the recommendations focus on the contractor in a dredging and reclamation projects. The recommendations are separately addressed for the project management of the projects and the contracting company.

Recommendations for the project management

Recommended is that sustainability aspects must be integrated in the general project management and not considered as a separate plan.

- Set up early and broad stakeholder engagement
- Create awareness of sustainability in the project team
- The Project Manager should be connected to and supported by different departments who have social and environmental knowledge.
- Place external accountabilities (social and environmental) early in the project preparation along other demands

Recommendations for the contracting company

- Create knowledge and awareness by increasing the learning and training of employees.
- Match-making of projects and Project Managers. When matching Project Managers with a project their experience and consideration with all TBL aspects would match the project.
- Facilitate the setting up of connections to the people with knowledge on how to integrate social and environmental aspects to support the project teams.
- Stimulate the exchange of experiences after projects and how this was set up as a goal in another project.

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List of Abbreviations

EE	Environmental Engineer
EED	Environmental Engineering Department
EIA	Environmental Impact Analysis
EIC	European International Contractors
GRI	Global Reporting Initiative
IFCE	International Federation of Consulting Engineers
MMHI	Maldives Ministry of Housing and Infrastructure
PM	Project Manager
PMI	Project Management Institute
PSEM	Project Sustainability Excellence Model
SDG	Sustainable Development Goals
SMP	Sustainable Management Plan
SQ	Sub-question
TBL	Triple Bottom Line
UN	United Nations
VO	Van Oord

PART I
Research Introduction

Chapter 1 – Introduction

1

Introduction

1.1 The Change at Hand

Sustainability is one of the most important topics of our time (Silvius & Schipper, 2010). The term sustainability is often linked to the definition of the Brundtland Commission (1987) described in 'Our Common Future' as meeting current needs without compromising future generations. Movies such as 'An Inconvenient Truth' and 'Before the Flood' bring more awareness of climate change to people (Silvius & Schipper, 2015). This awareness results in a growing focus on sustainable development, ethics, social responsibility and supply chains within companies (Carboni, 2014). Businesses are confronted to respond to the risks and impacts that are related to these topics (Baltissen, Jamriska-mulder, Rappoldt, Bitzer, & Mulder, 2018).

To stimulate people and businesses, The United Nations set up seventeen Sustainable Development Goals (SDGs) in the 2030 Agenda for Sustainable Development (United Nations, n.d.-b). Large companies that influence many SDGs are infrastructure, project-based, companies. The complex development of infrastructure contributes to almost all of the seventeen SDGs (EIC, 2018). Van Oord, a large international marine contractor, identifies that their projects contribute to seven of the SDG's shown in figure 1 (Van Oord, 2018) .

Figure 1 - SDG's Van Oord projects contribute to - (Van Oord, 2018)

These SDGs are being realised through projects that are carried out across the world. Aside from the end result, contracting firms are also focussing on the way they operate and how their processes are influencing the operating environment (Van Oord, 2017a). To realise a project many decision steps are needed. Planning, organisation, monitoring and control are all aspects of a project that are needed for it to fulfil the project objectives (Dinsmore & Cabanis-Brewin, 2006). The execution of these aspects is the responsibility of the project manager (Dinsmore & Cabanis-Brewin, 2006).

As introduced, companies are striving towards more sustainable operations but the problem that arises is the successful operationalization of a company's sustainability goals. 'An Inconvenient Truth: How Organizations Translate Climate Change into Business As Usual' (Wright & Nyberg, 2017) shows how sustainable corporate initiatives somehow disappear because when realised, they are translated back into business as usual. The project manager is responsible for the rolling out of a project and fulfilling the project objectives (Dinsmore & Cabanis-Brewin, 2006). Therefore, much of the operationalization of sustainability goals depends on the decision making of the project manager.

1.1.1 Award-winning Project

The 'Dredging and Port Construction Award' is a way to stimulate sustainability and innovation in projects in the coastal and marine environment. The award honours companies and individuals that are changing the current practices with new ideas, technologies and innovations. In 2017 Van Oord won the 'Innovation in Project Design' award with their land reclamation project in the Maldives. The project required land reclamation of three islands with a project site of over 600 kilometres. This was commissioned by the Maldives Ministry of Housing and Infrastructure to make development possible. The project stands out from other dredging and reclamation project because the contractor, Van Oord, took an active role to minimise the impact of this project on the marine environment by relocating coral species and to engage the local community.

1.1.2 Company Profile

This research is done in collaboration with Van Oord. With 150 years of experience as an international marine contractor there is much experience and expert input for the research. Van Oord's mission statement is "*As a global maritime contractor, we focus on dredging, oil & gas infrastructure and offshore wind. We work safe and closely with our clients and stakeholders to create innovative and sustainable solutions*."(Van Oord, 2018, p. 2). To create this, they identify 4 values through which Van Oord achieves their business goals. These 4 values are embedded in all the businesses which consist of dredging, offshore oil and gas and offshore wind. Van Oord is a large marine contractor operating all over the world, with an annual turnover of approximately 1.5 billion and 4,5 thousand employees in 2017 (Van Oord, 2017a). Although active in multiple activities dredging and reclamation remains Van Oord's largest activity.

Figure 2 - Van Oord values - (Van Oord, 2018)

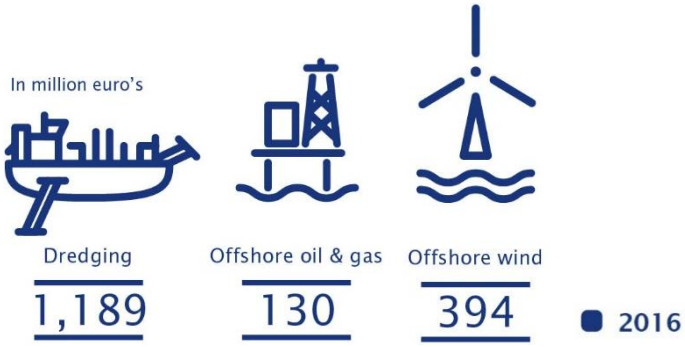


Figure 3 - Van Oord activities and turnover - (Van Oord, n.d.)

1.2 Literature Problem Analysis

The concept of sustainability is addressed and defined in several ways. The most common used understanding was formulated, by the Brundtland commission of the UN World Commission on Development and Environment, as: "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Brundtland, 1987, p. 16). The commission adds to this by describing sustainable development as a strategy that: "aims at promoting harmony among human beings and between humanity and nature" (Brundtland, 1987, p. 57). With this general understanding the report introduces the integration of a social and an environmental perspective alongside the economic perspective.

1.2.1 Contractors and Sustainable Operating

The European International Contractors (EIC) industry association is also recognising that the construction industry is leaving behind a large footprint and identifies the SDGs from the United Nations as a call for a change of businesses (EIC, 2018). When linking the SDGs to social, environmental and economic aspects in addition with responsible business context, EIC (2018) shows the large amount of areas that contractors impact when operating. These areas indicate the impact that should be regulated through guidelines. Standards such as ISO 9000, 14000, 26000 and 37001 address multiple issues from social responsibility to environmental responsibilities (EIC, 2018). However, infrastructure in the coastal and marine environment is often operated internationally. For instance, Van Oord is based in the Netherlands but operates all over the world. When operating internationally, companies encounter different cultures and other practices. Companies operating international have pressure from companies in the other country whom do not always comply with the standards and guidelines (Baltissen et al., 2018). When operating, the position of the contractor also differs from project to project. The contractor could function as a main contractor and carry many risks and responsibility or be a sub-contractor. In both cases the company should ensure that their part of the project is up to standards (Baltissen et al., 2018).

1.2.2 Sustainable Project Management

The International Project Management Association (IPMA) has repeatedly tried to create a focus on sustainability within project management. In 2008 the vice-president of IPMA Mary Mackinlay stated that 'the further development of the project management profession requires project managers to take responsibility for sustainability' (McKinlay, 2008). A decade later the industry has grown and alongside this, research has been done to link sustainability and project management. Recently, research has been conducted about the willingness of project managers to also incorporate social and environmental aspects. After researching 222 projects across the world, it has shown that there is a low degree of commitment to these aspects from project managers (Carvalho & Rabechini, 2017). Gradually new tools are addressing the operationalization of the growing studies on combining sustainability and project management (Silvius, Neuvonen, & Eerola, 2017).

Although new frameworks for project management have been formed by researchers attempting to connect sustainability and project management more research is needed for the development of tools, techniques and methodologies for projects organizational level (Mauro L. Martens & Carvalho, 2017; Silvius, Neuvonen, et al., 2017). Martens and Carvalho (2017) have identified that future studies could focus on the case studies of the actual business practices and look at variables such as sectors or countries.

1.2.3 Project Management and Decision Making

The main function of a project manager is to make decisions (Ward, 2015). Decisions are based on a broad spectrum of motives raging from rational to intuitive. Rational refers to decisions based on a structured analysis (Staib, 2005). All these decisions are influenced by external and internal factors that need to be considered in decision making (Staib, 2005). Decisions making can also be supported by predictions, facts and figures from analysis and assessments. Decision making is a critical skill that could increase sustainability in projects (Silvius, Kampinga, Paniagua, & Mooi, 2017). Silvius Et Al. (2017) also identified "the need for more empirical studies on this topic to explore how the dimensions of sustainability influence decision-making by project managers in practice" (Silvius, Kampinga, et al., 2017, p. 1140)/

Integrating sustainability in project management is a change from the traditional bottom line used to measure projects only to financial success. How changes unfold is a process study (van de Ven, 2007). There are two meanings of process of change; the first examines changes by variables over time while the second (development of change) identifies process as a sequence of events that describe how things change over time (van de Ven, 2007). The integration of sustainability in project is a change of the regular process. This process of change) occurs in four ways according to van de Ven & Poole (1995). These four general theories explain how and why organisations change and are categorized into unit of change and mode of change (figure 4).

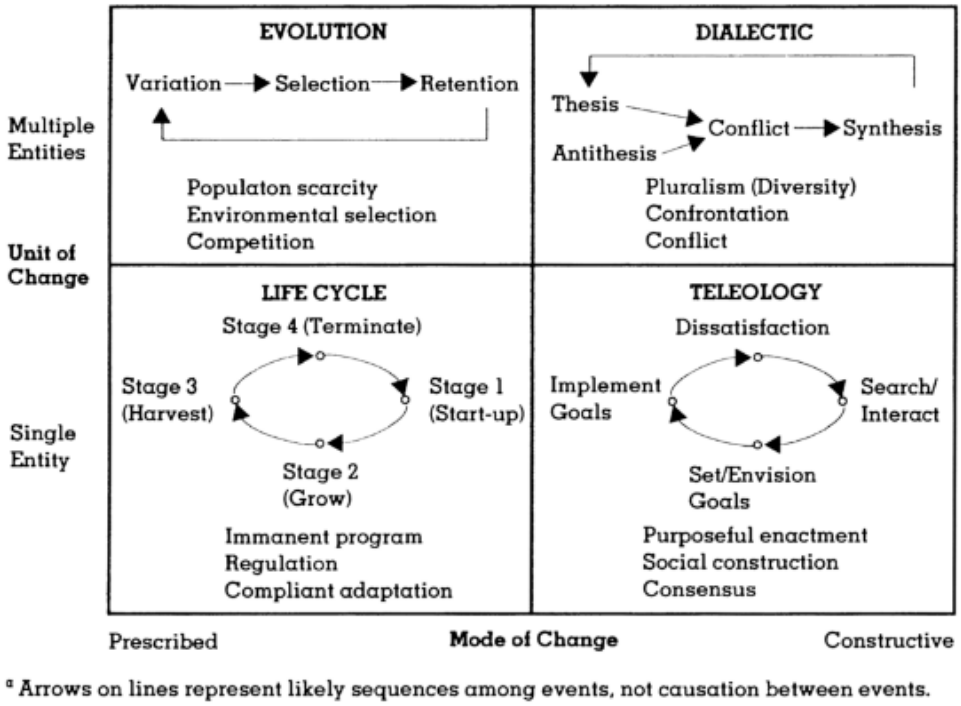


Figure 4 - Organization change process theories – (van de Ven & Poole, 1995)

1.2.4 Dredging and Reclamation Projects

Land reclamation, dredging, building harbours and building wind turbines are all examples of infrastructure in the coastal and marine environment. Infrastructure is seen as necessary for the development of a country (United Nations, n.d.-a) but is also import in regards to human vulnerability (Johnson & Bayley, 2016). As issues such as climate change and rising sea levels are increasing people are more at danger and in need of for instance flood proofing structures (Johnson & Bayley, 2016). Leaving situations to business as usual is not an option as “storm intensities are increasing, beaches are narrowing, landforms and habitats are being eliminated or truncated, natural sediment sources are dwindling, and increasing numbers of people are being placed at risk” (Johnson & Bayley, 2016, p. 5). Tackling these issues creates business for building companies in the coastal and marine environment. Projects in the coastal and marine environment go beyond the traditional engineering and need to incorporate the fragile coastal system and the socioeconomic environment it operates in (Kamphuis, 2011).

The impact of dredging practices has been a discussion for a long period (Wasim & Nine, 2017). Since the 1990’s there has been no doubt that dredging and reclamation activities have both positive and negative impact on social, economic and environmental aspects (Bray, 2009; Fisher, Walshe, Bessell-Browne, & Jones, 2018; Ismail, Abdalla, & Abdu, 1991; Miras-Rodríguez, Machuca, & Escobar-Pérez, 2018; Patmont, LaRosa, Narayanan, & Forrest, 2018; Wasim & Nine, 2017)

In comparison to the growing demand of dredging and reclamation activities and the impact of dredging positive and negative having been discussed for a long time, there is not much research done on the topic. The combinations of sustainability and general project management is an emerging topic however when dredging is introduced these decreases dramatically (general indication given in table 1).

Table 1 - Literature Search June 2018

	"sustainability"* AND "project management"	"sustainability" AND "project management" AND "dredging"
Scholar	131,000 (AND “Building” 34,200)	1,585
Scopus	1,751	0
Elsevier	210	0
Web of Science	4,783	9

*When same is done with comparable word such as sustainable etc. comparable results

1.3 Problem Statement

Companies (in general and in the dredging sector) are striving towards more sustainable operations however, problems arise in the changing of current practices to operationalize sustainability goals in projects. Gradually new tools are addressing the operationalization in the growing amount of studies on combining sustainability and project management (Silvius, Neuvonen, et al., 2017). Although tools are arising, research of Carvalho and Rabechini (2017) indicate a low degree of commitment towards sustainability aspects from project managers in many different sectors. The decision-making of project managers is a critical skill that could increase sustainability in projects (Silvius, Kampinga, et al., 2017). Therefore, to successfully operationalize sustainability goals in projects an understanding is needed about the decision process of project managers due to the influence of sustainability goals. This understanding should be retrieved from situations of project managers in practice (Silvius, Kampinga, et al., 2017).

1.4 Research Objective

The objective of this research is to describe the operational process of creating a sustainable operating environment for dredging and reclamation projects by analysing a dredging and reclamation project in the Maldives of Van Oord. The project of Van Oord in the Maldives is a unique opportunity to see how sustainability aspects have been implemented to operationalize sustainability goals in future projects. The project manager on this project had taken the environmental and social driver into account. This illustrated an example of attempting to establish a sustainable balance between social, environmental and economic dimensions even though this has become more difficult because the three drivers have become increasingly complex (Mauro L. Martens & Carvalho, 2017). The aim of the research is to gain a deeper understanding on the social, environmental and economic considerations and how these are implemented in the project and the process that contributed to the operating environment of a dredging and reclamation project in practice.

1.5 Research Question

To deliver the research objective, the main research question needs to be answered. Along this sub-questions have been formulated. These questions are stepping stones to answer the main research question.

How does project management create a sustainable operating environment in an international dredging and reclamation project?

1. What are criteria of a sustainable operating environment in international dredging and reclamation projects and what are potential success factors?

The first sub-question determines the axes along which sustainability can be assessed. The creation of a sustainable operating environment is an outcome of a project. This is determined based on established success criteria. The three dimensions of the triple bottom line are used to identify the success criteria of the sustainable operating environment. The given outcome gives an opportunity to build backwards and identify what contributes to the outcome (van de Ven, 2007). These is also explored as potential success factors.

2. How can criteria of a sustainable operating environment become visible in the course of a project management process?

By answering the second sub-question a strategy for collecting the data of the research is formulated. Identifying how the criteria and factors can become visible gives an indication of how this can also be found in the case study research. This is completed in two ways. The first focusses on the underlying signals of the process of a project manager. The second on the methodology of the case study research and the ability of the method to bring forward aspects in a case study.

3. How was a sustainable operating environment created during the land reclamation project of Van Oord in the Maldives?

The first sub-question identified the basis of established success criteria. These success criteria evaluate the outcome. The outcome of the case study is assessed along these success criteria and determines the sustainability of the operating environment in the case study (Maldives project of Van Oord). Then, a description is given of the process that unfolded in the Maldives project to create the sustainable operating environment. Focussing on an explanation that tells a story about how a sequence of events unfold to produce the given outcome (van de Ven, 2007). The identified success factors from sub-question 1 are not used directly but function as input to identify what is considered.

4. What factors took place in the project management process of the Maldives project and is the project management process transferable to other projects?

The final question adds on to the previous questions, as it steps out of the case study and brings forward the bigger picture. The results from the case study are used to identify the factors in process of project management in the case study. Aside from the factors, is the transferability of the process from this single case study to other projects brought forward.

1.6 Scope

When executing a large and complex infrastructure project there are many different parties involved with each their own perspective (Project Management Institute, 2013). The focus of the research is the operating environment and this is mostly influenced in the realisation phase and executed by a contractor (Nicholas & Steyn, 2012). VO is a large international dredging and offshore contractor (Van Oord, 2017a). Therefore, the research is conducted from the point of view of the contractor and specific from VO. When assessing

sustainability aspects of a project an 'one size fits all' list of indicators does not work, because when there are many aspects that are not related to your practices the willingness of a participant decreases (Silvius, Neuvonen, et al., 2017). Therefore, the research of the master thesis focuses on one specific industry and project type.

1.7 Research Strategy

The approach or research strategy is seen as a crucial decision when constructing a technical-research design. In order to decide on an approach first three questions were answered (Verschuren & Doorewaard, 2010). The first question is if the graduation thesis is an in-depth of broad question. This research aims at *an in-depth approach* focussing on a smaller scale. The second and third questions from Verschuren and Doorewaard (2013) are related to each other and refer to the quantification of the research and the decision if the research will be empirical or desk research. The research *focuses on qualitative methods* and insights are obtained *through empirical and desk research*.

The research objective aims at analysing the changing of the current practises of an existing situation. This is practice-orientated research (Verschuren & Doorewaard, 2010).

Figure 5 illustrates how the first three research questions relate to each other. First the outcome is defined based on literate. Just as the second research question, the process factors to create the sustainable outcome, is identified using current literature. These two questions form the initial research and sub-question three uses a case study for outcome driven process research. Additionally, sub-question four reflects the literature in the case study and the transferability of the single case study.

Figure 5 - Research approach first three sub-questions - (own illustration)

1.7.1.1 Initial Research

The first two research questions form the research preparation. The first sub-question elaborates onto the already preformed problem analysis in literature (1.2). The proposed literature study is more specified on the established success criteria of creating a sustainable operating environment in dredging and reclamation projects. This was done through desk research and focus on literature study.

1.7.1.2 Case Study Research

In order to provide a detailed and practical understanding of complex intervention realistic review is needed (Pawson, Greenhalgh, Harvey, & Walshe, 2005). Realistic review research will not answer if something works or not, but will provide full insight on a process. For this a case study research strategy was used. This strategy has the following 7 main characteristics (Verschuren & Doorewaard, 2010) that complement the intended analysis of a process. The research consists of a small number of cases to research but with intensive data gathering to have a more in-depth research. To do these there needs to be strategic sampling by observing information from the natural context through research methods. Aside from these, a case study is relevant when you want to cover contextual conditions, the behaviour cannot be manipulated, the boundaries between phenomenon and context are not clear and the question is a why and how question (Yin, 2006).

The case study will focus on a land reclamation project of Van Oord in the Maldives in 2016. Commissioned by the Ministry of Housing and Infrastructure of the Maldives, three islands were extended. This project forms a representative situation to identify how a project created a sustainable project environment. This is the focus

of the research and therefore a single case study. When researching a case study it can be embedded or holistic (Yin, 2006). The research in the graduation thesis is not focused on the case as a whole but zooms in on specific units (triple bottom line dimensions, operating environment, phase of project and roles of specific participants).

Case studies can get an in-depth grasp on a project and obtaining more knowledge by focussing on certain aspects. However, case study research also has limitations. The validity or generalisation of the results could be reduced because of the small amount of cases studied. This makes the ability to apply results to a broader context difficult. As the research is practise-oriented this is of less importance compared to a theory-oriented research (Verschuren & Doorewaard, 2010).

The main research question is a 'how' question. A 'how' question requires an explanation of the sequence of events that is needed for it to happen in the real world. In order to research a 'how' question, a process model of the order in which things develop and change is needed (van de Ven, 2007). A process model is the explanation of change between two strategies (figure 6).

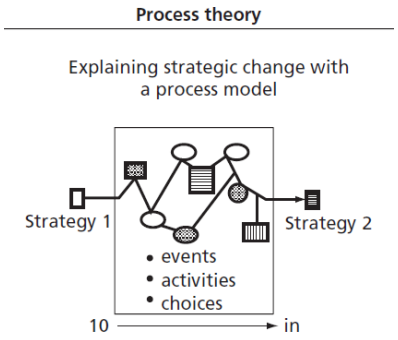


Figure 6 - Process Theory - (van de Ven, 2007)

Figure 7 - Process Theory in Case Study Research – (own illustration)

The goal of the master thesis study is to get a better understanding of 'how' project managers create a sustainable operating environment. To research this, a process study strategy is used (figure 7). The case study research is outcome driven. First, identifying the outcome of a project (sustainable operating environment) and then build backwards in time and identify the process that led to a certain outcome (van de Ven, 2007).

1.8 Structure of Thesis

This thesis will focus on the process of project management in creating a sustainable operating environment in dredging and reclamation projects. The topic has been introduced in this chapter. The following four chapters will answer the four sub-questions through research execution and the final chapter will review the research in accordance with the thesis structure in figure 8.

Figure 8 - Overview of Thesis Structure – (own illustration)

PART II
Initial Research

Chapter 2 – Literature Study: Sustainable Project Outcome and Process

Chapter 3 – Methodology Case Study: Sustainable Outcome and Process Identification

2

Literature Research: Sustainable Project Outcome and Process

This chapter brings forward possible sustainable outcome and process factors defined to dredging and reclamation projects. Before elaborating on project and process, sustainable development in general is introduced (3.1). In 3.2 the outcome criteria are researched and set in the context of a sustainable operating environment of international dredging and reclamation projects. Then, the general process is researched and factors contributing to a sustainable outcome are explored (3.3). These in turn, are set in the context of dredging and reclamation. The project outcome criteria and process factors, of sustainable dredging and reclamation projects, are brought together at the end of the chapter (3.4).

2.1 Sustainable Development

As previously introduced there is a growing focus on sustainable development, ethics, social responsibility and supply chains within companies (Carboni, 2014). Businesses are confronted to respond to the risks and impacts that are related to these topics (Baltissen et al., 2018). When talked about sustainability within companies the term Corporate Sustainability if often used. This indicates the sustainability aspects of a company and how they manage it (Marcelino-Sádaba, González-Jaen, & Pérez-Ezcurdia, 2015). Companies are trying to incorporate the definitions from Brundtland (1987) and a broadly used framework is the Triple Bottom Line (TBL). Many theories, frameworks, assessment and other definitions of sustainability use the TBL. 86% of the publications address sustainability in terms of the Triple Bottom Line. TBL can be seen as one of the key principles or elements of sustainability (Carvalho & Rabechini, 2017; Hammer & Pivo, 2017; Hosseini, Banihashemi, Martek, Golizadeh, & Ghodoosi, 2018; Mauro L. Martens & Carvalho, 2017; Mauro Luiz Martens, Carvalho, & Dai Prá Martens, 2016; Savitz & Weber, 2013; Schweikert, Espinet, & Chinowsky, 2017; Silvius, Kampinga, et al., 2017; Silvius, Neuvonen, et al., 2017; Silvius & Schipper, 2010, 2012; Thabrew, Perrone, Ewing, Abkowitz, & Hornberger, 2018)

2.1.1 Triple Bottom Line

When companies measure their success, it is traditionally done by measuring the company's financial success also called the bottom line (Savitz & Weber, 2013). In 1998 John Elkington introduced a new measure of success, the TBL, in his book 'Cannibals with Forks: The Triple Bottom Line of 21st Century Business' (Elkington, 1998). Before Elkington (1998) introduced the TBL framework environmentalist were struggling with the measuring of sustainability (Slaper & Hall, 2011). TBL is a concept that illustrates the essence of sustainability for businesses by measuring the impact of a company on society, the environment and the economy during their projects or processes (Savitz & Weber, 2013). The TBL framework broadens the aim from only achieving

economic sustainability, could succeed in the short run, to long term sustainability by also incorporating social and environmental criteria (Dyllick & Hockerts, 2002). The three dimensions of the TBL framework are also often referred to as the three pillar method: People, Planet, Profit (P3, the three P's) (Bray, 2009; Hammer & Pivo, 2017; Mauro L. Martens & Carvalho, 2017; Silvius & Schipper, 2010; Slaper & Hall, 2011).

2.1.1.1 Economic – Profit (Prosperity)

Dealing with the bottom line and cash flow is the main aim of the economic dimension (Elkington, 1998; Slaper & Hall, 2011). When a company is economically sustainable it refers to the ability to "guarantee at any time cashflow sufficient to ensure liquidity while producing a persistent above average return to their shareholders" (Dyllick & Hockerts, 2002, p. 133). This can also be seen as that the objective of the economic impact is to maximize profit (Thabrew et al., 2018). The focus of the economic dimension is from the point of view of a company and not society. When the triple bottom line is used by a governance or NGO the economic variables could also include the societal gains (prosperity) (Slaper & Hall, 2011).

2.1.1.2 Social - People

The social variables reflects all the social dimensions of the area where the organisation and project activities take place (Slaper & Hall, 2011). This incorporates both the human capital of the company as the societal capital of the operating environment (Dyllick & Hockerts, 2002; Elkington, 1998; Staib, 2005). Human capital refers to skills, knowledge and other intangible assets of an individual that could create economic value for the individual, company or community. Societal capital represents the societal network that has both economic as cultural value because this enables a society to function. A socially sustainable company adds value to a community in the operating environment by increasing the human capital of individual partners and furthering the societal capital of these communities as a whole (Dyllick & Hockerts, 2002). An important element is the management of stakeholders in a way that all stakeholders can understand the company's motives.

2.1.1.3 Environmental - Planet

Ecological sustainability is based on the idea that the earth is finite and that the depreciation of nature cannot go on forever (Dyllick & Hockerts, 2002). Environmental aspects are variables that reflect the type and quality of natural resources that would be potentially influenced by a project. Common known environmental variables are water, air and energy. Others that are often mentioned are waste generation and land use consumption (Slaper & Hall, 2011). Nature can reproduce resources and absorb and assimilate emissions, however this process takes time. If a projects desires to be environmentally sustainably it should not outreach this ability of nature (Dyllick & Hockerts, 2002)

2.1.1.4 TBL Relationships Between Dimensions

There is a relationship between the three dimensions of the TBL. First the relationships were understood as concentric circles where the environmental dimension was the outer circle and smaller circles undermine the larger. The TBL dimensions were understood as the circle of economics in that of society and those in turn in the environmental circle (Gibson, Hassan, & Tansey, 2013).

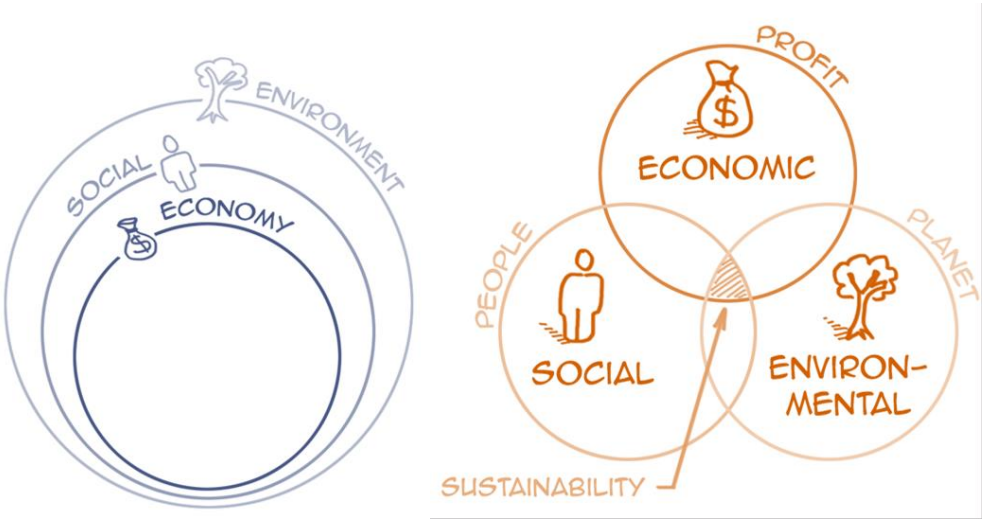


Figure 9 - Triple Bottom Line dimensions 'old' view (left) and 'current' view (right, Venn diagram) – ("Sustainability Cartoons - Sustainability Illustrated," 2014)

From the concentric circles a new representation of the dimensions was evolved because of the change towards new understanding of social and environmental dimensions. In the meantime society was being evaluated on how well they serve the economy and the environment seen as a source of resources and services (Gibson et al., 2013). The new representation encourages attention to the intersection by presenting the dimensions as circles that intersect (Elkington, 1998; Gibson et al., 2013). The centre of the Venn diagram represents where the three core aspects overlap, when a balance or harmony is found between the three aspects then we speak of sustainability (Elkington, 1998). The three dimensions each represent a pillar for sustainability but are not stable on their own (Elkington, 1998). With this Elkington (1998) intends to illustrate that the three dimensions have a constant interaction with each other due to pressures. Although the initial representation of centric circles still remains truth the new representation goes beyond the unidirectional dependencies (Gibson et al., 2013). Aside from a general overlap in the Venn diagram (sustainability) also show the three other interactions between the dimensions called shear zones (Elkington, 1998). These occur when only two dimensions overlap and are eco-efficiency, environmental justice and business ethics (Dyllick & Hockerts, 2002).

The TBL is a guideline to be used to address all three dimensions however in the project management practices there is a clear emphasis on the profit 'P'. The project drivers are often more focused on the profit dimension and the people and planet aspects are elements of the quality of the result. Therefore, these dimensions are often given less attention (Silvius, van den Brink, & Köhler, 2012). Especially the social dimension is not given enough attention in research while it is an import aspect of the TBL (Carvalho & Rabechini, 2017). ISO 26000:2010 forms a guideline to integrate social responsibility into project management. The following key principles act as guidance and not requirements; accountability, transparency, ethical behaviour, respect for stakeholder interests, respect for the rule of law, respect for international norms of behaviour and respect for human rights (International Standard, 2010).

2.2 Sustainable Project Outcome

When looking at sustainability impact of a projects outcome there are two sub parts (that are connected) to consider. One focusses on realising a sustainable project therefore the focus is on the end product. While the other approach focuses on the construction process (Bray, 2009; Kivilä, Martinsuo, & Vuorinen, 2017).

Figure 10 - Sustainable Project Outcome of Projects - (Kivilä et al., 2017)

- **Final Design -** Realising a sustainable project is dependent on the demands of the customer also knows as project objectives. As a contractor their role is traditionally the realisation of the clients demands. Contracting companies are trying to be proactive and involve themselves in the defining of the demands (van Koningsveld, Aarninkhof, Bridges, Vellinga, & Spearman, 2018). This way they can use their expertise to steer a project to contain more sustainable objectives and therefore a more sustainable project result.
- **Final Construction Process -** Focussing on the project process and creation of a sustainable operating environment. When working on projects there are many aspects to be considered during the execution process. These have an influence on the project and what happens during the realisation of a project (transition of change). Many decisions are being made by the project manager and therefore have an impact on the project. In the infrastructure sector there can be an improvement of 90% in the sustainability of the delivery process (Silvius, Neuvonen, et al., 2017).

2.2.1 List of Criteria of Sustainable Project Outcome

To determine a projects sustainable outcome sustainability assessments can be used. Sustainability assessments are important because they can assist decision makers with deciding on whether they should or should not undertake an action to make a project sustainable (Gibson et al., 2013; Singh, Murty, Gupta, & Dikshit, 2012). Frameworks such as the TBL can be used during the preparation and execution of a project when comparing different project alternatives (Marcelino-Sádaba et al., 2015; Singh et al., 2012) but are also beneficial for sustainability reporting after a project is completed (Carboni, 2014; Gray & Milne, 2004; Staib, 2005). Commonly used assessment techniques during the project management process are cost benefit analysis (CBA), Life Cycle Costing (LCC) and environmental impact analysis (EIA) (Bray, 2009; Singh et al., 2012; Staib, 2005). These are used during the project management process however to evaluate the outcome of a project other frameworks are used. Frameworks that are used for this sustainability reporting are Un Global Compact's Ten Principles (UNGC) and Global Reporting Initiative (GRI). UNGC is often used to assess a governmental perspective of sustainability goals as it also brings in the institutional dimension in the picture (Staib, 2005). When making a sustainability assessment of a project, companies interests are often better measured with the GRI framework (Staib, 2005).

The most broadly used standard, within companies, to understand and communicate the impact (outcome) of critical sustainability issues of projects is the GRI. Set up by the United Nations Environment Programme in 1997 it was developed to ensure global consistency in regards to sustainability (Staib, 2005). The GRI Sustainability Reporting Guideline embraces the TBL framework as it reflects on an organizations "governance approach and of the environmental, social and economic performance and impacts of organizations" (Global Reporting Initiative, 2014, p. 5).

Table 2 - GRI indicators in the TBL pillars - (Global Reporting Initiative, 2014)

Category	Economic			
Aspects	• Economic Performance • Market Presence • Indirect Economic Impacts • Procurement Practices			
Category	**Environmental**			
Aspects	• Materials • Energy • Water • Biodiversity • Emissions • Effluents and Waste • Products and Services • Compliance • Transport • Overall • Supplier Environmental Assessment • Environmental Grievance Mechanisms			
Category	**Social**			
Sub-Categories	**Labor Practices and Decent Work**	**Human Rights**	**Society**	**Product Responsibility**
Aspects	• Employment • Labor/Management Relations • Occupational Health and Safety • Training and Education • Diversity and Equal Opportunity • Equal Remuneration for Women and Men • Supplier Assessment for Labor Practices • Labor Practices Grievance Mechanisms	• Investment • Non-discrimination • Freedom of Association and Collective Bargaining • Child Labor • Forced or Compulsory Labor • Security Practices • Indigenous Rights • Assessment • Supplier Human Rights Assessment • Human Rights Grievance Mechanisms	• Local Communities • Anti-corruption • Public Policy • Anti-competitive Behavior • Compliance • Supplier Assessment for Impacts on Society • Grievance Mechanisms for Impacts on Society	• Customer Health and Safety • Product and Service Labeling • Marketing Communications • Customer Privacy • Compliance

The list of 64 indicators from GRI is intended for all sectors but too extensive to use in most projects (Silvius & Schipper, 2010). After systematic literature review in combination with input from project managers in practice, studies select relevant indicators from the original set of GRI that is applicable for sustainable project management (Mauro L. Martens & Carvalho, 2017; Silvius & Schipper, 2010). Although this list can be specified for sustainable project management the most important is to select criteria with a large contribution and thus, sector/project specific and in line with the companies sustainability strategy (Silvius & Schipper, 2010).

2.2.2 Relevant Criteria for Context

This research focusses on the dredging and reclamation projects. Activities in the coastal and marine environment that have a large impact on the surrounding are dredging and reclamation (Wasim & Nine, 2017). Many mayor coastal cities in the world experience a combined increase in population and migration to cities (Sengupta, Chen, & Meadows, 2018). Due to this growing demand of land in the past 30 years coastal regions are looking to reclaiming land from the sea by means of dredging and reclamation activities (Sengupta et al., 2018). However dredging is not a goal itself but a means to an end and the general motive of a dredging is to contribute to a project that improves the current situation (Bray, 2009).

Dredging is a term that covers a variety of activities. The most basic form is “the excavation of material from a sea, river or lake bed and the relocation of the excavated material elsewhere” (Bray, 2009, p. 9). However dredging entails many different activities and therefore a distinction has been made between three main types of dredging (Bray, 2009; van Koningsveld et al., 2018):

- *Capital dredging* entails the activities that are needed to create new or improved facilities. This can be for instance the creation of a harbour basin or an area of land reclamation for multiple purposes. Capital dredging is also involved in large infrastructure projects such as bridges and tunnels. This type of dredging projects is often non-repetitive, involve undisturbed and compact soil layers which have low contaminated content. The dredging or disposing activities of capital dredging are often in sensitive zones and cause destruction of natural habitats.

- *Maintenance dredging* is a repetitive activity that is a reaction to the natural siltation of channel beds. The projects encounter thin variable layers that can potentially be contaminated. The operations are often not damaging to the natural environment as it is often in already artificially deepened areas. The sediment that is retrieved can have potential impact as it can be contaminated and when it is disposed.
- *Remedial (environmental) dredging* has as its sole purpose to remove contaminated sediment and clean a previously dredged location. Therefore, it often concerns contaminated soils and small areas to be dredged.

Most dredging and reclamation activities are done in the capital dredging type. These are also the activities that support a broad spectrum of infrastructure building in the coastal and marine environment (Bray, 2009; van Koningsveld et al., 2018). Capital dredging often has the biggest impact of the three and is the most often used practice therefore, this research will focus on capital dredging when referring to dredging or reclamation.

2.2.2.1 Triple Bottom Line and Capital Dredging

Capital dredging (dredging and reclamation) activities have both positive and negative impact on social, economic and environmental aspects as it always makes some change in the environment (Bray, 2009; Fisher et al., 2018; Ismail et al., 1991; Miras-Rodríguez et al., 2018; Patmont et al., 2018; Wasim & Nine, 2017). Also, in the dredging and reclamation industry it is difficult for decision makers to incorporate these aspects. This is due to challenges when envisioning the consequences of decisions and actions for the future (Wasim & Nine, 2017). There are many variables that determine the amount of impact of a dredging project. Important variables are the stretch of areas dredged, frequency and duration of activity but also the sensitivity of an area in combination with the dredging technique (Wasim & Nine, 2017). The impact of these variables can be reflected in the triple bottom line dimensions.

Economic - Profit

The most tangible economic effects are the ones that can be measured easily and are often considered the increase of value for the stakeholders with and economic interest in the project (Bray, 2009). The economic impact of dredging and reclamation projects has long term positive effects that are experienced both local and on a larger scale. However, the negative economic effects are often experienced near to the project (Appendix A). The local economic activities that are effected by dredging projects are fishing, tourism, farming and industry (Bray, 2009). These can also be considered in the social dimension as they are socio-economic conditions.

Environmental - Planet

During capital dredging projects a distinction can be made between two types of environmental impact. The first refers to the physical environment, that can be seen as the non-living environment and the second focusses on the effects on ecosystems (Bray, 2009). Examples of the physical environment are changes in waves, current, water level and turbidity. These in turn also influence the ecology such as vegetation, fish, coral and birds. The removal or burial of habitat is the most common direct effect of dredging and reclamation projects. However, dredging and reclamation can also have indirect effects on the long term. Dredging and reclamation activities alter the bathymetry and therefore the hydrography which influences the sediment. High turbidity has an direct effect on the ecosystem (Wasim & Nine, 2017). The sediments released during dredging activities that alter the turbidity of the water have a large impact on the corals, seagrass and sponges (Bray, 2009; Fisher et al., 2018; Patmont et al., 2018; van Koningsveld et al., 2018; Wasim & Nine, 2017). Coral reefs are an important part of ecosystems however are very fragile. When damage is conflicted on a coral reef it has a slow ability to recover from damage. Due to these aspects when a coral reef is damaged it has a large impact on species diversity (Bray, 2009; van Koningsveld et al., 2018).

These are all effects that occur on the direct project side however dredging and reclamation projects alter the land scape in a way that surrounding marine environment should also be considered. By changing the physical environment surrounding areas respond with a natural process such as land erosion and accretion. The

negative and positive effect of dredging and reclamation has been set along a time scale and horizontal range scale (Appendix A).

Social – People

Many economic aspect, mentioned above, also have impact on the social dimension. When dredging and reclamation projects are being executed it influences much of the social dimension. Not only the final project, which intends to improve the current situation, but also during a project there are socio-economic effects. The dredging and reclamation projects can have negative impact on fisheries and other local business, by the obstruction dredging causes in the short term but also in the long term. However, during a project there are also employment opportunities for local communities.

Often dredging and reclamation projects are initiated by political or economic motivations which have positive impacts stretching beyond the project area. The negative impacts can have environmental effect also beyond the project are but the negative societal effect often only impacts the local communities (Bray, 2009) . Several effect that have an impact on the direct communities are noise disruption, visual pollution and emissions (Bray, 2009).

2.2.2.2 Criteria of Sustainable Dredging Outcome

Capital dredging is often an activity with an impact on its surrounding and there are many criteria that cover a broad spectrum of effects of a dredging and reclamation project. The product of capital dredging has an impact on its surrounding but also during the construction building there is an impact. In collaboration with experts in the field, the international association of dredging companies (IADC) and the Central Dredging Association (CEDA) set up the most critical criteria that are influenced by the equipment and process of a dredging and reclamation project (Bray, 2009; van Koningsveld et al., 2018):

1. Safety of the people on board is a main priority, however the safety of external people is also considered (social).
2. Accuracy of the excavated profile, by determining this as precise as possible there can be minimal volume to dredge which is very crucial when dealing with contaminated soil (environmental, economic).
3. As previously stated one of the largest impact on the flora and fauna is a result of the generation of suspended sediment and turbidity (environmental).
4. Due to the activities of dredging several different layers can get mixed which has consequences for the relocation, treatment and reuse of the area (environmental).
5. When an area is dredged but the layer is not entirely dredged it can cause impact on the longer term. The spill layer that remains can cause a new start of a natural erosion process which causes risk for neighbouring areas of flora and fauna (environmental).
6. To transport the materials, they are often mixed with large quantities of water. This is being done to facilitate hydraulic transport. However, by doing this the volume of materials the dredging activities effect is being increased (environmental).
7. The equipment used during dredging is often noisy. This concerns both above and below the water. Above the water the noise can have a disturbing effect on the people living close by (social) and underwater the noise can disturb the aquatic life (environmental).
8. A balance in the output rate of the equipment is needed. When this is too low it will cost more (economic) but a reduction of the output rate also reduces the immediate effects (environmental).

The above-mentioned criteria from dredging and reclamation projects can be used to indicate the important aspect of the GRI for dredging and reclamation projects. Several areas have an overlap with the GRI indicators and can be used to identify the critical criteria for sustainable practices.

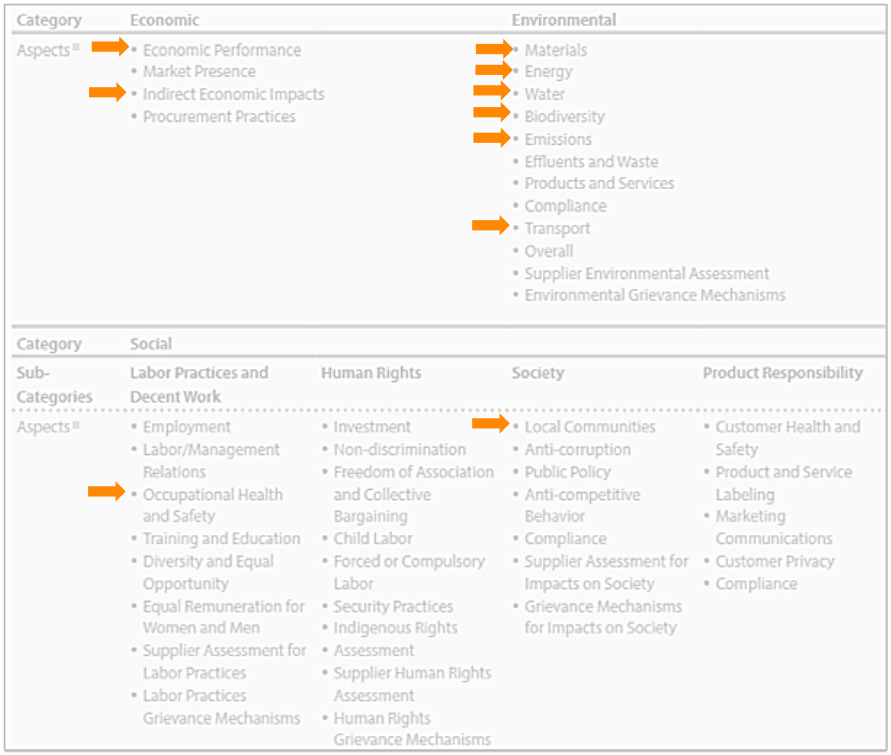


Figure 11 - GRI with Priorities from Dredging and Reclamation Projects – Own adaptation from (Global Reporting Initiative, 2014)

2.2.3 Underlying Signals to Capture Outcome

The previously mentioned relevant criteria for the dredging and reclamation context can be specified and made measurable by identifying the underlying signals of the sustainable outcome.

2.2.3.1 Economic Criteria for Dredging and Reclamation Projects in the GRI

Criteria of sustainable dredging outcome, 2 and 8 (from section 2.2.2.2) both have an economic consideration on the **Economic performance** of the project. According the GRI there are four signals that measure the economic performance (Global Reporting Initiative, 2014): direct economic value, financial risk and opportunities due to climate change, coverage of organizations benefit plan and financial assistance received from government (Appendix F). The main objective to execute a project is the **indirect economic impact** that the project has on a (greater) area.

2.2.3.2 Environmental Criteria for Dredging and Reclamation Projects in the GRI

The list of critical criteria of dredging and reclamation mostly consist of environmental impact. Due to the fragile environment it operates in and the large changes it makes (Bray, 2009) many of the critical criteria impact multiple indicators. Such as, the second criteria identifies that the volume of the area is a large influence, this had an impact on the amount of **Materials, Energy use, Water, Biodiversity, Emissions** and **Transport** (Global Reporting Initiative, 2014). Many of the environmental aspect are interacted with **Compliance** and this can define the fine line between acceptable and unacceptable which is difficult with assessments (Bray, 2009)**.** Each outcome category has different measures to identify the impact (Appendix F).

2.2.3.3 Social Criteria for Dredging and Reclamation Projects in the GRI

When looking at the critical social criteria (1 and 7 from section 2.2.2.2) they incorporate both internal and external social impact. The first concerns **Occupational Health**. The GRI indicates two indicators when assessing sustainable occupational health; life cycle assessments of health and safety and the number of incidents (Global Reporting Initiative, 2014).

In the 7th criteria the **Local Communities** were addressed. Bray (2009) identify noise as the biggest impact on the local community. Even though dredging and reclamation projects are not often happening direct in the local community, they often do impact in many more aspects than just noise. Therefore, GRI suggests to measure sustainability in the local communities on the basis of percentage of operations with local engagements and prevention and mitigation measures but also indicate the operations with significant impact on local communities (Global Reporting Initiative, 2014).

2.2.4 Summary

In this section the outcome of dredging and reclamation projects has been analysed by means of literature review of sustainability criteria. Within the TBL framework 11 critical areas have been identified with each internationally set assessment criteria to measure the sustainable output of a dredging and reclamation project.

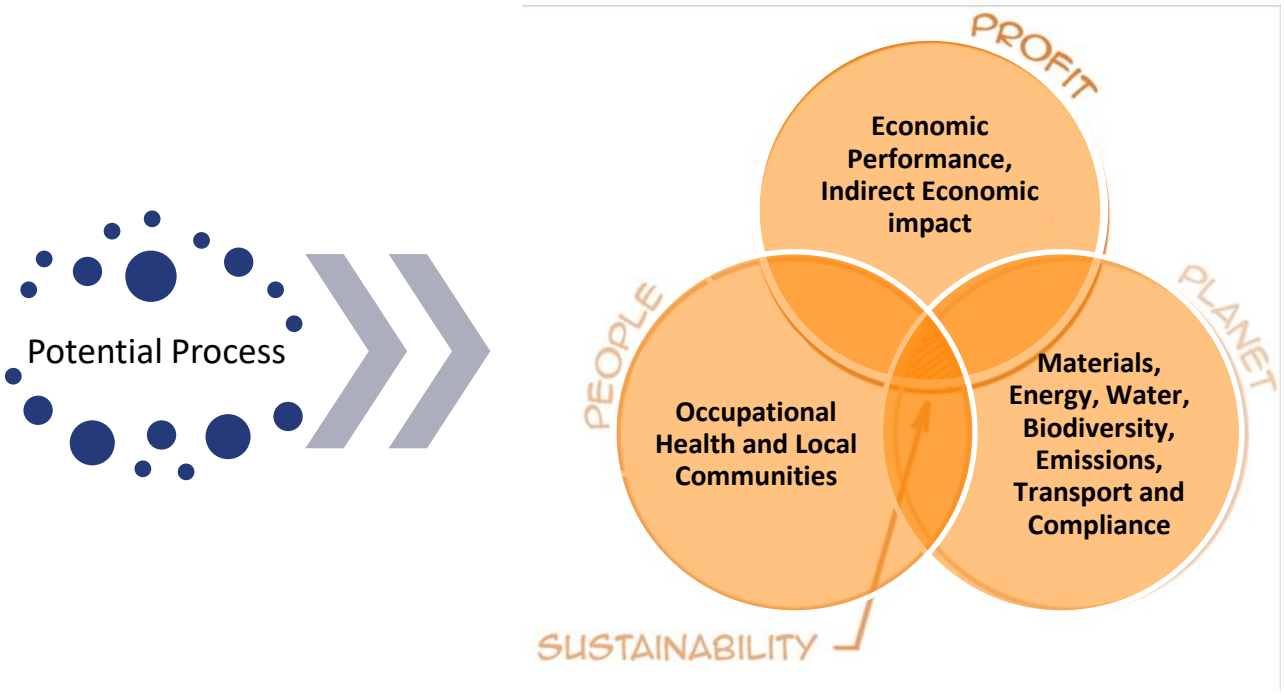


Figure 12 - Critical Sustainability Criteria of Dredging and Reclamation Projects Outcome – Own illustration adopted from ("Sustainability Cartoons - Sustainability Illustrated," 2014)

2.3 Sustainable Project Process

Literature identifies two outcomes of a project; the project product (final design) and the project process (final construction project) (Bray, 2009; Kivilä et al., 2017). To achieve a sustainable outcome on both aspects of a project, a process is needed to fulfil this. A process is "a set of interrelated activities"(International Organization for Standardization, 2012, p. 14). There are three general types of processes used in projects (Carboni, 2016):

1. Project management process, this entails the management of the projects selected activities
2. Delivery process, this is not unique to project management, but focusses on the project deliverables and the supporting product and services
3. Support process, also not unique to project management as it supports project management with other disciplines such as finance, safety and logistics

The project management process has several process groups or phases it goes through during a project. ISO21500 (2012) set up 5 phases that are initiating, planning, implementing, controlling, and closing. The activities in these project groups can be filled in in many ways. ISO21500 (2012) identifies the following subject groups in all the phases; integration, stakeholder, scope, resource, time, cost, risk, quality, procurement and communication. These are indications of a general standard of process groups however other methods have also been developed that incorporate sustainability in the project management process. Broadly accepted methods include but are not limited to the following three:

- **Green Project Management, Projects integrating Sustainable Methods (GPM PRiSM) and P5** (Carboni, 2016)
  The PRiSM method has made four adjustments to the list of subject groups. The most important changes are the identification that alongside risks there are also possibilities and adding the subject impact to the list. These subjects are translated into four process groups: subject groups, sustainability orientation, organizational focus and finally the outcome. These process groups are based on the P5 standard of sustainability. In 2014 Carboni introduces the P5 standard (in 2016 updates the P5 standard). This is a method that builds on the TBL by integrating the two subparts of projects. The exciting three dimensions (People, Planet and Profit) are used and the P5 standard adds context by linking it to two more: Project and Process (Carboni, 2014). The dimensions are used to assess a project during execution (with TBL and environmental impact assessment) and act accordingly through the sustainability management plan (SMP). The SMP is a separate plan that is developed and managed along the regular project management (Silvius, Neuvonen, et al., 2017).
- **Sustainability in Project Management (SPM)** (Silvius & Schipper, 2010)
  Another method that is addressed in literature is SPM. It suggests a more integrated approach, where the sustainability aspects arise in regular project management itself (Silvius, Neuvonen, et al., 2017). The SPM approaches the regular project management but now with consideration of the TBL, life cycle perspective and managing of and for stakeholders (Silvius & Schipper, 2010).
- **Project Sustainability Management Guidelines (PSMG)** (International Federation of Consulting Engineers, 2004)
  The IFCE introduced the Project Sustainability Management guidelines approach back in 2004 but is still relevant in current literature with an updated version in 2013. PSMG aims at a separate project sustainability 'logbook' to support decisions in project management. There are several stages in this project sustainability management process. First is *establishing* the objectives and indicators of sustainable development then *adjust* these to local context, *test* and redefine them and finally *use* the goals during all phases of a project (International Federation of Consulting Engineers, 2004).

These three methods are an indication of methods that go beyond the general process but also focus on sustainability. Although all have a common goal there are several differences between the methods. GPM

PRiSM and PSMG both make use of a separate plan that runs along the usual practices. The SPM is an example of a more integrated approach that focusses on the general project management that incorporates the TBL aspects.

2.3.1 List of Factors Sustainable Project Process

Combining sustainability and project management is an emerging field of knowledge and in recent years new tools have been developed (Silvius, Kampinga, et al., 2017). During these studies factors arise that are needed to create a sustainable outcome. These factors can also be seen as recognitions points within project management that contribute to sustainability in the project. Several studies have been done in the past year that review the exciting literature on these factors and identify the most common factors (Table 3).

Table 3 - Literature review 2017-2018 identifying critical factors of sustainability in project management

	The Six Principles of Sustainable Change Delivery (Carboni, 2016)	**Critical success factors (CSFs) for integration of sustainability into project management** (Banihashemi, Hosseini, Golizadeh, & Sankaran, 2017)	**Aspects of Sustainability in Project Management** (Mauro L. Martens & Carvalho, 2017)	**Aspects taken into account by project managers** (Silvius, Kampinga, et al., 2017)	**Sustainability strategies** (Aarseth, Ahola, Aaltonen, Økland, & Andersen, 2017)	**Critical parameter for sustainable project management** (Chawla, Chanda, Angra, & Chawla, 2018)	**Factors for sustainability in projects in Iran** (Hosseini et al., 2018)
Ability to deal with complexity					X		
Commitment towards sustainability	X	X			X		X
Creating accountability	X	X		X	X		X
Economics and competitive advantage	X		X	X		X	
Environmental and social considerations	X	X	X	X	X	X	X
Knowledge and Awareness	X	X		X	X		X
Local and Global Orientation	X	X		X	X	X	
Project managers experience				X	X		X
Quality management				X			
Stakeholder Management (Participation)		X	X	X	X	X	
Transparency	X			X		X	

The comparison shows that for a project to be sustainable all literature reviews indicate that the **environmental and social, alongside economic**, considerations need to be taken into account. Aside from the TBL considerations there are also other main factors that needs to be present. Literature focusses on **stakeholder engagement** and much relies on **knowledge, awareness and accountability of actions**.

These factors are used in the research as a guideline to know what to look for. Since this is the goal, the most comprehensive list will also be considered. Banihashemi et al. (2017) identified initial 332 factors in recent literature and then selected 56 factors on the basis of the following three criteria; “Applicability to developing

countries, applicability to TBL of sustainability and relevance to project management practices." (Banihashemi et al., 2017, p. 1105). The 56 indicators identify a broad spectrum of factors within project management (Appendix B).

2.3.2 Relevant Factors for Context

Section 2.2 introduced the two general types of interrelated project outcome (project product and project process). During the context of a dredging and reclamation project several pressures influence these two outcomes. These pressures are being managed during the process of a project to have a desired outcome on different areas of a project. Figure 13 shows that Bray (2009) identified risks that influence the project.

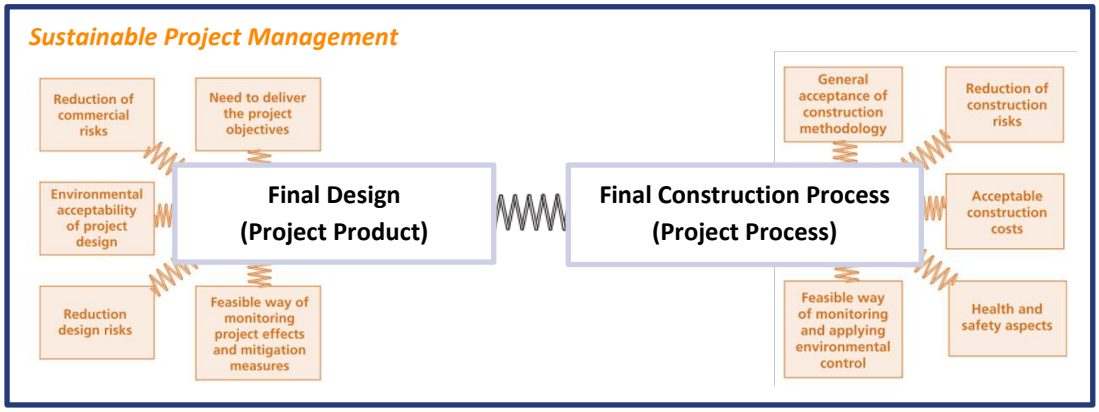


Figure 13 - Sustainable Project Outcome of Projects and the Pressures - (Bray, 2009; Kivilä et al., 2017)

However in the revised version almost 10 years later the dredging sector has adjusted its goals and identifies these risks also as opportunities (van Koningsveld et al., 2018). Initiatives such as Ecoshape, building with nature are emerging. Through **proactive design and project management**, initiatives such as the Sand Motor (Appendix C) use the environmental risks as an opportunity. This is becoming an important factor in hydraulic engineering projects (van Koningsveld et al., 2018). This approach introduces the contractor involvement earlier in the process and this should not be the only stakeholder that needs to be involved broader and earlier in the process. Stakeholder engagement was identified as an important general factor by almost all the reviews in 2.3.1. **Earlier and broad involvement of stakeholders** is also a very important factor in dredging and reclamation projects (van Koningsveld et al., 2018). Due to the large changes and delicate environment dredging project operate in there is much attention payed to monitoring and mitigation effects (Bray, 2009; van Koningsveld et al., 2018; Wasim & Nine, 2017). Monitoring and mitigation actions take place during a project process and ask for more **adaptive management** (van Koningsveld et al., 2018).

The simplified process of dredging and reclamation projects indicate that the environmental objectives are integrated in the general project management plan of a project. Previous model of dredging and land reclamation project management process have sustainability as a separate plan (such as a SMP or sustainability logbook) that runs alongside project management (Appendix D) (Bray, 2009). If the context of a project does not explicitly contain sustainability then the separated approach could be beneficial (Silvius, Neuvonen, et al., 2017). In dredging and reclamation projects one could argue that it operates in a delicate environment however not all the perspectives are focussed on sustainability and thus, the model of Bray has a separate approach, but the revised method integrates it in the regular project management.

2.3.3 Underlying Signals to Capture Process

The identification of sustainability in project management can be done by means of assessments. As sustainability is becoming more integrated in project management a new field emerges on how the project manager can assess a projects impact during and after a project (Silvius, Neuvonen, et al., 2017). This is needed because even though new initiatives on integrating sustainability in project management emerge, this does not always produce sustainable results. During a process a project manager uses assessments such as the

EIA, to assess the impact of a project. These can be used for decision making during the project management process and later to measure how a project manager fulfilled its objectives.

Instrument	**Sustainability criteria for projects** (Silvius, 2010; Silvius et al., 2012)	**Maturity model for the integration of sustainability in projects and project management** (Silvius and Schipper, 2010)	**Sustainable Footprint Methodology** (Oehlmann, 2011)	**P5 Standard for Sustainability in Project Management Version 1** (GPM Global, 2013)	**Project Sustainability Logbook (PSL)** (FIDIC, 2013)	**Sustainable Project Management Maturity Model (SPM3)** (Silvius and Schipper, 2015)	**P5 Standard for Sustainability in Project Management Version 1.5.1** (GPM Global, 2016)	**Project Sustainability Excellence Model (PSEM)** (Szabo, 2016)	**Project Sustainability Impact Assessment (PSIA)** (Tam, 2017)
Sustainability criteria	3 perspectives, operationalized in 11 indicators with 36 variables	3 perspectives, operationalized in 11 indicators with 36 variables	3 perspectives, operationalized in 48 variables	5 perspectives, operationalized in 11 indicators with 46 variables	4 domains, operationalized in 14 themes with 63 variables	3 perspectives, operationalized in 22 indicators with 77 potentially relevant variables	5 perspectives, operationalized in 11 indicators with 43 variables	3 perspectives, operationalized in 57 indicators with 143 potentially relevant variables	3 perspectives, operationalized in multiple potentially relevant variables
Derived from	- GRI G3	- List of sustainability criteria as published by Silvius, 2010	- GRI G3 - Life Cycle Assessment (LCA) - UN Commission on Sustainable Development - WWF Principles for Sustainability - Sweden's Environmental Objectives	- List of sustainability criteria as published by Silvius, 2010	- GRI G3 - Life Cycle Assessment (LCA) - CEEQUEL, BREAM, LEED	- Several sustainability indicators frameworks and studies - Several stages of sustainability frameworks	- Several UN standards - List of sustainability criteria as published by Silvius, 2010	- IPMA Project Excellence Model - GPM P5 standard	unclear
Conceptual foundation	- Triple Bottom Line (Elkington, 1997)	- Triple Bottom Line (Elkington, 1997) - Interacting project, asset and product lifecycles (Labuschagne and Brent, 2005)	- Triple Bottom Line (Elkington, 1997) - Interacting project, asset and product lifecycles (Labuschagne and Brent, 2005)	- Triple Bottom Line (Elkington, 1997) - Interacting project, asset and product lifecycles (Labuschagne and Brent, 2005)	- Triple Bottom Line (Elkington, 1997) - Project life cycle	- Triple Bottom Line (Elkington, 1997) - Interacting project, asset and product lifecycles (Labuschagne and Brent, 2005)	- Triple Bottom Line (Elkington, 1997) - Interacting project, asset and product lifecycles (Labuschagne and Brent, 2005)	- EFQM quality management model - Triple Bottom Line (Elkington, 1997)	- Triple Bottom Line (Elkington, 1997) - Project life cycle (Association of Project Management, 2006)
Nature	Checklist	Maturity model	Assessment model	Assessment model	Prioritizing model	Maturity model	Assessment model	Assessment model	Assessment model
Scale	n/a	4 level scale	5 point ordinal scale	7 point ordinal scale	3 point ordinal scale	4 level ordinal scale	7 point ordinal scale	5 point ordinal scale	5 point ordinal scale
Unit of analysis	- Project	- Project	- Project	- Project process - Project product	- Project process - Project product	- Project process - Project product	- Project process - Project product	- Project process - Project product	- Project
Assessment	Self-assessment or independent assessment	Self-assessment or independent assessment	Self-assessment or independent assessment	Self-assessment or independent assessment	Self-assessment or independent assessment	Self-assessment or independent assessment	Self-assessment or independent assessment	Self-assessment or independent assessment	Self-assessment or independent assessment
Applicca-bility	Generic	Generic	Generic	Generic	Generic	Customizable to context	Generic	Generic	Customizable to context

Figure 14 - Recent project sustainability impact analysis tools in project management - (Silvius, Neuvonen, et al., 2017)

Figure 14 show current best known approaches that are being used when assessing sustainability in project management (Silvius, Neuvonen, et al., 2017). Almost all the tools use the TBL perspective as the conceptual foundation. As mentioned before a project has a product impact and an impact during process. From the 9 methods (in figure 14), five consider the two aspects of project and process as a unit of analysis (orange in figure 14). The P5 method considers the process however does not look at underlying signals of this process. Both the PSL and the SPM3 use methods (prioritizing and maturity of sustainability in general) that are not useful when looking for underlying signals. The only common known method that does do this is the PSEM method (blue in figure 14). It specifically also measures the process by building onto the P5 method. PSEM (Appendix E) brings forward underlying signals of sustainability in the project management process. These signals are **focussed on leadership, people and resources** within a project management process.

2.3.4 Summary

During the sustainable project management process literature review identified multiple general factors that are needed for a project to have a sustainable outcome. These are general factors that can be found across all sectors. When reviewing factors in the marine building sector and specific dredging and reclamation then three new factors arise; proactive design, early and broad stakeholder involvement and adaptive management.

These factors should occur in a project management process that aims at a sustainable outcome. Underlying signals that can bring this forward are sustainability assessments during the process but also leadership, people and resources.

2.4 Conclusion

In this chapter literature research was conducted to bring forward sustainable project outcome criteria and sustainable project process factors. To do this the first search was the definition of sustainability and sustainable development. Elkington's TBL definition has been used in literature extensively to determine the sustainability of a project outcome. This brings forward the balance between the economic, environmental and social aspects of a project. The TBL has been used to determine sustainability outcome criteria in general. A list of criteria was set up, and continuously updated, by the GRI to assess the sustainability of a project and companies from all kinds of sectors use the criteria (2.3.1). From these models, a list of eleven relevant criteria has been formulated in section 2.2.2 for dredging and reclamation projects. Section 2.2.3 described the accompanied underlying signals.

To complete a sustainable project several factors, need to be present in the project management process. The literature research in 2.3 explored many different factors from multiple literature review papers in the past year. Thirteen relevant potential factors were identified in combination with project management of dredging literature. These factors could be present in the process of the case study however there are also underlying signals to capture this in a project process in section 2.3.3

When bringing together the literature research of sections 2.1, 2.2 and 2.3 a conceptual framework for sustainable outcome and process in dredging context can be formed (figure 15).

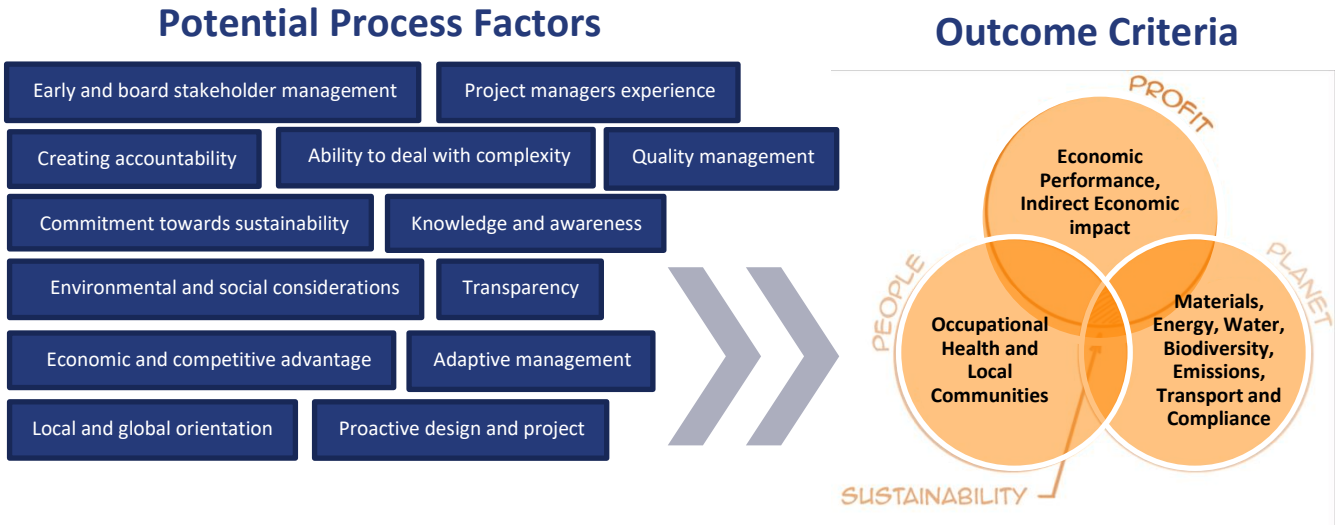


Figure 15 - Potential Process Factors and Outcome Criteria - (own illustration)

3

Methodology Case Study: Sustainable Outcome and Process Identification

This chapter brings forward a strategy for collecting the data of the research. By first, identifying the outcome (3.2) and process (3.2) research approach. Then, the case study approach (3.3), analysis (3.4) and finally the validation approach of the research (3.5).

3.1 Outcome Research

Realistic review focuses on explaining the relationship between the context in which an intervention is applied and the outcome it produces (Pawson et al., 2005). Therefore, the first step when addressing sustainability in project management in this research is to assess the outcome. This is done along the sustainability criteria set for the context of dredging and reclamation projects in 2.2.2. Each of the criteria have underlying signals that can be measured. These measures (in 2.2.3) vary from topic and method of measuring. This research focusses on sustainability in project management and therefore, when measuring sustainability outcome, it is more important that this was done deliberate instead of benchmarking to what degree the actual impact was.

The set underlying signals to capture project outcome from 2.2.3 are used to identify the outcome of a project in terms of commitment to sustainability. To the list of signals a new column has been added in Appendix F that is used for the case study research (table 4 shows a fragment of the list). This fragment of the complete list illustrates that when for instance looking at Energy the first GRI measures are the direct and indirect energy consumptions. However, knowing the amount of consumption does not give relevant information for this research. The more interesting are the third and fourth measures that look at initiatives. These indicate if there were actions taken to bring forward renewable energy sources, more energy efficient practices or to reduce the energy consumption. The case study research looks for these initiatives.

Table 4 – Fragment of the Case Study Outcome Signals Appendix F (adaptation from (Global Reporting Initiative, 2014))

TBL Dimension (Global Reporting Initiative, 2014)	**GRI Criteria** (Global Reporting Initiative, 2014)	**GRI Measure** (Global Reporting Initiative, 2014)	**Case Study**
Environmental	Energy	Direct energy consumption by primary energy source.	Initiatives to provide energy-efficient or renewable energy and reduce indirect energy consumption and reductions achieved.
		Indirect energy consumption by primary source.	
		Energy saved due to conservation and efficiency improvements.	
		Initiatives to provide energy-efficient or renewable energy-based products and services, and reductions in energy requirements as a result of these initiatives.	
		Initiatives to reduce indirect energy consumption and reductions achieved.	

3.2 Process Research

There are two types of process research. The first starts with collecting variables and then finding what end result these variables cause. The second, looks at an outcome and then works from there to identify the process that leads to this outcome (outcome driven) (van de Ven, 2007). This research follows the second method. After the outcome has been identified according to the method introduced in 3.1, the next step is to identify the process. For this the factors in 2.3 and the underlying signals from 2.3.3. can be used to indicate what to research.

A process study can have many different ways of researching. Therefore, Van der Ven (2007) formulated a table of decisions about key issues to make when starting a process study. For the process research used in this master thesis, table 5 indicates the decisions of the process approach.

Table 5 - Process Research Approach

Issue (van de Ven, 2007)	**Decisions** (van de Ven, 2007)	**Master Thesis Approach**	**Explanation Approach**
1. Meaning of Process	A category of concepts or a developmental sequence?	Developmental sequence	The aim of the research is to gain a deeper understanding of the project management process and therefore the developmental sequence and not a category of concepts are used
2. Theories of Process	Examine one or more models?	Multiple	The literature review has taken in consideration multiple models. The research is explorative therefore, multiple process theories could be identified.
3. Reflexivity	Whose viewpoint is featured	Multiple, the contractor is the main viewpoint	The main objective it to gain knowledge in the process so this is from multiple perspectives. However, the project management is often a role executed by the contractor.
4. Mode of inquiry	Deductive, inductive or reproductive?	Retroductive	This is in line with the intended research of a proposed explanation to account for a unusual observed fact. It entails working back from effect to cause.
5. Observational method	Real-time or Historical Observation?	Historical observation	The research is realistic review. Therefore, look back at a situation that has already happened.
6. Source of change	Age, cohort or transient sources?	Diachronic	The research question is in line with a diachronic approach as it aims to research how the process has developed and evolved through time.
7. Sample diversity	Homogeneous or heterogeneous?	Homogeneous	The focus is on dredging and reclamation projects thus, focus on one sector.
8. Sample size	Number of events and cases?	Single	The added value of the research is conducting an in-depth research and focus on a single case study
9. Process research designs	What data analysis methods to use?	Explorative, outcome driven	With a single case study an explorative approach can bring many different aspects to light

Aside from the decisions in table 5 to bring forward the process, qualitative research methods are used (Bryman, 2016). When a process is happening in real time than participant observation could be used. However when, such as with this research, the observational method is historical observation then retrospective interviewing and the construction of the process through examination of documents are needed (Bryman, 2016).

With quantitative research there is a desire for a certain number of participants and data to have a good representativeness of participants to generalise. This is more difficult for qualitative research (Bryman, 2016) as the goal of the research is to formulate in-depth the process that took place. However, if no new information is obtained through data and participants then the research is complete. Each interview and document that contains new information is a new puzzle-piece to the process puzzle. To determine when the puzzle is complete is difficult. Making the decision when to stop is based on the saturation-point (Pawson et al., 2005). The saturation-point is when there is enough data to ensure the research questions can be answered. To determine this an iterative process was done that continues throughout the retrieving of data and the analysis.

3.3 Case Study Research

3.3.1 Case Study Selection

Section 1.7.1 indicated that the research is a single case study. This decision is based on several considerations that should be reflected in the selected case. The most important consideration is how much new information the case brings. The case should bring a new perspective and insights to better the understanding of the exploring subject (Verschuren & Doorewaard, 2010). The case should also already have finished as the outcome is assessed but not be too long ago because it needs to be relevant anno 2018.

In the dredging and reclamation context there was one specific project in the past year that arose for further research. Within the large marine company, Van Oord, the project is seen as an approach that integrates the sustainable corporate strategy. Also, outside of the company this specific project had received recognition from the sector. It was awarded in the 'Dredging and Port Construction Awards 2017' for its integration of sustainability and innovation. Both the internal and external recognition make this project a suitable project for research as it is valuable to look back at what made this project successful. The different approach from regular project management practices provides much new information and a unique perspective which are requirements for a single case study.

Three Islands Reclamation Project Maldives

The project referred to above is a land reclamation project in the Maldives. In 2015 the Maldives Ministry of Housing and Infrastructure (MMHI) was seeking to enlarge islands and protecting them with rock revetments. The Maldives is a collection of about 1200 small island in the Indian Ocean southwest of India and Sri Lanka. Of all these islands only 196 are inhabited and of the approximately 350,000 inhabitants one third live in the capital Male. The capital Male is increasing rapidly however, there is not enough space for this growth. To accommodate the growth and better connect all the island to facilities, MMHI initially set out to enlarge 15 islands. The development of priority islands is intended to become urban centres and increase the standard of living. As part of this plan MMHI set a tender for the enlargement of three islands and later added Male to the contract. The project consisted of three very remote project locations (the islands Feydhoo, Thinadhoo and Himmafushi) and one less remote location in the Male Industrial Village.

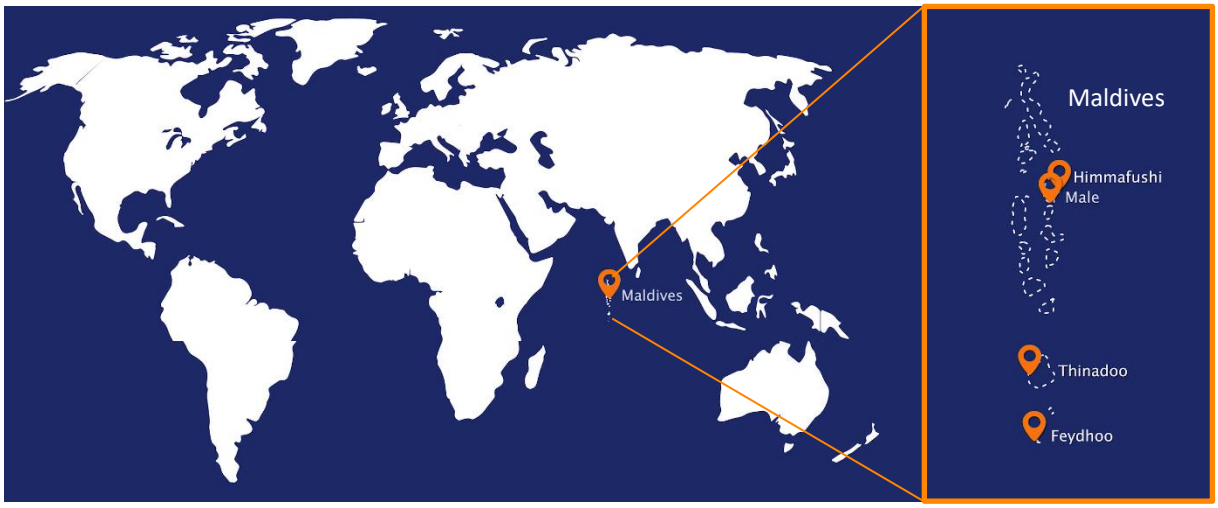


Figure 16 - Project Area's from top to bottom: Himmafushi, Male Industrial Village, Thinadhoo and Feydhoo – modified from: (Van Oord, 2017b)

The client of the Maldives project was the MMHI and the main contractor (the Dutch based) Van Oord. There was also a subcontractor involved for the civil works named Sierra Construction Private Limited from Sri Lanka. The tender date of the project was August 2015 and the contract was awarded to Van Oord in November 2015. The commencement date of the contract was January 2016 and the contractual completion was March 2017 (duration one year and two months).

Figure 17 shows the 4 project sites. The picture on the left was obtained from Google Earth prior to the project and the picture on the right was taken by an aerial drone after completion of the project

Himmafushi

Male

Thinadhoo

Feydhoo

Figure 17 – Areal images of the four project site before (left) and after project completion (right) – (Van Oord, 2017a)

3.3.2 Qualitative interview

Qualitative interviews aim at bringing forward the complete information which is in line with the process research intention. The qualitative method gives the interviewer the opportunity to get in-depth information (Bryman, 2016). There are several techniques that can be used when interviewing. This can range from structed to semi-structed and open interview. For qualitative research semi-structured and open question are often used (Bryman, 2016; Verschuren & Doorewaard, 2010).

3.3.2.1 Interview Protocol

To introduce the research to the interviewee, the interview protocol starts with an introduction of the interviewer. Then explaining the motivation, aim and structure of the interview and finally raise the issue of confidentiality of the interview and research. Also, the participants were asked if they object to the recording of the interview. The interviews were all recorded for transcription afterwards. To create a setting for participants to speak as freely as possible there was the option for the interview to be in Dutch. When transcribing the interview, it was then also translated to English.

The first section of the interview protocol consisted of semi-structured questions. It was used to obtain preliminary information from the interviewee but also to obtain information of the general process of the Maldives project.

The second section focusses on sustainability in the project. First, assessing the sustainability criteria. This is done by showing the list of criteria (explaining them) and then the interviewee indicated which criteria had initiatives contributing to a positive impact. Second, indicate if they were involved in this process and finally address if in their opinion the outcome was sustainable. As next step, the process of the criteria was explored with a narrative question. This entails that the question is a set up for the interviewee to tell their own story of the process with not much incentive from the interviewer (Bryman, 2016).

The final section consists of semi-structured questions. The main goal of this section is to bring forward the underlying signals in the process that were addressed in section 2.3.3.

The research is done on an exploratory basis. This means that the suggested factors in section 2.3 are there as a guideline and reference of the analysis but not used directly towards the participants. The underlying issues such as leadership, people and resources were directly used in the protocol.

3.3.2.2 Participant Selection

The participants of the interviews were all in one way or another involved in the case study project. Most of the participants worked for the contractor Van Oord as this is where most of the process took place. To identify the participants the project structure was used. The first contact was with the project manager who identified people to possibly interview. This was used as the starting point and during contact with other interviewees new suggestions for participants were addressed. After initial contact with the PM several interviews were set up (table 6).

Table 6 - Interview Participants

#	Company	Function in company	Role in Maldives project	Date interview
1	Van Oord	Project and structured finance officer, Corporate Treasury	Responsible for credit insurance and potential funding of project	26/06/2018
2	Van Oord	Engineer, EE Engineering projects	Environmental Engineer	29/06/2018
3	Van Oord	Engineer, EE Environmental Engineering	Environmental Engineer, rotating with other, 1 island present	2/07/2018
4	Van Oord	Area Manager MEAA Area South West Asia	Area manager, Bringing in the project	3/07/2018
5	Van Oord	Engineering Specialist, EE Environmental Engineering	Environmental advice	5/07/2018
6	Atradius	Senior Environmental & Social Advisor	Responsible for credit insurance	17/07/2018
7	Van Oord	Project manager, PROF Dredging Pool	Project manager	18/07/2018
8	Gili Lankanfushi resort	Marine biologist / Environmental officer	Environmental expert	14/08/2018

3.3.3 Resources

The most important consideration with the data collection of a single case study is triangulation. When using just one case it is important to eliminate chance and verify information through different sources (Yin, 2006). Due to the large amounts of documents that arise during these dredging and reclamation projects, the data gathering approach occurred in two stages. The first, initial stage provided information from documents received from the project manager. Then, gradually new documents were gathered through different participants. As previously discussed, there was a need to find documents from a third party. For the triangulation of information several resources were obtained from Van Oord and other parties involved in the project. Obtained from different parties a total of fourteen supporting documents was used for the research (table 7).

Table 7 - Supporting Documents for Research

	Document	Obtained From	Obtained Date	Date created
A	**00. Final report 34.3295 rev. 2**	PM, Van Oord	23/4/2018	30/11/2016 revised June 2017
B	**Maldives C&M Input for DPC award**	PM, Van Oord	23/4/2018	June 2017
C	**Taking over certificate client**	PM, Van Oord	23/4/2018	07 February 2017
D	**Recommendation letter NGO**	PM, Van Oord	23/4/2018	02 January 2017
E	**Stage gate 6 presentation**	PM, Van Oord	23/4/2018	June 2017
F	**Coral relocation report**	PM, Van Oord	23/4/2018	20 June 2016
G	**Project Preparation Meeting (PPM)**	PM, Van Oord	23/4/2018	07 December 2015
H	**Dredging Questionnaire Atradius**	Finance, Van Oord	17/7/2018	November 2016
I	**Final EIA Feydhoo**	Environmental Protection Agency	17/7/2018	May 2015
J	**EIA Male**	Environmental Protection Agency	17/7/2018	October 2015
K	**EIA Thinandoo**	Environmental Protection Agency	17/7/2018	December 2015
L	**Final environmental report**	Edocs, Van Oord	17/7/2018	01 September 2016
M	**Environmental management plan**	Edocs, Van Oord	17/7/2018	02 February 2016
N	**Process of MVO brochure**	Atradius	19/7/2018	-
O	**Sustainability report 2016**	Atradius	19/7/2018	June 2017

The documents and interviews were created in different times during the project. Thus, providing new insights or supporting each other. Most reflect on the whole project, however some also give information on only part of the project or indicate requirements that were set before the start of the project.

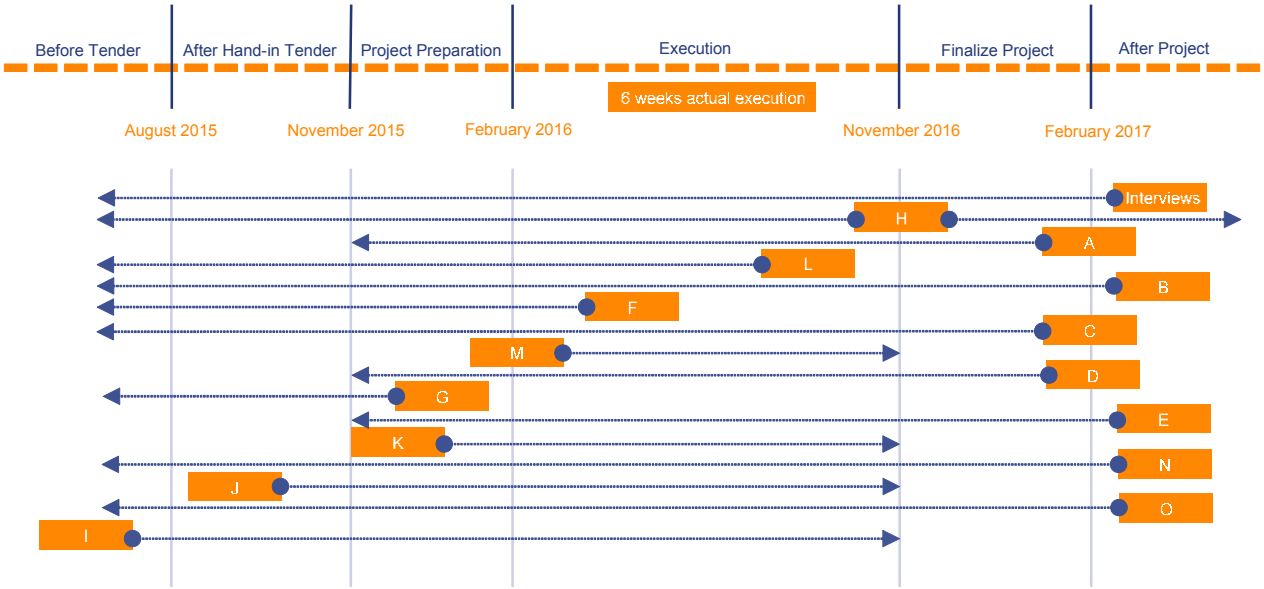


Figure 18 - Supporting documents set in Project TimeLine – *(own Illustration)*

The selection of interviewees is based on having information on the whole process. The documents and interviews combined cover the entire timeline of the project and multiple perspectives. This includes the area manager who initiated the project but also for instance the rotating environmental engineer and the local environmental expert who contributed with the coral relocation but initially protested the project.

3.4 Case Study Analysis

The analysis of the many events obtained has been done in multiple steps. First, a list of events is created (3.4.1) that could be compared (3.4.2) to make a visual representation of the process (3.4.3). Finally, The visual representation is used to identify factors in the process (3.4.4).

3.4.1 List of Events

During the interviews the process of the Maldives project was elaborated on by the interviewees. This was done on the previously introduced exploratory basis. Therefore, each interview brought forward the events that they deemed important (or remembered without the help or knowledge of the interviewer or other participants answers). All the events addressed in the interviews were put into one list. A complete list of just over 100 events was made with all the events that occurred during the project in relation to the sustainability outcome criteria from the interviewees perspective. Then 27 events were added from the documents that also reflected on events during the Maldives project in relation to the sustainability outcome criteria. The complete list is indicated in Appendix H.

The list consists of multiple columns. The first column numbering the events and the second identifying the number of the interview and the sub number of the event. The following columns categorised the project outcome criteria according to table 8 and the process stage as in figure 18. The final two columns consist of the text from the interviewer or document describing the event and the last containing a tag to identify the topic of the event.

Table 8 - Fragment of the List of Events in Appendix H

Event number	Number interview / document		Outcome	Process stage	Events	Tags
123	L	5	Biodiversity	Project Preparation	*After the last bleach check it was decided that the surviving corals showing acceptable health condition should be relocated. From the 27th of May 2016 only the surviving and healthy corals were relocated in a multiple day event. Many of the corals have been adopted into the coral rehabilitation program of the Gili-Lankanfushi resort.*	Coral

The list consists of 127 events that are divided into 5 outcome criteria with each tag categories. With the tags the list of events can be filtered and thus creating groups that are involved in a process but also show overlap between the different outcome criteria.

3.4.2 Comparison of Events

The second step in the analysis of the results is to indicate the overlap of events in the list. The list consists of all the events that were discussed by interviewees and documents. This results in a high chance of overlap due to the discussion of the same events. To analyse this the events are grouped per tag and compared to each other to indicate if there is overlap and no new information is given.

This systematic event comparison was done with a comparison matrix per tag to make sure none were missed (Appendix I). The method eliminated 29 events that indicated the exact same information about an event. If there were events that were similar but not exactly the same than it would be left in the list as it does bring in new information about the process. The events that gave a new insight or perspective were kept in the tables. This is to give a complete at possible description of the process.

The next step is comparing the events in time and setting an order to see what followed what event. This also had much to do with the description of events. In the same matrix in Appendix I an initial order of events was given. Although, given an initial order many events are not a consecutive series but are more an interaction between each other.

3.4.3 Visual Mapping of Case Study Project Process

The list of events has been put into groups per outcome (Appendix H & I) but needed to be placed in time. The large quantities of information and simultaneous occurrence of multiple events is difficult to represent. Thus, a visual representation is used (van de Ven, 2007). From the 5 outcome criteria the events have been set in a timeline indicating how they evolve over time (visual mapping of events). Each sustainable outcome has its own storyline however they are intertwined with each other and as brought forward by Elkington (1998) the power of the TBL is in finding the balance in the centre of the TBL. Therefore, the separate timelines are also brought together to show where the different outcome events are intertwined. The overlap is indicated with a black dotted line.

3.4.4 Factor Identification

The factors that are described in literature (section 2.3.2), were compared to the case study process and identified where they occurred. This was done by the researcher but validated with 5 other project managers. By knowing what factors occur in the process finding and conclusions can be drawn from the complex process.

3.5 Validation

Validation of the research raises the soundness of the methods and results. There are two types of validity. These are internal and external validity (Verschuren & Doorewaard, 2010). The internal refers to the method that was used and how the execution of the research is done without errors. First, section 3.5.1 will elaborate on this, as it demonstrates the validity of the data retrieved in the case study. Then, section 3.5.2 will indicate the approach for construct validity and external validity.

3.5.1 Case Study Data Validation

The data collection in the case study is done through interviews and documents. When using qualitative research methods such as interviews and a case study to collect data there is pressure on the validity of the data collection (Verschuren & Doorewaard, 2010). This can be minimised by several considerations in the research method such as strategic sampling, interview style and triangulation of information.

Which case study the research used is a very important decision. The choice for the Maldives project was based on its award-winning status and because the practices were different than other projects. Indicating that also sector wide the project is acknowledged as a new and favourable approach of a project.

The interviews were conducted with different participants who were all involved in the case study project and each brought a new perspective to the table. This was either a difference in the phase they were involved in the project or what party they belonged to. With this variation of interviewees, the data collection represents the whole picture of the project. This includes the whole life cycle but also refrain from having a one-sided story.

During the interviews the participants were introduced to a list of outcomes and then asked for each of the outcomes to indicate if initiatives were present in the project. For the validity of the research only outcome that more than half of the participants acknowledged were considered. This resulted in five outcome criteria with four out of the five selected outcomes were identified by 88-100% of the participants.

The interviews were completed face to face and recorded (except for one who was in the Maldives). Based on the recordings they were typed to get on paper (almost) exactly what the participants answered. This was then

communicated back to the interviewee for them to check if it was indeed what they thought but also to remove sensitive information if requested by the interviewees. The revised text was used directly as text for the events list. To complete the list of events, the documents were used for the triangulation of sources (Yin, 2006). All the discussed actions in the documents referring to the five outcome criteria were added to the list. The process of eliminating double events was done based on only deleting an event in the list if they were exactly the same. This comparison was done with the help of tables. The decision to keep different perspectives of the interviewees was to give the timeline a complete as possible overview.

3.5.2 Construct of Factors and Transferability of the Results

The validity of the data that was obtained is described in the previous chapter (3.5.2). However, for the validation of the construct of factors and the transferability of the results a different method it needed. The method used are validation sessions, that includes interactive identification of factors and a list of questions.

The initial step for the construct and external validation was a session with the staff manager project office. His experience and knowledge were used to define the validation approach. For the validation, the knowledge of experienced PMs is needed. The staff manager of the project office knows which project managers are available and are willing, but he also knows their previous projects and if they could contribute the aim of the research. He brought forward the PMs that participated in the validations sessions (table 9). Also, the decision to do separate sessions or one group session was discussed. Based on his expert advice and knowledge of the PMs he advised to do separate sessions. This was suggested to give all the PMs room to speak from their own experiences and keep the sessions as open as possible.

Table 9 - Participants Validation

Current Position Participant	Years of Experience as Project Manager	Most recent Project
Project Manager, Van Oord	25 years	Belle Greve Long Sea Outfall Guernsey
Manager Project Support, Van Oord	8 years	Breediep adjustments Port of Rotterdam (The Netherlands)
Project Manager, Van Oord	15 years	Container Terminal Costa Rica
Project Manager, Van Oord	29 years	Oyster traps for Windfarms
Project Manager, Van Oord	2,5 years	Offshore High Voltage Station for the Norther Windfarm (Belgian North Sea)

The validation sessions consisted of three parts using a validation protocol (Appendix K). The first focusses on obtaining general information from the participant. Then second is the questionnaire that is used to validate findings of the factors and the final part reflects on the transferability of the case study .

Construct Validation of Process Factors

The factors that are described in literature, were compared to the case study process and identified where they occurred. Van de Ven (2007) addresses the challenge with this type of matching is that they are not directly observed. The problem of construct validation is: the events (data collection) are constructed into higher-order factors (analysis) (van de Ven, 2007). To evaluate the construct validity of the identification of the factors the second part of the sessions was used.

The sessions started with explaining the whole process timeline and then going through the case study per factors. The PM received an A2 of the project process and by circling the factors they were either coloured green, red or a combination (Appendix M). The completed factor construct validation is also represented in Appendix M. Van de Ven (2007) specified that there is much added value in the participants responding to the constructs in a dialogue. Hence, during the circling of factors there was more weight put on the reasoning and additional remarks of the PMs.

External Validation - Transferability

The transferability of the results relates to the upscaling of the research thus the external validity. This was done in the validation sessions by asking questions that relate to the factors (Appendix J) and the findings of the case study (Appendix K). The PMs were asked to share their insights about the topics that arose during the research of the case study. They shared their experiences on other projects, expertise and understandings of the addressed topics.

PART III
Case Study Research

Chapter 4 - Case Study: Dredging and Reclamation Project in the Maldives

4

Case Study: Three Islands Reclamation Project Maldives

4.1 General Observations

The project was initiated from the office of Van Oord in Mumbai. After a few years of setting up the project Van Oord won the tender and started the project preparation. The first important decision was the selection of the project manager (PM). As soon as the PM was selected for the project the initiatives for a sustainable outcome arose. A main contributor in this was the allocation of an environmental engineer (EE) who would be present in the Maldives and travelled there ahead of the start of the execution phase. Although an EE is often allocated to a project for monitoring and other activities the PM stressed the importance of stakeholder engagement and this became a main focus for the EE thus contributing to the projects social aspects.

The interviews were conducted in retrospect and many addressed their contribution to a few of the sustainable outcomes. As sustainability is a popular topic, participants who contributed were very eager to talk about their experiences. The suggested interview style gave the participants the opportunity to elaborate on this and providing much information. This brought forward, that when talking about sustainability it is important to understand people's perspective in relation to sustainability in the Maldives project. Several project team members suggested that the whole team had the motivation and mindset to contribute to something good and preserve the Maldives environment. Interviewee 2 suggested a critical element of this project that contributed to this, '*When you are there you see all the waste on the streets and then you see what a country finds important and their mindset. Then you know if they think it is important if we (Van Oord) are sustainable. The people do see coral as a priority since only a short while. People have many affinities with coral which is surprising. People have affinity with the coral riff in Australia even though they have never been there but a can of coke in their backyard they don't care about*' (Environmental Engineer, 2018). Aside from people's association with coral there were also actions from the PM such as pamphlets etc that contributed to this. Many interviewees addressed that during the project initiatives to contribute to sustainability were often welcomed and easy to bring forward as they knew in the small project team who to approach for what and there was room to work and think together about issues.

4.1.1 Considerable Changes

The project in the Maldives is part of a reclamation plan for fifteen islands. Although within VO the project is considered as one project. The project is actually three separate projects that were organised to have the same tender date. After the completion of one island the client was satisfied with the progress and requested a fourth reclamation to be added to the works. This was the extension of the capital Male which was rapidly added to the project.

A reoccurring issue that was brought forward by the interviews was transport. In the Netherlands the transport routes were calculated however with little experience in the Maldives this was underestimated. The different islands (project sites) were so widely spread that shifting of personnel from the main office in Male to the project sites was misjudged. This resulted in a delay because the team members were not ready even though the equipment and ships was already mobilised. Not only moving personnel but also the ships had difficulty with the distance. The Maldives consists of many small islands that are together in atolls. For the ships to move from atoll to atoll they cross open sea and for this new insurance certificate were needed, which was not explicitly considered in the budget.

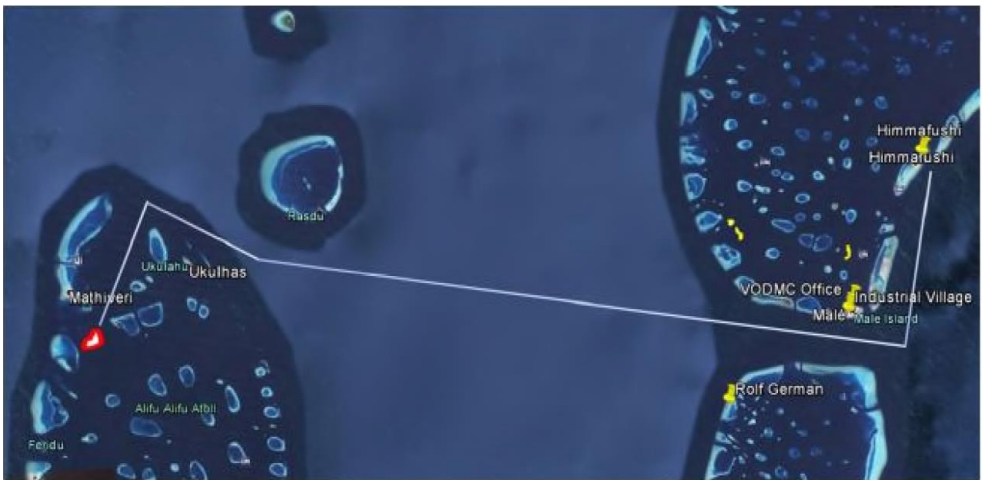


Figure 19 - Ship movement from one atoll to another – (Van Oord, 2017a)

4.2 Project Outcome

As a project is complex and many different decisions and subjects arise the events the research looks for are focussed on the previously identified sustainable project outcome criteria (3.3.4). These have been identified during the interviews and used as starting point to indicate the process.

4.2.1 Interview Results

One section of the interviews focusses on the outcome criteria of the project. The participants were asked to indicate if they knew of initiatives present in the Maldives project on certain outcome criteria. The results from the 8 interviews are represented in table 10.

Table 10 - Results Interviews Outcome Criteria Maldives Project

Outcome Criteria	1	2	3	4	5	6	7	8	Total
Economic Performance	x	x	x	x	x	x	x		7
Indirect Economic Impact	x	x	x	x	x	x	x	X	8
Materials		x	x	x			x	x	5
Energy									-
Water									-
Biodiversity	x	x	x	x	x	x	x	x	8
Emissions									-
Transport				x					1
Compliance			x			x		x	3
Occupational Health			x			x	x		3
Local Communities		x	x	x	x	x	x	x	7

These indications are used for the following questions in the interviews to support the analysis of the process. To bring forward how a process evolved there needed to be initiatives to look at. Therefore, the five topics that have more than half the participants identifying initiatives are followed. Economic performance, indirect economic impact, materials, biodiversity and local communities are all topics that have been addressed in the process of the Maldives project.

Economic Performance

Several events with consideration to the Economic Performance of the project arose. These were given two tags. One refers to the *start of the project* the motives for working in the Maldives and how the project came about. The second topic is a subject that reoccurred in many interviews and discusses the new policy of Van Oord. Since a while it set a standard to always have credit insurance with these kind of projects, resulting in several environmental and social demands from the insurance company that were incorporated in the project.

Indirect Economic Impact

A big motive for the land reclamation in the Maldives are the *island plans*. Discussed in many interviews and documents the end product of the project will contribute to the Maldives by enlarging living space and creating hubs. Also, is there indirect economic impact through the *employment of locals*. This way the project contributes temporarily to the local economy.

Materials

Although there were no materials recycled during the Maldives projects two materials were often referred to and used as tags. This is the tag *sand* relating to the turbidity of the water. A sand search was set up to find more coarse sand which would have less environmental and economic impact. Also, initiatives and awareness of the *stones* used in the project was present.

Biodiversity

Actions were undertaken to the *ships* to ensure a lower probability of harming the underwater environment in the Maldives. Also, many actions were taken to prevent harm to the *coral*.

Local Communities

Many initiatives arose to keep the *stakeholders* of the project in the loop. Brought forward from different angles these were initiatives discussed in all the interviews and documents. By doing a reclamation project that is so close to the local communities *nuisance* can occur. As many team members were aware of this several measures were taken to mitigate the consequences of the reclamation works

Figure 20 - Event outcome criteria with tags - *(own illustration)*

Although Transport, Compliance and Occupational health have risen during the interviews these have not been addressed by most of the participants or occurred in documents. The unexpected longer transport was an issue that occurred however these were not indications of initiatives to minimize the impact but more an adaptation of an unexpected situation. This adaptation to unexpected events also occurred with occupational health problems when there was a dengue outbreak amongst the workers of the subcontractor.

Energy, Water and Emissions were also outcome criteria that were not addressed by any of the participants. A possible explanation was addressed by interviewee five. During this interview a distinction was made between

the responsibilities of a project and how other departments within the company are responsible for other aspects such as ships with lower emissions or waste policies.

Aside from responding to the outcome list, the interviewees were also questioned if they felt there should be criteria added to this list. Many addressed the difficulty of defining what sustainability encompasses but agree with the list as given above. Interviewee eight who is an environmental expert responded to the list with; "It seems pretty good to me" and suggested as extra criteria general mitigation to the list actions (although considered it could be under the biodiversity outcome). Another participant addressed the issue of bribery and political issues.

4.2.2 Sustainable Project Outcome

The events are categorised in the five main outcome criteria. When looking at the number of events referred to by different documents and interviews roughly one third are actions regarding the outcome biodiversity, one third regrading local communities and one third about the other three sustainable criteria.

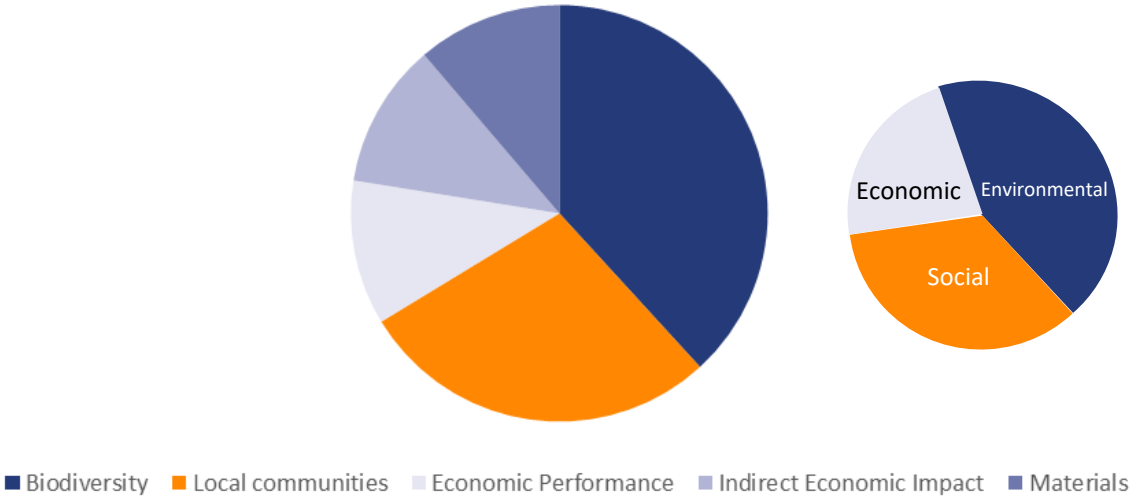


Figure 21 - Pie Chart of Distribution of Events in Different Outcome Criteria - *(own Illustration)*

When approximately categorising the events, from the five outcomes, into the TBL aspects it can be seen that all three considerations of the TBL are represented in the events. At first glance, the division of events is a balance between the TBL aspects as they are all present and almost equally divided. After the project completion there was appreciation for the approach of VO seen in letters from the client, NGO and local residents. Also, the water measurements and biodiversity count had positive outcome. Thus, the project had successfully mitigated the social and environmental impact to create a sustainable operating environment. Elkington (1998) illustrates the essence of sustainability for businesses is by measuring the impact of a company on society, the environment and the economy during their projects or processes which can be recognised in the project of VO.

4.3 Project Process

***Please see total timeline in separate fold-out page at the end of thesis report ***

The project process of the case study has many different actions and is shown in the fold-out. The different outcomes each have their own colour but are also labelled by their first letter. Each event has its own number within its outcome criteria. These numbers do not specify an order of events but give the event an indication for referral. Figure 22 shows the example of event E6. This means that the event is part of the process of the economic performance outcome. It does not say that it is the 6th event of the outcome performance.

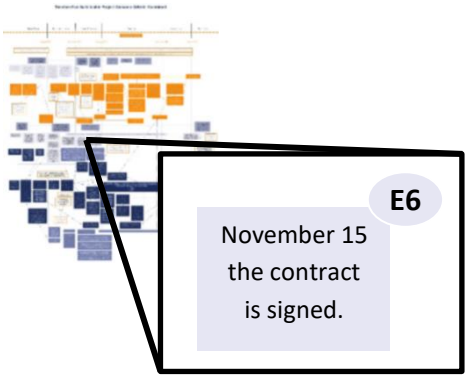


Figure 22 - Zoom in of timeline label - (own illustration)

4.3.1 Economic Performance (E)

The Maldives project was initiated by a Van Oord Area Manager in India. The Area Manager had perceived that competitors were executing projects (and earning money) in the Maldives (**E1**). The Maldives Ministry of Housing and Infrastructure (MMHI) was looking to enlarge several small islands. The enlargement of three islands was on the market but for the large ships of VO to come to the Maladies the separate projects needed to be larger (**E2**). This was discussed in multiple meetings between the Area Manager and the MMHI. During these meetings the Area Manager needed to convince the MMHI to bring together three small projects and the MMHI requested to see examples of how VO operates in environments such as the Maldives (**E3**). This was eventually partially successful as three projects were all put on the same tender date and within VO it is considered as one project.

After the tender was handed in financing discussions arose (**E4**). The Maldives currently have a large debt and The World Bank monitors if they can borrow more money. For the financing of the project the Area Manager was willing to help the MMHI (approach the Dutch State Bank, Atradius) but this was stopped by The World Bank (**E5**). However, due to the close contact between VO and MMHI a solution was found. The Minister of Economics of the Maldives wrote a letter declaring part of the budget for the upcoming year would be accounted for the three islands reclamation project. Then, a payment schedule was set up that was manageable for both VO and helped the MMHI. Finally, the contract was signed November 15, 2015 (**E6**).

Aside from the financing request, the project was already known at Atradius for the projects request for credit insurance. Since a while, the VO board has made it their policy to have credit insurance for their projects (**E7**) when working in countries such as the Maldives (**E8**). The Area Manager requested the credit insurance at VO's treasury department, through the internal digital system, when registering the project (**E9**). With the initial information of the project the treasury department makes a decision between a private insurer or the national insurer (**E10**). For a project like this the national insurer Atradius needed to be approached by the treasury department. Atradius has in the past had variating experiences on the Maldives and were willing to consider the request (**E11**). After this decision the process had to start speeding and the Environmental Engineering Department (EED) was involved because to get a credit insurance from Atradius VO needed to comply to many environmental and social requirements (**E12**). This is not usual because the EED prefers to be involved earlier and started with the focus on the monitoring of water quality and corals. This was a requirement (from the Environmental Impact Analysis), but can also be advised for a company to protect themselves from claims (**E12-B17**). The Environmental Impact Analysis (EIA) that was provided to VO, at that moment, were used to set up the Atradius demands and published by Atradius on their website (**E13**). Along this, there is a standard dredging questionnaire Atradius uses for all these types of projects to divide the projects in categories. The Maldives project was identified as a category A project, which weighs the heaviest and has the most demands from Atradius (**E14**). During this process there were also actions taken to make sure the working conditions at

the stone quarries are up to standard (**M1-3**). With several demands answered, Atradius made the decision to provide the credit insurance for the project. This was also based on the relationship Atradius and VO have because Atradius understands that not all the measures could already be in place at the start and there is trust on VO's practices (**E15**). During the whole process there was constant communication between Atradius, the EED of VO and the treasury of VO (**E17**). Also, as part of the policy Atradius is kept in the loop during the project about the progress (**E16**).

Finally, the project was completed when all the payments to VO were completed (**E18)**. However, if the financing of the project by Atradius (**E5**) would have withstand, then Atradius would have observed the project outcome on more than the financial aspect (**E18**).

4.3.2 Indirect Economic Impact (I)

The main driver for the MMHI to request the reclamation of the islands was to develop hubs on the islands that will minimize transport to the capital and alleviate the problem of congestion in the capital city Male. The purpose of the project is to also create even distribution of resources throughout the country and for regional and social development (**I7**). This goal of the project is also a large consideration for the Atradius request as the outcome of the project would contribute much to the Maldives (**I8**). Aside from this, the project also increases quality of life on the islands as it prolongs the islands durability against the ocean. With the rising sea level the resilience of the islands decreases which would be helped by the projects. Team members who joined the project (**E9**) recognised this as a big motive for doing the project and helping the Maldives. After the project was completed, the reclaimed land in Male is being built but the other three islands are not yet. The industrial area in Male was already budgeted for but for the development of the islands the MMHI had to look afterwards at a budget for development (**I10**).

To increase the positive indirect economic impact there were several attempts of VO for the inclusion of local employment in the project (**I1-6**). Initially it was incorporated in the sales pitch (before the tender) but this was stopped by the president of the Maldives. The president insisted on a focus on quality and therefore VO adjusted this in their tender bid (**I1**). The PM also took local employment into account in his considerations. When initially walking on the beach of the project site he saw the close proximity of the project site to the houses and realised how quickly damage could be done (**I2**). Figure 23 shows the close proximity of the project sites to people's houses. Also, on the left side of the picture is the high-end resort, Gili Lankanfushi, which was very concerned about the projects impact.

Figure 23 - Drone pricture of reclamation works at Himmafushi - (Van Oord, 2017a)

Due to this, the PM desired Dutch employees operating the machines in the night shifts (this is more based on experience than nationality) (**I3**).
Also, at the start of the project there was a local secretary in the project preparation team in Male (**I4**). However, due to not or irregular showing up of the secretary the PM believed less in the local communities 7 to 5 mentality (**I5**). Finally, VO did invest in local content during the project in the form of hotel accommodations etc. but also during the diving activities they used local boats, diving equipment and diving experts (**I6**). This was made possible due to the contact from the stakeholder meetings (**L4**).

4.3.3 Materials (M)

In a land reclamation project two types of materials are used most. These are stone and sand. During the Maldives project both were looked at very closely by multiple stakeholders. VO is becoming more aware of their supply chain and therefor also takes responsibility for the working conditions at the stone quarries (**M1**). Additionally, Atradius asks questions about what the management system of the quarry is and working conditions of the employees but then it comes down to the own due diligence of the company of their own supply chain. The stones were being supplied by the subcontractor Sierra (who in turn also contracted parties for the stones). An Environmental Engineer (EE) of VO examined this and made sure when the quarries were not up to standard that the subcontractor adjusted and followed VO guidelines. Representatives of VO and Sierra went to Tuticorin, India on March 10, 2016. After satisfactory inspection it was mutually agreed to use boulders for the project from 3 different suppliers by Sierra (**M3**).

The second material mostly used was sand and this was addressed early on in the project as it is an important material to build the reclamation but also obtaining the material would happen in the Maldives and has an impact on the surrounding. Sand was brought forward as a material of interest due to two events. The first, was because the PM had seen (after a google search) competitors working in the Maldives and the way they worked made all the fine sand visible causing bad publicity (**M4**). The second, are the EIA demands on the turbidity in the water (**M5**). Hereafter, the PM sought advice from the EED (**M6**). They put together all the rules, clients demands and regulations. With this information, VO makes a trade-off matrix with these demands to see how and in which way they can meet the demands.
In this project the client (MMHI) had appointed three areas where VO could obtain sand (**M7**). The PM was given a budget for the project that took into account a sand density of 350 mu but eventually the PM used 400-450 mu sand. This decision increased the costs of production but was needed (from the PMs perspective)

for the aim of VO for minimal possible plumes. VO had a free letter to look for sand with exception of some areas because of stingrays and VO was not allowed to come close to several coral riffs (**M9**).
The ship Blackbird (a push buster owned by VO) was deployed to perform the sand search campaign. Before ships start the PM would sit with the skipper to explain the environmental demands and the way VO approaches these (**M8**). First in the sand search, a survey was conducted using a Parametric Echo Sounder (PES). Based on the PES result, the geologist of VO evaluated the data and determined potential borrow area for further vibro-core investigation. VO engaged Marine Sampling Holland to execute the vibro-core investigation. The extracted sand samples were logged, and selected samples were sent to Fugro in Dubai for lab analysis (**M10**). Most vibrocore samples indicated a suitable sand thickness of 1 meter. Based on the vibrocore results the borrow area outline was further specified (**M11**). After this process, a borrow area was proposed to the client for each reclamation project. This proposal included the explanation of materials found in the borrow area and why certain borrow areas were unsuitable for the works (**M12**).

Figure 24 - Sand sample from borrow area - (Van Oord, 2017a)

To make sure all the turbidity actions were having the desired results, the turbidity of the water was measured every day (**M13**). This was also part of the water quality monitoring plan (**B17**), used for communication towards stakeholders and contributed to the minimal complaints from local communities concerning turbidity (**L22**)

4.3.4 Biodiversity (B)

The Maldives are known for their pristine fringing reefs that are home to very diverse marine life. Many hundred-thousands of tourists visit the Maldives every year for its rich and colourful ecosystem (**B1**). The MMHI requested in their initial project that the project would be done with a cutter which means the sand before the beach will be cut and then this sand will be used for the reclamation. This would normally ruin all the coral (**B22**). But, VO addressed this proactive and brought forward the idea that the project should not use a cutter with these kind of projects but should use a hopper. With a hopper, the ship obtains sand from a deeper location and does not ruin your 'front yards'. The client (MMHI) agreed with the possibility of using a hopper for the projects and left it open in the tender (**B23**). Because of this decision the EIAs needed to be revised because these were written based on cutter ships (**B24**). The reclamation project sites were in close proximity to high-end resorts and frequently visited diving sites. Therefore, the project had to comply with strict EIA requirements and an environmental monitoring program, amongst others (**B2**):
- Construction of peripheral bunds at the reclamation area to prevent outflow of fine sediment
- Turbidity requirements (limitations 29 NTU) and extensive water quality monitoring campaign
- Coral monitoring program prior to the works and after completion
- Coral relocation effort for live coral in the footprint area.

These demands were incorporated in the method statement of VO for the tender but were also transferred to the subcontracts with Sierra (**B3**). Alongside the general method statement VO was also using the EIA when setting up the Environmental Management Plan. The Environmental Management Plan includes all the plans to mitigate the environmental impact and was shared with the client and Atradius (**B4**).

The motive for the PM's focus on the environmental aspects is a twofold. First, several actions were demanded by the client and the EIA because there are many coral reefs in and around the project sites which the MMHI recognised as zones needing to be protected. Second, there was personal motive of the PM to focus on a good reputation of the company. The PM knew there was a Chinese contractor that had previously ruined coral in the great barrier reef and now they are banned operate again in Australia. The PM stressed this should be avoided in this project (**B6**). Due to these motives several actions followed: all Van Oord employees were

asked to pay extra attention to the marine fauna to not cause damage to the coral (**B18**), the monitoring of water and coral was executed (**B17**) and the PM focussed on the hydraulic systems on the ships. The ships of VO have hydraulic systems and the PM requested these to be taken off in order to have certainty about not having oil leaks or other risks that come with this system (**B7**). So, during the final preparation of the ships in the Middle East, before the ships came to the Maldives, it was taken off. This happened first by addressing ship management, also in communication with works manager and finally communicated back to the planning in Rotterdam. The technology department first said the risk is small so it was not necessary. But the PM insisted because hydraulics can cause a lot of damage and the PM aimed at avoiding this in all aspects of the project (**B8**).This additional activity costed money, which was at the expense of the project.

The focus of the PM (**B6**) also led to the successful relocation of coral. The EIA specified where VO could cause impact and mitigate negative effects such as relocating coral. Before relocating coral, it was important for VO to indicate that the coral was already bleaching and that this was not caused by the works of VO (also important for the client because they also need to show it to their stakeholders) (**B9**). To do the monitoring and the relocation a collaboration with NGO Safe the Beach was initiated proactive. VO first approached the client and then Safe the Beach because initially they might cause difficulty and VO wanted to minimise this by approaching them first. VO requested (via the client) a meeting with them as soon as possible. Two days later the EE of VO had a meeting with Safe the Beach who were initially completely against the reclamation project (**B10**). However, after showing VO's intentions to mitigate the impact Safe the Beach joined the coral relocation and monitoring actions. For the monitoring and relocation of the coral VO worked together with Safe the Beach but also the environmental expert from a resort close to the project site was involved. The environmental expert was initially involved in protesting the project along with her general manager. They provided the Government of the Maldives and the Himmafushi Council with scientific evidence of why the project should not take place, from an environmental standpoint. Issues that were raised included the abundance of green sea turtles, presence of endangered sea grass beds, high coral cover of many bleaching resistant species in the face of an upcoming El Niño, the effect of sedimentation compounding on the effects of the upcoming El Niño, and the presence of juvenile lemon sharks, which are rare in the atoll. The General Manager of the resort was also upset from an aesthetic standpoint (**B19**). Following the protest to the project, the environmental expert was emailed by the EE of VO and the resort invited him to the island. Just as with Safe the Beach, the local environmental expert recognised that initiatives for action only arose when VO approached these and then they were willing to collaborate (**B5**).

Both Safe the Beach and the environmental expert (with her team) helped to conduct surveys on the reefs surrounding the proposed reclamation site before the work took place (**B11**). They used a renowned system and then every few meters took pictures underwater of one by one meter. With these pictures Safe the Beach had software and with their knowledge VO could determine what needed to be protected. VO supported the activities by supplying the boats to go to the islands with the divers (**B12**). The first survey was conducted on 30th of March 2016. Within the area to be filled in for reclamation, in the South Eastern lagoon of Himmafushi, there were various species of hard corals, fish and invertebrates. Using a 100 meter transact, surveys were carried out to estimate the coral, fish and invertebrate species and their numbers (**B14**).

Figure 25 - Safe the Beach employees executing transact surveys for the project – (Van Oord, 2017b)

After the last bleach check it was decided that the surviving corals showing acceptable health condition should be relocated. Only the surviving and healthy corals were relocated in a multiple day event. The coral relocation process is shown in figure 26 with a pictorial timeline consisting of nine steps. In this representation several employees of Safe the Beach and the environmental expert (with her team) can be seen working together to relocate the coral. The process had nine steps explained in the coral relocation report of Van Oord (table 7, document F):

1. Corals are being detached from the reef using a hammer and chisel
2. Only slow growing species and healthy corals are taken
3. The detached corals are carefully transported to the recipient site
4. The detached corals are transported by bucket
5. Or submerged in large cages
6. Brought to a location at the reef 500 meter south of the reclamation areas
7. The environmental expert at the resort used part of the relocated corals for a coral rehabilitation program.
8. The corals are fragmented and attached to either frames or ropes.
9. Two weeks after the placement on the frame the corals were in good health. (**B15**).

Figure 26 - Coral relocation pictorial timeline – (Van Oord, 2017a)

But VO had little time to sort out the mitigative plans, and local environmental expert and her team believe they could have done more had they been given more notice (**B13**).

The environmental expert believed VO had a hand in postponing the reclamation project to give them time to do this. They managed to get 3 weeks, within which time they were able to remove several hundred kgs. of coral and clams from the area that would have inevitably died, however there was still a lot more that couldn't be saved (**B13**). Aside from the coral relocation the environmental expert did express concerns about the seagrass beds that were destroyed which are used by green turtles as feeding grounds (**B16**).

Also, the use of bunding around the sand pump was used to prevent sedimentation to the reef. This was initiated by VO (**B20**) just as the outflow of the reclamation (**B21**). This is something needs to be taken into account because when water with sand comes out of the pumps this should not be at a location with coral. The opening of the project site was also observed and considered so wildlife would not be trapped in the reclamation. The EIA (**B2**) stated that there should be monitoring between 3 and 5 years of the coral. Because VO would leave the project site again there was an agreement that the client (MMHI) would continue this work (**B26- E18**). The coral health monitoring after the dredging and reclamation works showed no impact to the reef or fish in the direct vicinity of the borrow area. It was clearly stated by the NGO executing the monitoring activities that no damages to the reef had been found which were not previously there. The number of fish and the variety of fish was even higher from the survey compared to the previous survey (**B25**).

Figure 27 - Bunds at Feydhoo (left), Himmafushi (middle) and Male (right) - (Van Oord, 2017a)

4.3.5 Local Communities (L)

The Maldives itself is under developed, there is not much legislation, bad infrastructure and bad or no waste disposal facilities. When building a highway in Europe it is normal for contractors to talk to the people who live there. However, in the Maldives it is common to just build your project without approaching the inhabitants that are effected by the project (**L1**). In The Netherlands the process of engaging stakeholders (often fishers) is done automatically because a contractor must make their plans public which gives people the opportunity to respond to this. However, in the Maldives this is different. The client in the project brought forward the idea of not saying too much about the project because to avoid waking up 'sleeping dogs'. VO disagreed with this and initiated being open to the stakeholders because in the view of VO one way or another the plans will become apparent and eventually it is better in stakeholders are onboard (**L2**).

An employee from the Environmental Engineering Department of VO in the Netherlands had an important role in this philosophy. As a stakeholder engagement specialist he had worked for many years on projects in many countries. Internationally the PM had not heard very explicitly of this before. Contact between the PM and the employee was set up and he showed the PM proactive methods of stakeholder engagement (**L3**). The PM took this approach into account involved an Environmental Engineer (EE) to start this up in the Maldives. The EE had not done this so outspoken in a project before but did a similar approach in the Bahamas (there it was not addressed as specific focus). The addressed focus provided the EE with the resources to implement stakeholder engagement in the Maldives (**L4**).

The first step in setting up stakeholder engagement meetings was to address the client and get them onboard that VO can inform people about the project (**L5**). MMHI took a while to take this in consideration as these are not common practices for them but finally MMHI wanted to cooperate. With the cooperation of the MMHI the EE started addressing people in the street to spread the word across the islands (the Islands are not so big with about 20.000 people). The EE did this by first addressing the diving school and then with the diving instructor walked to the fisher etc. and approached them by explaining: "next week Wednesday I want to talk about my project etc.". This resulted in several meetings with variating crowds. The people present included the local authorities, resorts, dive school owners, fishermen, airport authorities, etc.(**L6**). During the meetings a brief description of the project was given and questions from concerned stakeholders were answered. By informing and involving the local stakeholders a better support base for the project was created. Showing VO's track

record and achievements on other environmental sensitive projects (Australia, Bahamas, EU) increased the confidence of the stakeholders (**L7**). The meetings are also done because VO knows many have different first impression because they are not informed. They have doom scenarios such as VO came there with the biggest ship and VO will destroy the whole island. Because they don't know what VO doing and the ship is almost half the size of the island, so VO can imagine (**L8**). Also, locals said a contractor just comes there makes a deal with the government does its work, earns their money and leaves again. VO came there and approached the locals proactive and this they had never experienced before (**L9**).

The stakeholder meetings had many positive effects on the project that were experienced later in the project process. An initial attribution was, by knowing the stakeholders, the contact for information and complaints was made easier(**L11**). An example of this is a Dutchmen who was initially not in favour of the project because his diving school was licensed for the stingray area and the project would disrupt this. However, with the stakeholder engagement approach of VO his attitude toward the project turned and he became involved in the project for diving equipment (**L12**).
Also, through the interaction with the local communities the Ramadan was brought to the attention. By having knowledge of the local traditions and customs VO was able to act and contact restaurants with no windows to make sure the employees would not be visible eating in front of locals. Additionally, all employees joining the project received a message from the PM explaining what the Ramadan was and the guest role of VO in their culture. Therefore, urging the employees to show respect for this. This message was also sent to employees who joined the project later when they were traveling to the Maldives (**L13**).
Finally, the stakeholder engagement contributed to havening almost no complaints after the completion regarding the turbidity or noise (**L22**). Only one complaint was received from Nika Island Resort situated in the North Ari Atoll. The island resort claimed to be uninformed which from the point of view of VO was not the case. The project team clearly informed the Client as the complaint was partly based on a political point of view and VO does wish to not interfere nor get involved in political discussions (**L14**). After the project completion VO also received a letter from a local inhabitant who complemented VO on how they had changed her view on the project. She remembered when a competitor of VO went to the Maldives to reclaim land for the airport and ruined the breeding ground of the turtles in the area. She lived next to the project site and was very sceptic of how VO would operate due to the previous experience with competitors. However, in her letter she explained how VO illustrated a way that made it possible to reclaim land without ruining the environment (**L15**).
These are indicators that the efforts of VO were received well by many different stakeholders. This is special in the Maldives because of the different standard there compared to the Netherlands thus the efforts of the VO team were rewarded (**L16**).

During the case study process there were two stakeholders that played a significant role. These are the NGO, Safe the Beach, and a resort close to the project site on the island Himmafushi. Both parties were against the project. In Himmafushi the high-end resort (Gili Lankanfushi) was within 1000m of the reclamation area. The resort protested the project prior to the start of the works and successfully managed to delay the final EIA approval with approximately 3 months (**L20**). Contact had been established with the resort manager and the marine biologists of the resort and they became involved in the project (**L21-B11**). Also Safe the Beach was fundamentally against the dredging activities. Therefore, these two stakeholders were approached alongside the stakeholder meetings. VO initially approached Safe the Beach with questions about their perspective/attitude towards the project. When VO indicated their willingness to look at ways to minimize the impact then, Safe the Beach responded and became involved (**L17**). The EE maintained open and transparent communication with Safe the Beach about the EIA of each island. VO send them 1 on 1 their environmental report, that was also shared with the client during the weekly meeting with the client (**L18**). After the project Safe the Beach recognized officially that VO always tried to minimize the impact (**L19**).

When executing the project, the PM and the team focussed on working without causing nuisance for the surrounding inhabitants. An idea that was used to minimise the nuisance is to 'keep your feet off the shores'. This would mean that VO directed on having as many as possible activities and equipment on the ships and offshore (**L23**). In order to do this, VO had a floating container with a workshop and fuel supplies. Everything was kept on the floating container and only took it off when needed (**L24**).

Figure 28 - Floating container with supplies used in the Maldives project – (van Oord, 2017a)

4.3.6 General Additional Events (G)

In the events list in Appendix H there is an additional category tag; general TBL. These events were not categorised under one of the outcomes as they influenced multiple events or reflect underlying signals from the final part of the interview protocol. These are represented in the timeline as a box with an orange outline.

The first general event is the view of the board that indirectly influence many events. The board of VO promotes sustainability with examples such as providing budget for initiatives. The directors of VO have expressed they want to make sustainability VO's business as it can be seen as point of differentiation to bring in new projects (**G1**). This vision is also expressed in the statement in the EMP in the case study that shows the intentions and attitude that is desired towards the environmental aspects of the project (**G4**).

G2 initiates that if a budget is allocated for and EE or sustainable initiatives that a PM could be triggered to use the money and incorporate actions or new initiatives. **G3**, **G5** and **G9** all reflect how team members are included in the project. This can be through the company's system (**G3**) or through own motive after hearing about the project at an internal presentation (**G9**). The PM also has general believes that he incorporates in the selection of team members thus looks to also include young people with a larger focus on sustainability aspects in his team (**G5**). This resulted in a team where everybody had the mindset, which was sufficient in this small project. If something occurred the EE would be informed, and people knew how to find each other. Everybody does their own focus but is thinking about sustainable aspects (just as safety is embedded in the thoughts) (**G6**). The EE had contact with many stakeholders and the PM with the client (**G8**). The EED is not automatically involved in the process this was done after the EED approached the area manager (**G7**). With the experience the PM had on a previous project he was willing to take action to prevent the project from getting bad publicity (**G13**).

As previously stated, Atradius was involved in the project for the credit insurance. They work with the treasury department of VO but also the EED. Atradius has been working together with VO on many previous projects and thus there is knowledge of what each party needs. Also, Atradius is looking to incorporate more social requirements (**G10**). After the project was completed Atradius deemed the case study as a positive project and reported it in their annually public sustainability report (**G11**). After the project there is a larger picture that could be taken into consideration. As the reclamations of the islands is a small part of a larger project (**G12**).

4.4 Factors in the Project Management Process

This section indicates where in the project process of the case study the thirteen factors, of project management to create a sustainable outcome (section 2.3.2), become visible. Each factor shows actions in the project that are present for the factors to arise (shown in the project process in Appendix J). The final paragraph per factor, includes the construct and external validation findings.

1. Ability to deal with complexity

Several interviewees stated that the case study project might not be very complex. This is relative comment as the project has complexities which include but are not limited to operating in a different culture, project being at the other side of the world, 4 different project sites spread across 600 km, complex and well-known ecosystems to deal with and large pieces of land to create with much detail. Identified in research in section 3.3.1 complexity is a part of construction projects and incorporating sustainability into these large projects is a skill (Aarseth et al., 2017). The projects have many social-political influences that make projects even more complex (Aarseth et al., 2017).

The team members did not feel the complexity because it was dealt with. The attribute brought forward in the timeline is an element, that arose due to the small project team, that was the accessibility of people. Team members knew very well who did what and when (**G3**). This way everyone was approachable for when initiatives regarding sustainability criteria needed to be addressed. Also, people were not only focussed on their own part but felt responsibility for the project outcome as a whole.

During the construct validation the PMs agreed with the understanding of complexity and that to minimise this it is an important example for team members to know how to find each other. But it was brought forward that complexity is so much more than one action. Many other actions of a PM contribute to this and the small team size of the project played an important role in the case study. One PM said “With a small team it is easier to get people together but less resources are available. In a big project you have more resources but how do you create a culture with 300 people rotating on a project”. Also, PMs brought forward that currently in projects much relies on knowing your network and who to approach is based on your own knowledge and network. This should be accommodated in the future to make sure that people can find each other (and other expertise’s) easier.

2. Creating Accountability

There are two external accountabilities in the case study that cause many actions in regard to sustainable criteria. One is the EIA that is set up before the project by a local independent agency (**B2**) and the other is Atradius who sets demands before providing the credit insurance for the project (**E7 – E15**). The EIA needs to be incorporated in order to get permits for the project and the demands of Atradius need to be followed to obtain a credit insurance from them which had been set as a standard in the new policy of the VO board. Both have demands which need to be followed for the project to be realised and are being put in the project by the EE in collaboration with the PM. This makes the PM and EE accountable for following the demands while receiving them from different channels. The EIA through the Area Manager and the Atradius demands thought the treasury department.

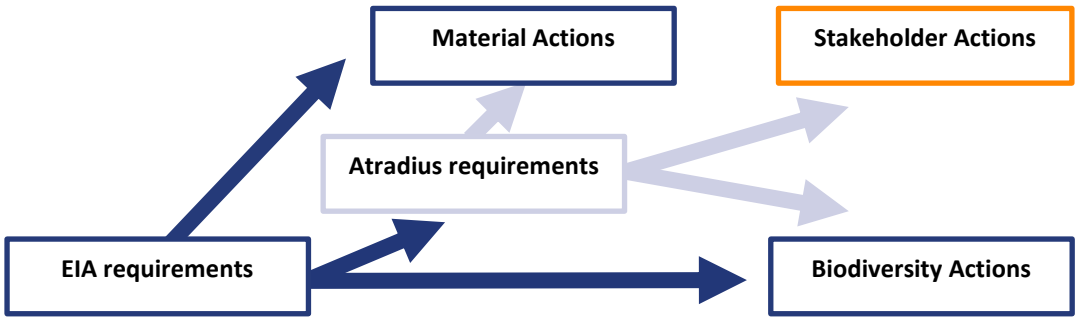


Figure 29 - Flow of requirements during case study - (own illustration)

Aside from these two external demands there is no internal accountability visible in the process.

Initially the Atradius requirements were seen as a separate accountability. However, the PMs pointed out that these requirements are fully dependant on the EIA requirements (**B2-E12**). This can also be seen in figure 29, therefore, the focus should be on the EIA demands as these would also be acceptable for Atradius. However, Atradius is incorporating in the future more social aspects (**G8**). The project process of the case study also illustrated that the requirements of Atradius go beyond only the environmental dimension (EIA) and **M1-3** were actions as a result of the social requirements from Atradius. However, a credit insurance or financing from Atradius is not always needed during a project and then requirements from Atradius are not included.

3. Environmental and social considerations

One could argue that the project as a whole was not done for environmental considerations but to benefit the economic and social situation in the Maldives. The environmental considerations were considered in the execution, but it was not the goal of the project to better the environment there (**I7-I10**). However, during the project many mitigative action were undertaken in regard to social and environmental impact. These arose due to the motive of the PM but also as indicated in an interview the association with coral and especially the case study location motivated much action.

There were different understandings amongst the PMs. This has much to do with the changing sector. Previously projects and especially the role of the PM was only focussed on the execution of projects and environmental and social considerations were fully dependant of permits, standards and the clients wishes. For instance, the stakeholder management is seen as something the client does and only when requested the contracting company would get involved. But the PMs see that this is changing, and their role is increasing. A PM used to be involved very late in the process and fly out to the location just before the project started. Now they are trying to get involved earlier. At present the industry is changing, contractors are either requested by the client to take more the environmental and social aspects into consideration or the contractor does it themselves. This has multiple motives; to unburden the client and create goodwill, companies reputation (**B6-M4**) and risk management.

4. Adaptive Management

In section 3.3.1 adaptive management was introduced when using monitoring and mitigative actions during the project preparation and execution (van Koningsveld et al., 2018). This was done much in the case study in regard to the biodiversity. The close monitoring of water and coral was required in the EIA but was also needed due to the effect of El Niño to show that VO was not causing the bleaching effects (**B2&B19**). The monitoring was used to identify which coral species were good enough to relocate (**B12-B16**).

Adaptive management can be regarding as adapting to all kinds of changes. All PMs indicated that the understanding of adaptive management through monitoring and measuring (van Koningsveld et al., 2018) should be approached differently as this is often done because of the requirements in an EIA or by the client. A PM added to this “monitoring here was done reactive but it should happen proactive.” The monitoring itself is being done because it is often required but the actions happen as a response to the monitoring are adaptive management. In the case study adaptive management had to do with changing and adapting in the situation at the project location. This is a result of close interaction with the surrounding and a reaction of the stakeholder meetings. The PMs also saw this in other projects by knowing the culture it can improve the project collaborations.

5. **Commitment towards sustainability**

In the case study there was some commitment toward the sustainable criteria. The PM was committed to stay out of the press (**B6-M4**) and other team members were also committed to accomplishing this. Especially the function of the EE was important in realising this. As stated in chapter 5 coral is a motivator for people and many understand that this should be protected. Through the EIA and Atradius demands, accountability from VO was created. This resulted in commitment from the financial department, EED, the EE on the project and the PM in the preparation and execution phase. Indicated in the process it could better be incorporated in the tender phase.

This was acknowledged by multiple PMs who said in order to be committed there needs to be a motive. This can come from requirements or other demands but eventually a PM him/herself also needs to be motivated. An argument that was brought forward was, “You need to be motivated, to motivate other people”.

6. **Economic and competitive advantage**

These are reflected in the economic performance criteria but also arise in other outcomes. An important motive for many actions is that the competitor did the opposite and had much bad publicity (**B6-M4**). Therefore, many actions are driven by being a better company than the competition which would in turn lead to more projects in the future. Considering the competitive advantage demands looking at the longer term. By earning money now but damaging the reputation more is lost then spending a little more on a project but maintaining a good reputation and increasing business in the future. This was reflected in the PMs actions.

All PMs stressed that the main goal of a project is the economic perspective for the company as they don’t do ’charity projects’. The competitive advantage is being integrated more and more into other projects as well. The example from the oyster reefs (section 6.1.2) show how VO is overall looking at other ways to create a competitive advantage. The PM on this project saw it as “a win-win project because usually there is much opposition from fishers who cannot fish there anymore but with this solution, we create more fish so there is less pressure for VO and the client in the installation works.” Other PMs stressed the local reputation to keep the door for future projects in the area open.

7. **Proactive design**

During the process there were several steps that suggested proactive design and had an impact on the way the project was executed. In the early stage of the project, the tender was adjusted after the area manager suggested a different type of ship but also later the sand search was approached proactive (**B22-B24**). The stakeholder meetings were also initiated proactive. Although the client initially did not want it after the proactive approach of VO they went along and were present at the meetings which resulted in good

communication with local communities (**L5**). At the end of the project the client wrote a letter that indicated the good work of VO.

Some PMs know there is a focus to enhance this and see sustainability as a selling point. In a tender sustainability aspects can be a selling argument even though the client did not specifically request this (thus a proactive approach is needed). There is a divide between the PMs, some think environmental considerations and social aspects should be done if the client requests it (reactive)). However, several other PMs addresses the urgency to approach aspects on own initiative (proactive). From a more extensive list of factors in literate (Appendix B) two factors reflect the responsibility of the client; 6. Clients commitment to the needs of stakeholders and 43. support of client's team towards sustainability (Banihashemi et al., 2017). The case study illustrated that although, 6 was not present this can still be achieved by proactive having a plan to incorporate these actions (**L5**).

8. Local and global orientation

The case study had been executed on the other side of the world than the contractors office. The global orientation is clear as it crosses half the world and ships are being brought in from other countries as well. The local situation is an important consideration. Although, employees do some project preparation in the Netherlands they should incorporate the local orientation. This was set up by the EE through stakeholder involvement. They knew the approach how it is done in the Netherlands but now wanted to incorporate this in the case study location (**L1-L2**).

The PMs experience had a large variety because some only operated abroad and others were more used to the rules and regulation in The Netherlands (or similar countries). The case study illustrated that sustainably operating in the Maldives required own initiative to bring in stakeholder management. When operating in The Netherlands the PMs said a stakeholder engagement specialist would be put on their projects to manage this. However, this is not required internationally so then it comes down to the PM instead of the client bringing this forward and not all PMs agreed this was needed.

9. Knowledge and awareness

A company such as VO contributes much knowledge about the technical and managerial aspects of a project. VO also has much more knowledge inhouse and the PM was sent to the EED to gain knowledge on other aspects, by learning from an employee of the EED department who had many years of experience in stakeholder engagement (**L3**). Also, other knowledge of VO was used in the project, an example is the knowledge on the impact of dredging and reclamation projects. By knowing the impact of coarse sand in comparison to fine sand the design can be adjusted accordingly (**M7-M12**).

In the case study there were several instances where VO broadened their knowledge. Due to the contact with the stakeholders, VO opened up and used the knowledge of the NGO (**L17**) and local environmental expert (**B11**) on how to monitor the coral and how to relocate it (**B10-B16**).

The complete list of factors addressed in section 3.3.1 included awareness but further elaborated in Appendix B (Banihashemi et al., 2017) . This list brought forward the awareness of the project team members. Awareness is very important to make sure the whole team knows about the goals of the project, why they operate in a certain way etc. The PM created this awareness in three criteria outcomes. These concern the biodiversity (**B18**), materials (**M8**) and local communities (**L13**) with each their own approach.

The case study project illustrated methods of how creation of awareness could be approached. However, the PMs specified that these are very dependent on the project size. This refer to the difference with a small

project team and trying to 'create a culture with 300 people rotating on a project' addressed in dealing with complexity. Suggested was training and guidance for PMs and staff to have sustainability just as safety incorporated in all aspects of a project because of safety everyone is aware and that is also a topic that was introduced a few years ago. It should become a topic that is talked about. To make it a discussion topic PMs believe this comes from high up in the organisation.

10. Transparency

Two types of transparent actions can be seen in the case study process. The first is internal and linked to the awareness (discussed above). The second was after having set up measures to mitigate the impact on the environmental and social aspects of the project the PM was very transparent with the reports. It was required to share environmental reports with the client, but it was also shared with the NGO that was collaborating in the project (**L8**).

The transparent behaviour of the PM was recognised during the validation sessions although many PMs did indicate that this is often required by the client thus being a mandatory action. When setting up the stakeholder process the approach is also intended to be transparent towards the stakeholders. Thus, the PMs recognised this in other projects when holding stakeholder meetings and keeping this also a constant flow of updated information.

11. Project manager (PM) experience

Many initiatives to better the outcome of the project came from the PM. An important role in this is his experience as a PM. From previous projects he had learned important lessons that were implemented in the project case. During a project before the case study the PM had experienced bad publicity on the project even though they did not do anything wrong (**G14**). To prevent this the PM set a goal of avoiding bad publicity and therefore, being very aware of how the project would reflect on people (**M4 &B6**). This led to actions in multiple outcome criteria. It triggered the stakeholder engagement approach (**L1-L19**), search for other sand (**M4-M16**) and the focus of incorporating biodiversity plans (**B6-B18**).

The experience from the PM resulted in at least 48 actions, as this gave the PM a motive to focus on sustainability aspects. Most understand the motive of the PM to incorporate other considerations because they see currently a company such as VO needs to operate sustainable (especially in an environment as the Maldives). There was also a general feeling that the PM is responsible for the whole project this includes safety but also environmental damage. From the experience a PM, he/she has motive to incorporate sustainability however budget is needed. The budget of a project is always tight, but all PMs see that they have room to search and create space thus, the freedom is there. Several PMs felt the support within VO and if there needed to be extra budget for initiatives that the board would support it. However, not all see these aspects as their responsibility because a PM focusses within the boundaries of the project and an area manger looks broader.

12. Quality management

This focus was initiated by the client by addressing it when VO wanted to incorporate local content in their tender. The President of the Maldives demanded quality and suggested this cannot be achieved with local content (**I1**). Also, during the project, the PM focussed on quality when works were either more difficult or should be done precise to prevent damage. The actions had much to do with experience of the PM and focus of considerations. The PM was focussed on not creating any damage thus pumps were taken of the ships (**B7-**

B8), Dutch crew was put on night shift (**I3**) and the sand search (**M4-M16**) was stared resulting in a better quality.

The actions to incorporate quality management were all related to the other factors; PM experience and knowledge and awareness. PMs indicated that the quality aspects in this case study were very specific and that in general quality is almost always an objective of a project. Therefore, it can be disregarded as a specific factor to integrate sustainability in the project management process as it is already there.

13. (early) Stakeholder management

Stakeholder management was visible in the local communities timeline. It started by acknowledging that the situation is different than the usual practices the Netherlands and that stakeholder engagement should be incorporated (**L1-L2**). To involve all the stakeholders at the start of the project is an action that was initiated by the PM based on his experience and the EED. To fill in the how question he was advised by an experienced employee of the EED (**L3**). Then the process started of having the EE focus on this and give him the room to operate (**L4**). All the stakeholders on the island were informed on the basis of meetings (**L6**). At first the client did not want this but after proactive approach form VO towards the client the meetings were organised in consultation/collaboration with the client (**L5**). By keeping the stakeholders on the island in the loop many other actions regarding knowledge sharing, biodiversity actions and actions in regard to materials followed.

However, the 'how' question is more difficult. In the case study the PM was supported by the EED and the EE set up the process locally. All the PMs had done the stakeholder management themselves in previous projects. This can be initiated by the client or from experience as an example in African projects it is approached different. When doing projects in the Netherlands the stakeholder management was done separate and an environmental manger is added to the project. Also, multiple projects have hired a local employee to join the team to manage the stakeholders (better understanding of culture etc.). When the PMs were shown how the EE in the case study process came forward and did stakeholder management acknowledge they acknowledge its role. As, they expressed, that for a PM it is important to have the right people (expertise) on the right place. Thus, having an EE on the project has added value. All see the importance that for specific functions, specific requirements of an employee are needed.

The PMs suggested a large motive for stakeholder management in projects is the cohesion with money. If there are many objections from local stakeholders, it will influence the project and client. By managing the stakeholders, the project outcome and economic perspective is also being managed.

An important aspect of the stakeholder management was brought forward by some PMs. The communication towards stakeholders also depends on the size of the projects and the culture. In some cases, the PM needs to give the presentations to give weight to the words. But some projects are that large that Pieter Van Oord (CEO Van Oord) himself would be present at the meetings.

PART IV
Research Review

Chapter 5 - Discussion

Chapter 6 – Conclusions, Limitations and Recommendations

5

Discussion

5.1 Transferability of the Single Case Study

The case study research used a project that was expected to show how the processes was executed differently than other projects. The transferability of the project process was in many aspects high. PMs, with experience in many other projects, acknowledged how several aspects the project process could also be implemented in their projects. However, the biggest challenge with the transferability of actions, that was addressed in the validation, is the team size. An example is the creation of awareness. Although this is important no matter what the size of the project is there is a difference in how this should be done in a small team compared to a large project teams.
The case study indicated a large dependency of integrating sustainability on the considerations of the PM. Therefore, actions are more difficult to transfer to other projects with a different PM who could potentially have a different mindset.
Additionally, several PMs addressed that the client has a significant role in incorporating social and environmental considerations. The willingness of the client to incorporate/initiate this differs per project. However, this research indicates that although this is important it does not have to be required and with increasing responsibility of the contractor these aspects can be initiated by the contractor.

5.2 Research Findings

The results from the case study (chapter 4) bring forward findings. The following findings reflect on the project management process that created a sustainable operating environment.

Integration of Sustainability

Appendix K presented that the case study project management process integrated the environmental and social considerations in the general project management thus, relating to the SPM method (section 2.3). A dredging project does often have a separate environmental management plan and social considerations could be included in this plan. However, all PMs in the validation sessions agreed that the sustainability plan should not be incorporated in the environmental plan as the social aspects should be incorporated in the general project management. A PM explained this by stating: “Stakeholder management should be in the project management plan as it is so much more, it is an integral part of how you manage a project.”

Factors in Project Management Process

As expected from literature research (section 2.3), knowledge and awareness and the early and broad stakeholder involvement were significant factors in the process. However, the PM experience had a significant part in the project management process. The PM experience was based on environmental and social considerations but also an economic perspective that aims at a competitive advantage resulted in his commitment towards sustainability. Several events were also encouraged by external accountabilities. However, proactive and adaptive management that were brought forward that specific for this sector this should be a focus. They were present in the project process but did not have such a significant role as previous mentioned factors. The key factors include knowledge and awareness, the early and broad stakeholder involvement, PM experience (based on environmental and social considerations but also an economic perspective that aims at a competitive advantage), commitment towards sustainability and external accountabilities.

This visual representation of factors in the process (Appendix J) suggests that three factors are represented multiple times in the process at the same time. This is due to the project managers decision making. The PMs experience influences actions in the process but this is based on his experience in another project with bad publicity. Knowing how the competitor operated in the case study environment, led to the PM determination to do it better. Thus, from an economic perspective that aims at a competitive advantage he was committed to sustainability.

These examples show the interaction between factors as they are not separate elements that occur separate but have a interdependency with each other.

Early and Broad Stakeholder Management

The case study provide an example of the added value of stakeholder management of all stakeholders. Martens and Carvalho (2017) define stakeholder management as a twofold. One focusses on the management of stakeholders such as suppliers, subcontractors and responsibility of products. The second is the relationships with society and local communities. In many projects the first is addressed accordingly by the PM while the second is not addressed. The case study illustrated that this can both be done as the client was managed along the meetings with the local communities (L5-L6). By having a team member also focusing on the society and local communities the opposing views of stakeholders towards the project can be turned and contribute to the project.

Underlying Signals in the Project Process

The underlying signals in the project process (2.3.3) are leadership, people and resources. The occurrence of the signals in the case study process are acknowledged in Appendix K. The role of the PM is significant to integrate sustainability in a project but also the ability to communicate the sustainability considerations to the whole team was closely followed in the process.

The case study brought forward the significant role of the PM but leadership also goes beyond the PM as the question rises not only from his own experience but within the company there is also a stimulus. Other PMs indicated that they feel they have responsibility of the whole project. This includes the social and environmental considerations. Additionally, multiple PMs addressed that this should also be the responsibility of the whole team/everyone. PMs feel a stimulus for projects that incorporate sustainability as these projects are appreciated by the board and shown within the company. Also, they feel more resources are made available by the board if necessary.

Resources in the form of knowledge and budget were needed in the case study project. Knowledge within the company but also local expertise needs to be connected. Knowledge includes having the same understanding of sustainability and educating employees on what incorporating sustainability means for their practices. Also, there was a willingness to invest in environmental and social aspects. PMs feel that there is enough room for the TBL considerations in their budgets, as the exact interpretation has not been set in stone. But, the way PMs see sustainability had differences between the answers of the PMs. The one understood it more as taking steps to comply with the rules, regulations, and demands of the client while others see it as a separate added value of a project. The knowledge of PMs of sustainability also came forward from the questions in the first part. All the PMs see the growing importance (in different ways) of incorporating sustainability and the company is slowly integrating it more but, this is not a general consideration within projects yet. The validation sessions indicated that many different views are still present about sustainability. The general definition of sustainability is not clear and therefore different responses occur. Throughout the research there has been interest in the topic from multiple people thus, illustrating that there are people willing and interested to learn more and potentially incorporate sustainability in their practices.

The final underlying signal refers to the people on the project. The PM on the project is key in incorporating the TBL but also other team member should have the skills and be motivated. Young people with new ideas can contribute to this but also motive and experience are important. The validation sessions brought forward that, for the role as project manager it is important to be able to rely on people to also think on their own about these aspects. Therefore, looking at other capabilities of people when they are included in a project was suggested.

Role of the Project Manager

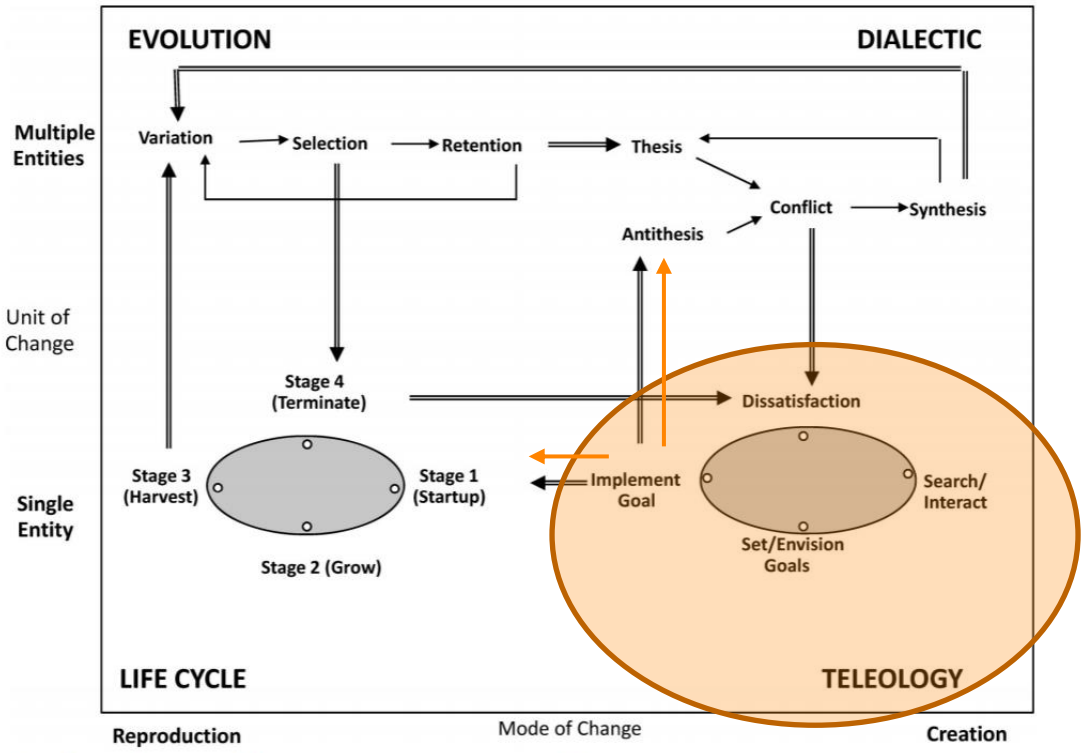
Many of the events and actions are a result of the PM's motivation. The role of the PM is changing as the industry is changing. The contractor is taking more responsibilities and starts looking beyond the engineering responsibilities. Contracting companies in the dredging and reclamation industry are slowly incorporating a different role and the PM is expected to integrate more aspects in the project execution. This goes beyond the clients demands but initiates a proactive approach towards projects. The knowledge of the contractor can be used to address suggested changes to improve a project. This increases the PMs influence at the start of the project thus creating more overlap with the area and tender manager who are involved earlier in earlier stages. Many considerations should also already be incorporated there and thus, collaboration between these managers is needed.

We live in a world where people are more connected than ever before. Publicity has a large influence on the reputation of companies and influences the way PMs operate. The case study indicated the experience of the PM with bad publicity as a large motive to focus on other aspects. When this is not being done in the current connected world projects can experience many delays or reputational damage to the company (subsequently having a negative economic result).

Carvalho and Rabechini (2017) indicated a low degree of commitment to social and environmental aspects among PMs. The case study brought forward an example of the opposite and indicated how much can be accomplished with the commitment of the PM towards sustainability.
The case study project illustrated that many actions in multiple directions need to be incorporated when thinking of all sustainability aspects. Therefore, the mindset and motivation of the PM is important. The case study also illustrated that often to undertake action many steps are needed. An example are the hydraulic pumps on the ship. The PM was very motivated to take these off as he wanted no risks. This needed to go though many channels thus demanding perseverance. Also, eventually the taking off costs money and backing from higher up in the organisation is needed.

Process of Change

The results from the case study indicate the important role of the PM. The PM used his dissatisfaction in previous projects and searched in ways to approach this project different. Then, set up actions and implemented this in the case study project. When comparing this to the process of change introduced in section 1.2 (figure 4) the teleology change model can be identified. The steps of the model are followed and the PM was a single entity that created a change. This single change can be brought to multiple entities by creating a group supporting the antithesis (aiming at triple bottom line success instead of the thesis of bottom line success) or progress to prescribed change by using the implementation as the start-up of a life cycle change in which the next step would be to grow (visible with orange arrows in figure 30).



Note: Arrows on lines represent likely sequences among events, not causation between events.

Figure 30 - Relation amongst change models - (van de Ven & Sun, 2011) ***– adjusted with orange identification of case study process***

This research also contributes to the organizations change process as it reflects on the teleology change and brings forward how it could be approached and conveyed to others. The research indicated the significance of the PMs decision making. As brought forward by Staib (2005) there are rational and intuitive decisions. The case study results elaborate on this by exemplifying the intuitive decisions of the PM thus bringing forward double-loop learning as it deems to incorporate this in the intuitive decisions of other PMs.

On the other hand the results of the case study bring forward change encouraged by competition which could be seen as an evolution change model. Other companies are similarly focussing more and more on integrating sustainability. This does not only refer to competitors but also companies in other sectors. Companies such as Atradius are constantly updating their requirements (currently incorporating more social requirements). Therefore, in the future contracting companies need to keep improving their standards to acquire credit insurance for their future projects.

6

Conclusions, Limitations and Recommendations

6.1 Conclusions

In this research, the creation of a sustainable operating environment in dredging and reclamation projects through project management has been analysed. The conclusions drawn from the research aim at answering the research question introduced in chapter 1. Four sub-research questions had been formulated that are stepping stones to answer the main research question:

6.1.1 Conclusion Sub-Questions

This section focusses on answering the sub-questions that were introduced in chapter 1. There are four questions that each form a step in the research execution.

1. *What are criteria of a sustainable operating environment in international dredging and reclamation projects and what are potential success factors?*

The first sub-question determines the axes along which sustainability is assessed in the research. Based on Elkington's TBL definition of sustainability 12 sustainability outcome criteria and thirteen relevant potential factors were identified in combination with project management of dredging literature (figure 31).

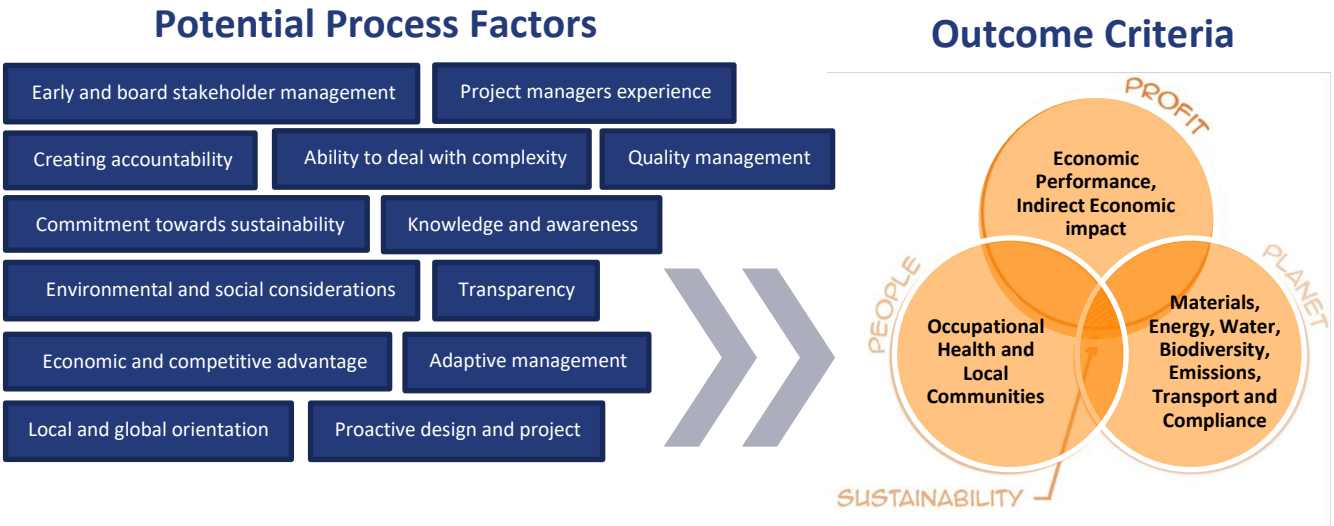


Figure 31 - Potential Process Factors and Outcome Criteria - (own illustration)

2. *How can criteria of a sustainable operating environment become visible in the course of a project management process?*

In order to make criteria of a sustainable operating environment visible a single in-depth case study can be used. Outcome driven process research is used to identify the project management process of a case study in retrospect. This is based on first identifying the outcome of a project and then build backwards in time and identify the process that led to a certain outcome. To have an in-depth understanding qualitative research is needed. Along explorative interviews, documents are searched to give an additional indication of views and events that are discussed by the interviewees. Thus, aiming at triangulation of information. These interviews incorporate the Project Sustainability Excellence Model that brings forward underlying signals of sustainability in the project management process. It focusses on both the impact during execution and on the end product by finding information of leadership, people and resources used in the project.

3. *How was a sustainable operating environment created during the land reclamation project of Van Oord in the Maldives?*

The Maldives project has had the most initiatives in five sustainable outcomes. These are economic performance, indirect economic impact, materials, biodiversity and local communities. Each outcome criteria had a set of events that developed over time in the Maldives project. The visual representation, of the developmental sequence of events, shows the story line of how the sequence of events unfolded producing the sustainable outcome (the fold-out page).

4. *What factors took place in the project management process of the Maldives project and is the project management process transferable to other projects?*

Overall the **PMs experience** was a big driver in the case study project. The PMs experience was based on **environmental and social considerations** but also **the economic perspective that aims at a competitive advantage** which resulted in his **commitment towards sustainability**. Additionally, external **accountabilities** required the PM/team members to incorporate environmental and social aspects in the execution of the process. These requirements were integrated in the project because of the dependency with short term necessities to execute a project such as permits, but eventually contributed to the projects long term outcome.

Knowledge and awareness as well as **the early and broad stakeholder involvement** had a significant role in the case study process. Knowledge was needed in the case study to integrate sustainability. The case study illustrated the importance of incorporating local knowledge in a project (which can be set up through stakeholder involvement). Additionally, seeking knowledge from other experts in the organisation was proven to be beneficial. The PM in the case study was guided in the stakeholder involvement approach by an EE with much experience in this field. Consequently, the stakeholder management approach in the case study was successful as it also opened doors for collaboration with locals and after the project there were almost no complaints. Awareness is created to encourage bottom-up integration of sustainability. Several efforts were undertaken by the PM in the case study that resulted in a team which was aware of why they operated in a certain way. Also, knowledge is needed of the execution works (monitoring of water turbidity etc.). This can be used for mitigative actions (**adaptive management**) but also for the stakeholder management.

The transferability of the project process was in many aspects high as many aspects of the project process could also be implemented in other projects by PMs. However, there are two consideration that are important when transferring the results. These include, the project size when creating awareness and the varying social and environmental requirements from the client but these can be initiated by the contractor.

6.1.2 Conclusion of the Main Research Question

How does project management create a sustainable operating environment in an international dredging and reclamation project?

A sustainable operating environment in international dredging and reclamation projects is created by integrating social and environmental considerations, along with economic considerations in a project. This integration takes place in the general project management process and not as a separate plan. The visual map of the project management process for a sustainable outcome (fold-out) shows the complex interaction when integrating sustainability during a project process.

The most significant role to integrate sustainability in a project is the Project Manager (PM). The decision-making of the PM in the case study was changed by dissatisfaction of an earlier experience. The dissatisfaction had evolved into a goal to commit towards sustainability in this project. This commitment is also brought on by change encouraged by the evolution change model. Competitors as well as companies who set external accountabilities are incorporating sustainability. Contracting companies see business opportunity and motivation to keep improving their sustainability standards.

The motivation from the PM drives actions to integrate external accountabilities but also to go beyond requirements and search for opportunities (proactive). The PM and his team focus on also increasing the added value of a project that goes beyond executing the technical requirements. This is done by integrating environmental mitigation actions, such as sand search and coral relocation, but also broad stakeholder management. The stakeholders are engaged by approaching them in the project preparation and communicate open about the project. A separate team member is given time and budget to focus on stakeholder management. When informing the stakeholders issues can be resolved thus, contributing to the social criteria of the project.

To facilitate the motivation to action, the PM creates a team where employees are aware of sustainability and have the ability to initiate action. For this, resources are needed including knowledge from multiple disciplines (local and internal) and the support (if necessary financially) from the organisation.

6.2 Limitations of research

This discussion of the research limitations gives the opportunity to more accurately determine the value of the research. The research design (6.1.1) has limitations but also the data collection and analysis (6.1.2). The limitations of the research form the starting points for recommendations in regards to future research (6.2.2).

6.2.1 Research design

Table five, in section 3.2.1, indicated which decisions about key issues were made when starting the process study based on an approach from Van de Ven (2007). Several decisions made here are limitations of the research design. The first two questions keep the research as open as possible by looking at the whole developmental sequence and multiple process theories. However, the main viewpoint of the research is from the perspective of the contractor. To increase the validity and total picture is created by including other perspectives in the research however the focus remains on the contractor when creating a sustainable operating environment.

Other decisions that could be a limitation of the research is the observational method, sample size and diversity. The observational method is historical observation. The research was a realistic review and this requires looking back at a situation that has already happened (Pawson et al., 2005). Therefore, the situation is not observed by the researcher and all the information is based on other people recollections of events or documents produced by others. An important decision in the research design was the choice of a single case study. This was important as it has added value by conducting an in-depth research but the generalization of the findings is more difficult (Verschuren & Doorewaard, 2010). This is acknowledged by Yin (2006), but he elaborates and says that critics who say this typically make the comparison to survey research which relies on statistical generalization, but case study research relies on analytical generalization. Therefore, the importance is if the case is representative and fitting for the research. This case study selection is explained in section 4.3.1. There are also researchers who say that by giving proof of how it happened in one case means it can be done thus, it can be generalized (Bryman, 2016, p. 134). Also, the research intent is important, as there is a difference in identifying if it can or cannot work or the research brings forward how it could work and gain knowledge from that. This research focusses on the latter thus, there is no need for generalizability but a focus on transferability.

6.2.2 Data collection and analysis

During the research data collection and analysis many steps were undertaken that should be considered with the accompanied limitations. Therefore, this section sums up all the limitations that arose during the research process:

- When selecting a method to measure the sustainability outcome of the project many were considered but for the measuring of the sustainability criteria specific data and knowledge of data is needed. This was either irrelevant or not present. Also, the interesting part for the research was to focus on indicating if there was motive but not to identify how sustainable it was. Therefore, the sustainability criteria were only identified and used to look at the process. The research does not comment on how sustainable the case study was or should be.
- The research was initiated from Van Oord. This means that the initial steps and motives were done from this perspective. Although the researcher was from the TU Delft, many participants were approached and included in the research through VO. Thus, it might have created a certain bias in the research but it need not to.
- The motive for the research is that many companies are looking to incorporate sustainability. This includes the company VO. Many employees and participants of the research are aware of this and want to show how well they have done this. As the research is conducted through historical observation many participants were eager to talk about their share in this now that the project is

considered successful. Although, when the project occurred they could have been less eager to incorporate the sustainability aspects.

- The case study research was focussed on interviewing people who participated in the initiatives to incorporate sustainability in the project. This brought forward a side of the project with team members who were focussed on sustainability. The participants understood the motive and were willing to incorporate sustainability aspects. Different perspectives from different parties were sought but also all of these saw the benefit of integrating sustainability aspects.
- From the interviews all potential events that contributed were selected and put into the events list. However, there could have been events that were not discussed or acknowledged in documents. Also, this selection relies on the researcher. Although done as complete as possible, events could be missing and a certain subjectivity could be incorporated.
- The analysis was completed by comparing the events to each other. This was initially done in one large Microsoft Excel. However, this comparison proved too large and made an outcome almost impossible. Instead of one large matrix it was split into the outcome criteria (on the basis of tags) and then doubles were taken out. This and the reconstruction of events was done on the basis of the researchers interpretation of the data therefore, subjectivity could have influenced the research.
- The validation sessions looked to increase the transferability but the PMs that were interviewed are all working in the same company. The company is a good representative of the sector but also internal aspects influenced the project. Thus, the validation generalizes from one case study to multiple projects but might not refer to the whole sector.

6.3 Recommendations

6.3.1 For Future Creation of a Sustainable Operating Environment

The recommendations focus on the perspective of a contractor in a dredging and reclamation project. When focussed on this perspective regarding a project, the discussion brings forward the significant role of leadership in the project itself and from higher up in the organisation. Therefore, the recommendations are from two different angles. The first is the perspective of the project management of the project itself. This includes the PM and other team members in the whole project cycle. The second focusses on the company as a whole and the positive influence it can have on creating a sustainable operating environment in its projects.

Recommendations for the project management

Recommended is that sustainability aspects must be integrated in the general project management and not considered as a separate plan. When this is done, sustainability becomes an integral part of the project management process thus effecting many aspects. As this takes place in the general project management process a significant role in this integration is the PM. This can be done through the following recommendations:

- It is recommended to set up stakeholder engagement early in the project preparation and execution. The case study brought forward the added value of having a team member focus on relationships with society and local communities which included the biggest opposition. This employee should be given time and budget to set up stakeholder engagement that is fitting for the project size. This could be done though open communication, informing stakeholders about the execution and eventually including several in the project.
- The execution of a project should focus beyond the clients wishes and also search for opportunities (proactive). To realise this, the PM and team members need to be connected to employees who have knowledge of environmental and social topics. Recommended is that the PM is connected to and supported by different departments who have this knowledge.
- It is recommended to create awareness of integrating sustainability with all team members. This can be incorporated when selecting team members but also when operating this can be brought forward. Although the size of projects differs, actions could be taken to inform the whole execution team and make them aware of why they operate in a certain way by understanding the reasoning behind it. When this is set up it is recommended that employees are also given the opportunity to initiate actions that arise because of their awareness of sustainability and knowledge of their job.
- External accountabilities bring forward social and environmental requirements that could be integrated in the project because of the dependency with short term necessities to execute a project (such as permits). Recommended would be to include these requirements as soon as possible in a project (examples from the case study are the EIA and requirements to obtain a credit insurance from Atradius). Just as in the case study, it would be recommended for the PM in the project to place the external accountabilities along other demands of the project as they demand an initial incorporation of environmental and social aspects.

Recommendations for the contracting company

Within the contracting company many actions should be encouraged top-down that create an environment where sustainability is integrated bottom-up. To stimulate this, the following recommendations are brought forward:

- It is recommended to create sustainable knowledge and awareness by increasing the learning and training of employees. This can be done by, providing training and guidance for PMs and employees within the company so sustainability can be, just as safety, incorporated in all aspects of a project. For this, sustainability needs to become a topic that is talked about by everyone in a way that employees

have a general understanding and 'speak the same language'. When conveying the message, incorporate the business opportunity of improving the sustainability standards.
To make it a discussion topic it is recommended for sustainability to be stimulated from high up in the organisation. Initiatives that support sustainability are gradually being supported top-down and this impacts employees. It is recommended to make the support more apparent and demonstrate examples within the company.

- The role of the PM has a significant impact on the integration of sustainability in a project. Therefore, it is recommended to create a match-making of projects and PMs. When matching PMs with a project their experience and consideration with all TBL aspects should match the project. The qualities of the PM should complement the project execution because PMs do many different projects and work with many different clients. Each client has different wishes, demands and expectations regarding stakeholder management. Also, the setting of its accountabilities can differ. Therefore, it is recommended in the selection of the PM to take into consideration the ability to deal with the impact and the experience in previous projects.
- In the previous recommendations for project management there was initiated that there should be support from different departments for the PM due to the increasing demand of having knowledge of multiple aspects. Recommended would be for the organisation to facilitate the setting up of connections to the employees with knowledge on how to integrate social and environmental aspects to support the project teams. A key role in this could be the Environmental Engineering Department. This department has much knowledge of how to incorporate environmental and social aspects and could become a central point for the spreading of the knowledge across regions, departments and different disciplines.
- It is recommended, to attract motivated and knowledgeable employees for a project, upcoming projects need to be made visible before execution to all the employees and recommended would be to also present the possibility to be included in these projects based on motivation aside from usual requirements. When selecting people for a project it would be recommended to include multiple motives and qualifications. Preferably, team members have motives for a certain project. The expertise of an employee is required to fulfil their own part of the project but also aim at the ability to look beyond their own expertise when needed.
- The dissatisfaction of an earlier experiences of the PM encouraged the change towards sustainable practices. To stimulate the change without first experiencing the dissatisfaction, it is recommended to stimulate the exchange of experiences after projects and how this was set up as a goal in another project.

6.3.2 For Future Research

The discussion brought forward limitations of the research and thus there are recommendations for future research when examining the project management process to create a sustainable operating environment.

- The research focussed on a single case study. Future research could focus on doing a comparative case study to bring forward the different approaches different PMs in the project management process. Also due to the single case study approach in this research, it focussed on operations within one company. Future research could approach this differently and compare sector wide processes by comparing different companies.
- Martens and Carvalho (2017) have identified that future studies could focus on the case studies of the actual business practices and look at variables such as sectors or countries. The Maldives case study confirms that location did play a role for the level of commitment to sustainability. But more case studies across a variety of locations are needed to confirm this relation. Also, the research focusses on

the dredging and reclamation sector this variable could be researched as other sectors might approach sustainability differently.

- The research focussed on initially multiple and after the interview five sustainable project outcomes. Future research could look into different project outcomes and illustrate if the factors in the process are also different. The research could also consider all the GRI aspects and measure the specific sustainability criteria of the outcomes.
- Several recommendations regarding stimulation of considerations. The research done was a historical observation however by doing real-time observations future research could contribute to the understanding of how this can be stimulated in a project process.
- The project size of the case study arose several times. As the project team was relative small future research could compare the process to a larger project and how it differs when many more team members and budget are involved.
- The research focusses on the contribution of the contractor company. However, in many projects the project execution is done by a consortium and this changes the project process drastically. Future project could focus on the integration of sustainability in these types of projects.
- The research brought forward the changing role of the client in relation to the contractor. This research focussed on the response of how the contractor is trying to integrate sustainability in this changing role. Future research could also look at this topic but then approach it from the client's perspective.

7

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8

Appendices

Appendix A – Time scale and horizontal range effect of dredging and reclamation

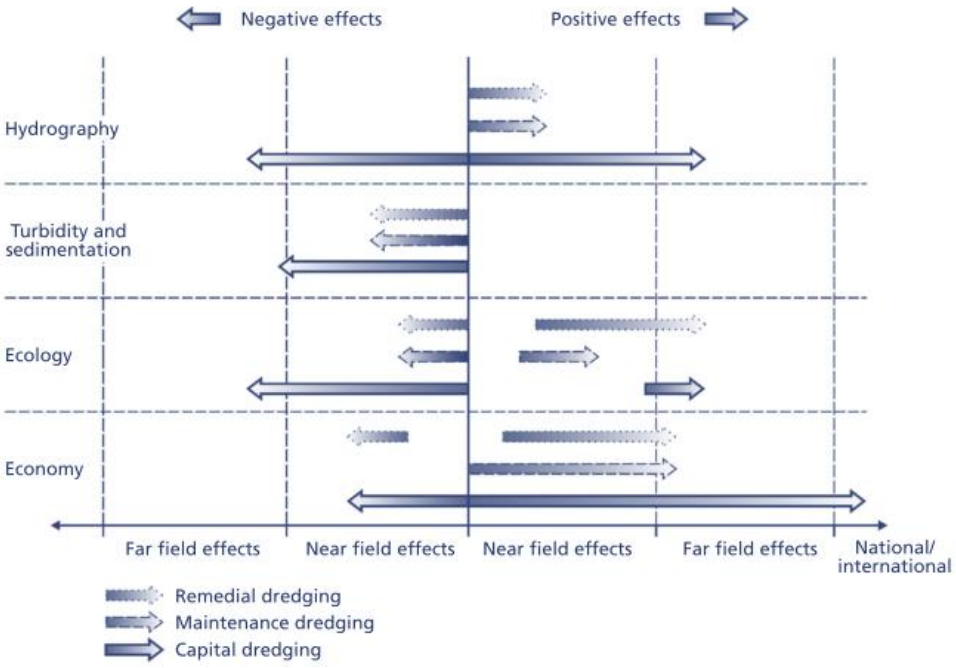


Figure 32 - Horizontal range of effect - (Bray, 2009)

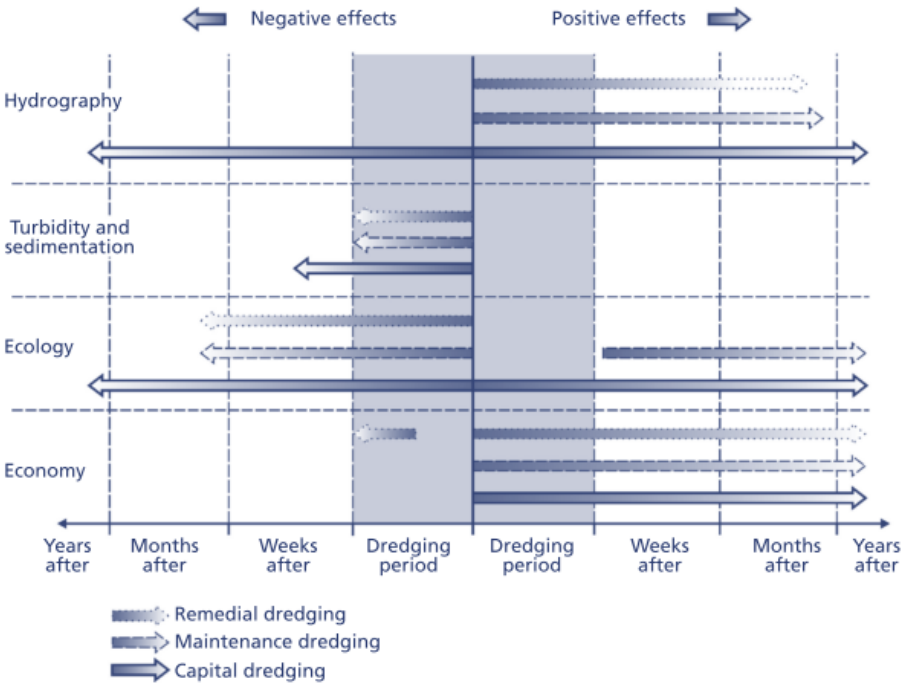


Figure 33 - Time scale of effect - (Bray, 2009)

Appendix B – 56 CSF's from literature review

No.	Potential CSFs	References																		
		(Songer and Molenaar, 1997) US	(Jefferies et al., 2002) Australia	(Chan et al., 2004) Hong Kong	(Duy Nguyen et al., 2004) Vietnam	(Belout and Gauvreau, 2004) Canada	(Fortune and White, 2006) UK	(Du Plessis, 2007) South Africa	(Ogunlana, 2008) Thailand	(Ahadzie et al., 2008) Ghana	(Taylor, 2008) Worldwide checklists	(Saqib et al., 2008) Pakistan	(Bakar et al., 2010) Malaysia	(Li et al., 2011) Singapore	(Tabish and Jha, 2011) India	(ISO, 2012) Worldwide checklists	(Silvius et al., 2012) Worldwide checklists	(Gudienė et al., 2013) Lithuania	(Yong and Mustaffa, 2013) Malaysia	(Ihuah et al., 2014) Nigeria	(Liu et al., 2016) China
1	Knowledge and awareness of sustainable project delivery in the Project Management Team (PMT)																			✓	
2	Dominance of constructive relationships within project stakeholders								✓												✓
3	Implementing an effective strategic planning regime		✓		✓																
4	Emphasis on high quality workmanship								✓										✓		
5	Strong commitment to sustainable project delivery from project stakeholders													✓						✓	✓
6	Client's commitment to the needs of the other stakeholders			✓						✓											
7	Compliance with anti-corruption rules and regulations in the decision-making process													✓	✓						
8	Project managers leadership style											✓						✓	✓		
9	Needs assessment of people							✓													✓
10	Public acceptance towards the project																		✓		
11	Economic and Political stability		✓										✓								
12	Positive organizational culture in support of sustainable project management								✓									✓			✓
13	Enacting required policies in supporting sustainability principles establishment in construction projects by governmental and professional bodies										✓										
14	Clearly defined goals and prioritize of all stakeholders							✓										✓	✓		
15	Strategic alignment of project goals with stakeholders' needs								✓												
16	Comprehensive contract documentation				✓				✓				✓								
17	Well-defined scope of work and project constraints	✓													✓				✓		
18	Effective tendering method			✓															✓		
19	Project manager's experience and competence						✓	✓				✓						✓			
20	Availability of resources (fund, machinery, materials, etc.) as planned throughout the project				✓		✓								✓						
21	Multidisciplinary/competent project management team				✓								✓							✓	
22	Transparent and competitive procurement process										✓								✓		
23	Creating accountabilities, expectations, roles and responsibilities for the organization								✓												
24	Support and cooperation of Project Management Team (PMT) in delivering a sustainable project													✓	✓				✓		
25	A high degree of trust within the PMT		✓						✓						✓				✓		
26	Effective and open share of knowledge among PMT																				✓
27	Commitment to systematic methodologies of project management						✓		✓												
28	Adaptability to amendment in project scope														✓				✓		
29	Implementing an effective decision making process by the PMT						✓											✓			
30	Implementing an effective quality control and quality assurance regime									✓									✓		
31	Implementing an effective project monitoring and feedback methodology							✓												✓	
32	Deploying updated and realistic project cost and time estimates by the PMT												✓							✓	
33	Implementing an effective project risk management by the PMT	✓																		✓	
34	Implementing an effective change management system						✓		✓												
35	Implementing effective communication and data exchange protocols at all levels of decision-making within the PMT			✓				✓													
36	Use of lessons learnt in previous projects by the PMT				✓		✓														
37	Effective allocation of resources	✓	✓																	✓	
38	Implementing effective health and safety protocols by the PMT									✓	✓										
39	Use of up to date construction technology and methods for execution of the project								✓												
40	Environmental impacts management by the PMT		✓							✓											
41	Water and noise pollutions minimization										✓										
42	Waste management										✓										
43	Support of client's team for sustainability			✓		✓															
44	Top management support						✓		✓						✓				✓		
45	Effective management of changes in the scope of work during construction			✓											✓						
46	Effective use of facts and data to support actions at all levels of decision-making								✓												
47	Effective Project Control					✓							✓								
48	Continuing involvement of stakeholders in the project								✓										✓		
49	No social and political interference			✓											✓						
50	Absence of bureaucracy from the work place				✓				✓								✓				
51	Community involvement		✓		✓			✓													
52	Transparency in the procurement process																		✓		
53	Competitive procurement			✓															✓		
54	Comprehensive pre-tender investigation on project														✓				✓		
55	Providing adequate design details and specifications													✓					✓		
56	Regular quality control and quality assurance activities														✓	✓					

Figure 34 - 56 CSF's from literature review (Banihashemi et al., 2017)

Appendix C – Sand Motor, Building with Nature

Text obtained from, http://www.dezandmotor.nl/en/the-sand-motor/introduction/

Every year, the sea takes sand from the Dutch coast. Every five years, Rijkswaterstaat replenishes the shortfall by depositing sand on the beaches and in the offshore area. If we didn't, the west of the Netherlands, which is below sea level, would be exposed to the sea. The sand replenishment operations every five years do the job, but can we protect the coast in more sustainable and natural ways?

By building the Sand Motor (also known as Sand Engine), a peninsula on the coast near Ter Heijde, we try to find out whether nature can spread sand along the coast for us. It goes without saying that the Dutch government is not experimenting with the safety of its people: the coastal defences are now at maximum strength as the Sand Motor starts to take shape.

Building with Nature

The Sand Motor is a great example of building with nature. By depositing a large amount of sand in a single operation, we can avoid repeated disruption of the vulnerable seabed. Nature will take the sand to the right place for us. If the Sand Motor fulfils our expectations, sand replenishment off the Delfland Coast will be unnecessary for the next 20 years.

Unique in the world

The Sand Motor is the first experiment of its kind. With this pilot project, the Netherlands is continuing to set the standard in water management. In 2011, we are doing this by actually working with water, instead of against it. If the Sand Motor works as we expect, the concept can be rolled out to other places in the Netherlands and the rest of the world.

Research

Scientists are studying how the Sand Motor develops to see whether this innovative method for coastal protection does indeed work. Measurement data are also needed to manage the Sand Motor properly. One example is mapping out new currents so we know where it is safe to bathe. But we also want to see which animals visit the Sand Motor, and how visitors spend their leisure time on the Sand Motor.

Appendix D – Project Management Process and Environmental Objectives

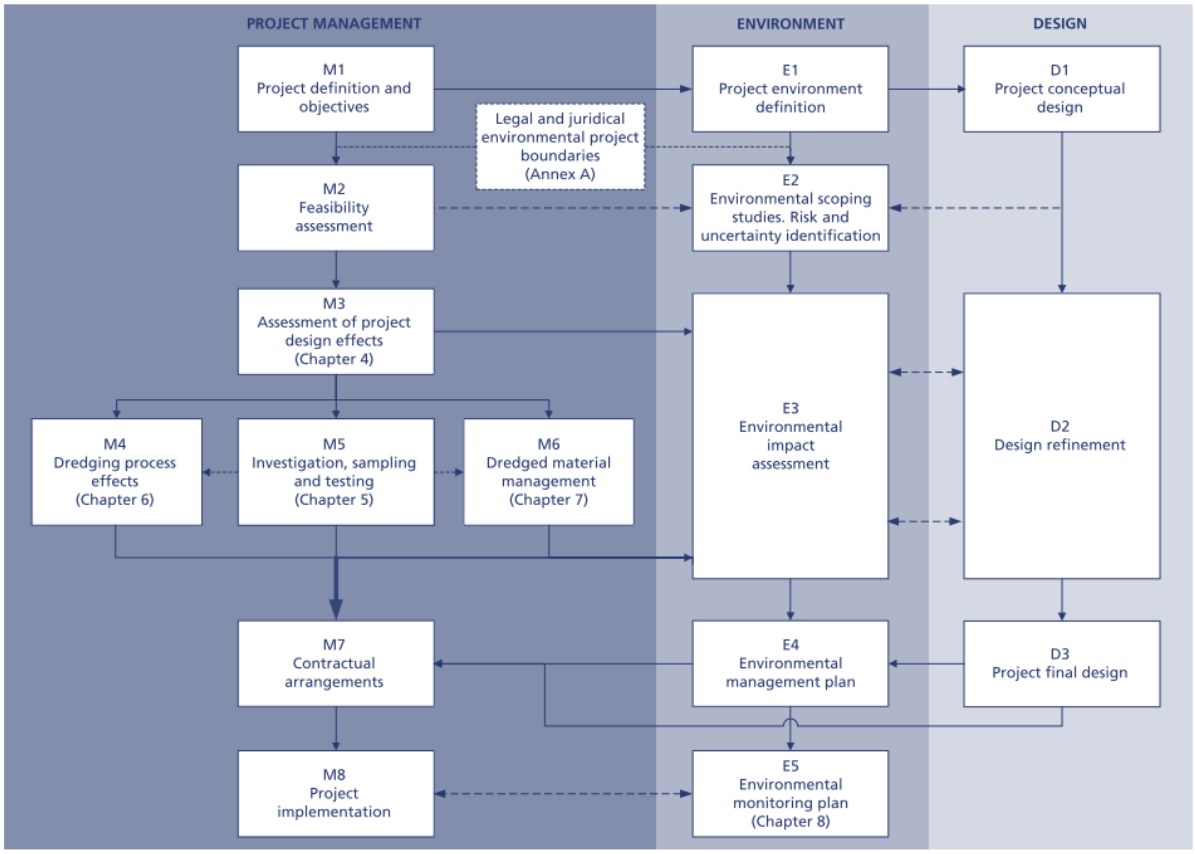


Figure 35 - Visual respresentation of environmental objectives in the project management process - (van Koningsveld et al., 2018)

Appendix E - The Project Sustainability Excellence Model

1. Project Objectives (140 points)
2. Leadership (80 points)
3. People (70 points)
4. Resources (70 points)
5. Processes (140 points)

1. PROJECT OBJECTIVES: To what extent is sustainability a feature for setting project objectives?

To what extent do the following issues appear in the project

(GRI TBL aspects)

2. PROJECT LEADERSHIP: Is sustainability an important issue for the project leadership? How do managers support and promote sustainability during the project life cycle?

To what extent does the project leadership pay attention to

– reaching the financial goals?
– the improvement of environmental protection?
– the contribution to the social development?
– fostering innovation?
– support creativity and creative solution?

3. PEOPLE: How are project team members involved in the sustainability of the project, how is their potential seen and utilized?

To what extent are the following issues taken into consideration when project team members are selected?

– They should be able to reach the expected financial results.
– They should work environmentally friendly.
– They should have social sensibility.
– They should know or be able to get to know existing social problems and to identify social needs.
– They should be innovative.
– They should be creative.

4. RESOURCES: How are existing resources used effectively and efficiently from the point of view of sustainability as well as innovation and creativity?

How effectively does the project use financial resources in order to

How effectively does the project use information as a resource in order to

How effectively does the project use services of the project suppliers in order to

SUSTAINABILITY
– increase the business sustainability of the project?
– increase the environmental sustainability of the project?
– increase the social sustainability of the project?

INNOVATION
– to promote technical innovation in the product / service / construction / other project outcome,

– to promote process innovation in the project outcome,
– to promote marketing innovation in the project outcome.

CREATIVITY
– apply creativity tools and technics in the idea generation during the planning phase,
– identify business and financial problems,
– develop creative solution for the identified problems,
– identify opportunities and threats and to use these for setting up the project strategy.

5. PROCESSES: How do important processes support project sustainability?

To what extent did important processes of the project support the realization of the following goals?
GRI

(GRI TBL aspects)

Appendix F – Outcome Criteria for Case Study Research

TBL Dimension	GRI Criteria	GRI Measure	*Case Study*
Economic	Economic Performance	Direct economic value generated and distributed, including revenues, operating costs, employee compensation, donations and other community investments, retained earnings, and payments to capital providers and governments.	*Has the project been profitable?*
		Financial implications and other risks and opportunities for the organization's activities due to climate change.	
		Coverage of the organization's defined benefit plan obligations.	
		Significant financial assistance received from government.	
	Indirect Economic Effect	Development and impact of infrastructure investments and services provided primarily for public benefit through commercial, in-kind, or pro bono engagement.	*Were there initiatives to increase to positive indirect economic effect*
		Understanding and describing significant indirect economic impacts, including the extent of impacts.	
Environmental	Materials	Materials used by weight or volume.	*Initiatives to reduce or recycle materials used*
		Percentage of materials used that are recycled input materials.	
	Energy	Direct energy consumption by primary energy source.	*Initiatives to reduce indirect energy consumption and reductions achieved.*
		Indirect energy consumption by primary source.	
		Energy saved due to conservation and efficiency improvements.	
		Initiatives to provide energy-efficient or renewable energy based products and services, and reductions in energy requirements as a result of these initiatives.	
		Initiatives to reduce indirect energy consumption and reductions achieved.	
	Water	Total water withdrawal by source.	*Percentage and total volume of water recycled and reused*
		Water sources significantly affected by withdrawal of water.	
		Percentage and total volume of water recycled and reused.	
	Biodiversity	Location and size of land owned, leased, managed in, or adjacent to, protected areas and areas of high biodiversity value outside protected areas.	*- Strategies, current actions, and future plans for managing impacts on biodiversity.* *- Habitats protected or restored.*
		Description of significant impacts of activities, products, and services on biodiversity in protected areas and areas of	

		high biodiversity value outside protected areas.	
		Habitats protected or restored.	
		Strategies, current actions, and future plans for managing impacts on biodiversity.	
		Number of IUCN Red List species and national conservation list species with habitats in areas affected by operations, by level of extinction risk.	
	Emissions	Total direct and indirect greenhouse gas emissions by weight.	*Initiatives to reduce greenhouse gas emissions and reductions achieved*
		Other relevant indirect greenhouse gas emissions by weight.	
		Initiatives to reduce greenhouse gas emissions and reductions achieved.	
		Emissions of ozone-depleting substances by weight.	
		NOx, SOx, and other significant air emissions by type and weight.	
		Total water discharge by quality and destination.	
		Total weight of waste by type and disposal method.	
		Total number and volume of significant spills.	
		Weight of transported, imported, exported, or treated waste deemed hazardous under the terms of the Basel Convention Annex I, II, III, and VIII, and percentage of transported waste shipped internationally.	
		Identity, size, protected status, and biodiversity value of water bodies and related habitats significantly affected by the reporting organization's discharges of water and runoff.	
	Transport	Significant environmental impacts of transporting products and other goods and materials used for the organization's operations, and transporting members of the workforce.	*Initiative to reduce impact on transport*
	Compliance	Monetary value of significant fines and total number of non-monetary sanctions for non-compliance with environmental laws and regulations.	*Total number of non-compliance with environmental laws and regulations*
Society	Occupational Health	Life cycle stages in which health and safety impacts of products and services are assessed for improvement, and percentage of significant products and services categories subject to such procedures.	*Total number of incidents concerning health and safety impacts of products and services during*

		Total number of incidents of non-compliance with regulations and voluntary codes concerning health and safety impacts of products and services during their life cycle, by type of outcomes.	*their life cycle, by type of outcomes.*
	Local Communities	Percentage of operations with implemented local community engagement, impact assessments, and development programs.	*Operations with implemented local community engagement, impact assessments, and development programs.*
		Operations with significant potential or actual negative impacts on local communities.	
		Prevention and mitigation measures implemented in operations with significant potential or actual negative impacts on local communities.	

Appendix G – Interview Protocol

Creating a sustainable operating environment in dredging and reclamation projects

No of interview:	**#**
Date:	
Interviewer:	Valerie van Walt Meijer V.A.vanWaltMeijer@student.tudelft.nl Valerie.vanWaltMeijer@vanoord.com
Interviewee:	

I would like to thank you in advance for your time and your contribution to my research!

Introduction

First short introduction who I am:

- Master Construction Management and Engineering at the TU Delft, Civil Engineering with extra graduation annotation of 'Sustainable Development and Technology'
- Master thesis conducted in collaboration with Van Oord, working together with Erik van Eekelen and Sander Dekker
- Interest in project management and the role it can play when incorporating sustainability in a project. Involved in multiple construction project during master projects and internships however new field dredging.

Motivation

As part of the research several interviews will be conducted. This will be done to bring forward the process and the motivators of people involved. The aim of the research to gain knowledge on how to incorporate sustainability considerations at project level.

Aim of the meeting / interview

The interview will be used to analyse the process of the three islands reclamation project in the Maldives to identify the different roles and initiatives to increase sustainability in the project.

Structure of the interview

The interview consists of three parts. The first part will focus on questions regarding the general process of the Maldives project. Then in the second part the sustainability outcome of the project will be identified and the final part will focus on how sustainability criteria become apparent within the project process.

Confidentiality

Before starting with the main part of the interview I would like to raise the issue of confidentiality regarding the information you provide in this interview.

How would you like to be cited?

☐ By name, position, institution

☐ Position and institution only

☐ Neither name nor institution

☐ Make a suggestion and send me any potential publications (e.g. reports, journal papers) beforehand. Unless I request changes within two weeks after reception, my agreement can be assumed.

☐ Other:_____

May I record our meeting?
☐ Yes ☐ No

Before we start with the questions, I would like to clarify that there are no right or wrong answers as this is about your perspective and opinions. Should you consider any of the questions as unpleasant and prefer not to reply, you are free to do so. Additionally, should you have any difficulty in understanding the questions, do not hesitate to ask me for further explanation.

Do you have any questions so far?

Interview Part 1 – The process of the Maldives project

At first, I would like to understand the process of the Maldives project and how different activities unfolded over time.

1. Please shortly explain to me what your role was during the Maldives project.
2. How did the project come about? And how were you included in the project?
3. Could you please line out how the project progressed over time? Did it adhere to any specific steps or phases?
4. What were the main activities that needed to be completed in the project? Where there any unforeseen events or happenings that shaped the outcome of the project? Could you try to illustrate these over an imaginary timeline?

Interview Part 2 – Sustainable Outcome Criteria

5. Do you think the Maldives is a sustainable project? Why yes / Why not?

6. In my research I have set the following sustainable criteria based on literature. What do you think about the following criteria? And were the criteria present in the Maldives project? (outcome criteria assessment list present for additional explanation of criteria)

Outcome Criteria	**Initiatives present in Maldives Project for positive outcome**	**Were you part of this process**	**Sustainable outcome in your opinion**
Economic Performance			
Indirect Economic impact			
Materials			
Energy			
Water			
Biodiversity			
Emissions			

Transport
Compliance
Occupational Health
Local Communities

7. However these are based on literature. Would you, from your practical experience, add other outcome criteria?

8. For each of the criteria in question 2 could you tell the story of events that were followed for this to happen?
   - What people, resources were needed?
   - What would you consider factors that are needed for this to succeed?

Interview Part 3 – Sustainable Project Process Open Questions

9. Do you think existing resources (products and people) are used effectively and efficiently from the point of view of sustainability as well as innovation and creativity? If yes, how? If not, why?

10. On what criteria are people selected to be involved in the project? How are project team members involved in sustainability aspects of the project?

11. Why and how do managers support and promote sustainability during the project life cycle? Motivations could be organizational culture of requirements of contracts or personal conviction, risk minimization..

12. Was the approach of the Maldives project different from previous projects? In which way?
13. If yes, do you now apply this way of working in new projects? Why yes / Why not?

14. Is there anything else that you would like to add or discuss?

Final

Thank you for your time and participation!

I will summarize our interview. If desired, I could send you a copy for review

☐ Yes ☐ No

Appendix H – List of Events

Event number	Number interview / document		Outcome	Process stage	Events	Tags
1	1	1	Economic Performance	Tender untill end project	*The Maldives itself is a though country economic speaking. In the new Van Oord policy there is a standard of credit insurance for all the projects. The Maldives is such a country that when doing a project there credit insurance is required within Van Oord. At the start of the project there was a request to also help with the financing of the project. For these two matters I was involved in the project. We started to approach Atradius to see if they were open for transactions on the Maldives.*	Credit Insurance
2	1	2	Economic Performance	Tender untill end project	*Usually we get the request through the area controller of where the project is and then I had much contact with the area manager and later with the project manager of the project. The start of a project has a certain structure to ensure payment and during the project I am involved if the payments don't occur according to that standard. Part of the polis is to keep the insurer informed of the status of the project. In the event of default this would have to reported. An example is if someone passes away during the project or if adverse information about the client or personal of the client arises. Then I always inform the insurer of the project status.* *1. Area has a request. This is set in the digital system to register the project with a form for the credit insurance so we have initial information of the project.* *2. Then we take in consideration if with the information we have received of the project if we should go to a private insurer or the national insurer (Atradius) Ministry of Finance. We do an approach for either of the two, (when private we often use a broker)*	Credit Insurance
3	1	3	Economic Performance	Tender	*Due to the risk of the Maldives project we wanted to go to the national insurer, Atradius. They had variating experiences however also positive on that basis they started looking at the Maldives project. An indication of variating experiences is: with the recent airport project the authorities showed bad moral motivation because they did not pay so there is a general question of doubt in the Maldives*	Credit Insurance
4	1	4	General TBL	Tender untill end project	*Exceptional is the large partner (subcontractor) we had in this project and their works were also in our insurance. They did a large part of the project and were still finishing their works when we were already done. We only had to pay our subcontractor if we were paid.*	
5	1	5	Economic Performance & Indirect Economic Impact	General	*This is mainly due to the relevance of the development. We did the initial step to create hubs for the inhabitant of Male. The bridge function is very sustainable so people don't have to travel as much to get access to schools and hospital. However I am interested is what there is completed now! In principle when the project is paid the project is closed for us. With the DGGF fund there would have been an assessment afterwards (post audit) report CSR how is worked out. Usual projects with Atradius this is not required however I think they are changing it. We did have to indicate the relevance of this development beforehand.*	Credit Insurance
6	1	6	General TBL	Project Preparation & Execution	*During the process of the project I think it is hard to say. Dredging is in principle not sustainable. You use fuels, you suck away materials which is in principle not sustainable. However, I think we adjusted our work methods to take care of the environment*	
7	1	7	Biodiversity	Project Preparation & Execution	*First it was a demand of the client and second there are many coral reefs there which need to be taken care of. There was an Chinese contractor that ruined coral in the great barrier reef and now they are banned to ever do a project in Australia. This has to do with your reputation as a company.*	Coral
8	1	8	Local Communities	Execution	*There was not much Local Labour used in the project maybe food or something local but not much*	Local employment
9	1	9	Economic Performance	Tender untill end project	*Much explanation of what we do there, also towards Atradius. Yes, there is definitely accountability towards Atradius. There is standard a dredging questionnaire we have to do. Categories A B or C. A is the heaviest and has the most demands. Such as an EIA is required. The EIA is published by Atradius for everyone to see so also NGO's use these.* *Don't know if the EIA was in the Maldives Project. Separate route of Environmental Engineer at Van Oord. Always approval of MVO department of Atradius. When credit is approved there is always an approval with a 'but' the environmental should check out. Until this is done the credit cannot be implemented. This was all approved in the Maldives project.* *Environmental engineer and I have much contact however everyone does their own bit. Calls together with employees of Atradius. Each own part but must come together as shared outcome. We also do the environmental studies for ourselves. Atradius wants to know things but we also do it for ourselves.*	Credit Insurance
10	2	1	General TBL	Project Preparation	*From the EE department looking at the EIA and demands. What we should do. And after I had a conversation with the PM and he had an important goal: no negative media attention during the project. Illustrated this with two examples. On our direct competition rainbowed in the Maldives with much local disruption. He showed me the articles from this (2/3 year before our project). This we definitely don't want*	stakeholder
11	2	2	General TBL	Project Preparation	*PM had a project before in Brazil with negative media and although not prover we don't want this. HE said the situation in the Maldives is so sensitive we need to do our works without negative press. Of course I thought what a good idea! This made my job bigger and more proactive instead of just following the EIA. Change of approach. I became more my second role stakeholder manager.*	
12	2	3	General TBL	Project Preparation	*Because many presentation within the company I was informed of the project and two years earlier I did also a very sensitive project in the Bahamas. So I addressed my supervisor he I this not a good project for me to do next and a week later I was on a plane to the Maldives.*	
13	2	4	Transport	Execution	*What was a setback during the execution was the transport from and to the different island. The Maldives have bad facilities and much effort was needed to have equipment form location to location. We worked one island at a time.*	
14	2	5	Local Communities	Project Preparation & Execution	*I think for the standard there it was a very high level but if you look at the European knowledge of sustainability it might disappoint. The Maldives itself is under developed, there is not much legislation, bad infrastructure, or waste disposal facilities. when I build a highway it is normal for us to talk to the people who live there. However in the Maldives you just build it and don't approach the inhabitants. The way we did it by approaching neighbours and fishers in the area was completely new for them. Locals said a contractor just comes there makes a deal with the government does its work, earns their money and leaves again. We came there and approached the locals proactive and how we involved them they had never experienced this.*	stakeholder
15	2	6	Indirect economic impact	General	*Original plan from the government why they want to develop the area. All nice on paper and believe in it. Which was mayor for the client but not necessary we were involved in this.*	Island Plans
16	2	7	Materials	Tender and Project Preparation	*The materials used in this case is sand and stone. We search for the most coarse sand that we could find because when dredging you want less turbidity. In the project we had bad (less coarse) sand close by, but we wanted the other san from further away. Not beneficial due to the extra transport with the ships that is needed, but better for environment and actually also better as a building material in these projects. Here we really steered the client. Told them we need this area for the sand* *The idea to do this was after putting together all the rules, clients demands and regulations. You make a trade-off matrix with these demands and see how and in which way we can meet the demands. In this case the client pointed three Areas we could obtain sand. We did ground research in all three areas, what kind of sand is there and on that bases identified here is the most coarse san so we want that area. We think this in the Netherlands,* *In the Maldives project there was a payment schedule per travelled distance of the ships but I was not involved if this was economic good or bad. The project manager does that. It was not a very large project, unusually the people who plan the budgets take that into account when they make the offers, so I think the PM had contact with that department. Usually this is all done before the offer I don't know if this in the case in the Maldives. When I was involved in the Maldives preparation phase this was still an ongoing process.*	sand
17	2	8	Biodiversity	Project Preparation	*Location of the reclamation demanded in the EIA. Not all islands, one island was necessary to relocate the coral. Reclamation on this location went through a coral. Living coral was present. Try to move a part of the coral. (EIA set up by consultant, CDE local consultant, one of their core business is writing EIA's) With this document we create an approach. Other location no alive coral to take into account. Two interfaces with the coral. We did have where took the coral. We did water quality monitors. Before and after dredging we did reef checks with divers around the area.*	Coral
18	2	9	Materials	Project Preparation	*Demand sin EIA turbidity cannot be this much. So what we then do is measure every day this value. That is our proof. As long as this stay . From the environmental department. Before ship starts we sit with the skipper The are the environmental demands and this is how we approach it. If the values are exceeded.*	Sand
19	2	10	Local Communities	Project Preparation	*Contact with fishers. In NL this process goes automatically because you have to make your plans public and then people respond to this. However in the Maldives different. The client said don't 'say to much because we don't want to wake sleeping dogs. We thought lets be open because one way or another the plans will become apparent and you still need people.* *First step ask permission to the client in we can inform people. They had to think about this very long because these are not common practices for them and finally they wanted to cooperate but that meant they wanted to join the meeting*	stakeholder

20	2	11	Local Communities	Project Preparation	*It started asking people in the street. Went to the local diving school. Island not so big islands with about 20.000 people so you can find your way to the people. With diving instructor walked to the fisher etc and approached them that next week Wednesday I want to talk about my project. One time 15 people, one time nobody and one time many people showed up at the meetings. People have difficulty actually believing that this will be honest for them. The first impression because they are not informed people have doom scenarios such as we came there with our biggest ship and people would think we would destroy the whole island. Because they don't know what we are doing and The ship is almost half the size of the island so I can imagine*	stakeholder
21	2	12	Local Communities	Project Preparation	*I went to the Maldives to do this. The moment the PM asked me to do the stakeholder management. I have not done this so outspoken as in this project before. Did it in the Bahamas but there it was not addressed that I had this as specific focus. The addressed focus gave me freedom to do this in the Maldives.*	stakeholder
22	2	13	Local Communities	Execution	*The nuisance during the project. We work 24/7 and during the project a period was the Ramadan. We did not receive complaint however the people that work need to eat and during the Ramadan. Local people we employ (not many in the Maldives) but also respectful toward their culture. So although we might be able to eat we don't want to eat in front of their faces. We know when this is and should anticipate. This anticipation occurs through the project structure. There is a PM then a works manager and then specialty groups such as me environmental engineering and basically works manager is daily operation supervisor and he should decide how we approach these issues.*	nuisance
23	2	14	General TBL	Project Preparation	*In the Maldives I think accidently integrated in the project. We started proactive approaching people and therefor much interaction with the locals. This caused us to also help with the beach clean days. 2 or 3 hours putting trash in bins with locals. We were there and now they approached us if we wanted to also help. This is a result of the close interaction with the locals. If you have a good relationship with people in the surrounding than these this occurred themselves*	
24	2	15	General TBL	Execution	*Ideas start at the lunch table when people say 'hey should we do this', or after a visit to a town hall when people ask if you can take something in consideration. I think because it was a small project everybody knows what everyone is doing so you can approach people about your idea. This is needed to connect to the right person for your idea.*	
25	2	16	Local Communities	After Project	*What I think is important as conformation. That for a few stakeholder we got positive feedback. We got a nice email from a woman who hated us when we came and afterwards told us he you did this good. This makes the effort worthwhile. She lived next to our site, and three years before we came the airport was extended and ruined the breeding ground van de turtles in the area and she was sceptic if we were going to do it different as promised. She changed her view during and after the project and say that land reclamation is also possible without ruining the environment.*	stakeholder
26	3	1	General TBL	Execution	*Thinandoo we could not come to the island so a new berm was made. Big difference in volume and impact. We found this out there. Was thought up that week and made there. We did it all there, discussed this with operational works manager, environmental and the client. We searched for the best possible option, did many measurements to show we did not have extra impact. All in consultation with each other, everyone knows about the sensitivity of the environment there, and a small team so knows easily who to find. Everybody feels responsible for everything (in large projects only responsible for your own part)*	
27	3	2	Indirect economic impact	Project Preparation	*When I was going in the plane to the Maldives read that it is a place that you should visit because it will disappear in the future. So Sustainable because with the project you look for the long term at the island and increase its survivor (sustainability as it stays long).*	Island Plans
28	3	3	Local Communities & Biodiversity	Project Preparation	*I think most important conscious of our impact also in small scale, in two week enlarging twice the size of the island but also large scale impact on the coral.*	mindset
29	3	4	Local Communities	Project Preparation	*But also small scale we were very conscious of where we were working, proactive doing more that only what is required by the client, open communication towards client and other stakeholders*	mindset
30	3	5	Local Communities	General	*For the local inhabitants, could be also negative for the resorts. There are two economies there. The local inhabitants and the resorts. Increasing an island bring possibilities for the local communities however one resort was against it because the locals burn much waste and now that is the view of the resort. International investors who earn their money in these resorts*	stakeholder
31	3	6	Materials	Project Preparation	*The initiative to use other sand. I think is twofold (economic and environmental), amount of sailing movement saved and better for environment. We were active in this search, where is the most coarse sand. Good that it twofold, don't know if this was already done during the tender, maybe sensors campaign was already part of tender but don't know*	sand
32	3	7	Biodiversity	Project Preparation & Execution	*The first EE initiated the coral relocation. This is obvious from the EIA that shows the sensitive pointe. Showing where can you cause impact and mitigate it but also important to show how you are not effecting it because the coral was already bleaching. You don't want to get claims because this happens which is not your doing. Also important for the client the monitoring because they also need to show it to their stakeholders. Thought up in project presentation and executed there with a local stakeholder (save the beach). This happens during the project and project preparation. One could say this should already happen when writing the tender. Important decision was to bring an EE, someone there that has time to do this, invest money in this person. Execution of these plans does not cost much money (relocation of coral done with volunteers). This decision was probably the PM but maybe in consultation with the Area manager.*	Coral
33	3	8	Local Communities	Execution	*Then resorts we had contact with one give the phone number, we know you are not happy but let us know if there is something, We moved the 'bak' out of sight for the resort.*	stakeholder
34	3	9	General TBL	General	*I think this should be supported from higher up and the rest of them should also have eye for it. Which was the case in the Maldives, everyone should be made aware. It is an team effort.*	
35	3	10	Occupational Health	Execution	*There was a dengue outbreak amongst the workers of the subcontractor and supported them with the hospital and set up rules, so no one infected when I was there.*	
36	3	11	General TBL	General	*Everybody had the mindset, which was sufficient in this small project. If something occurred the EE would be informed. Everybody does their own job but is thinking about this (just as safety). Don't think is was necessary that everyone was dedicated towards.*	
37	3	12	General TBL	General	*Partly personal, Project team personal, Risk minimisation for the project but also within Van Oord. Requirements contract than one way or the other we will have to oblige. With risk and reputation you can bring along other people in the organisation because although not much money is needed. The EE shared an article at the start of the project about how our competitor did a previous project there and failed. Reputational damage for your company and the client. I think personal conviction maybe less. But is needed in the execution* *From the board we see and importance and then it starts to live more which helps. People need to feel supported and have the resources available such as money and an EE on the project.*	
38	3	13	Local Communities	After Project	*I think approach definitely different because it is used many times as example of stakeholder management. Many projects we let the client handle this but here we took charge and did it ourselves. In some projects we leave it to the client and just execute the contract. Aside the story of the coral but I think most important the stakeholder engagement.*	stakeholder
40	4	1	Economic Performance	Before Tender	*The reason we went to the Maldives is I saw other contractors working there. If they are working there, there is money to make there*	Start Project
41	4	2	Economic Performance	Before Tender	*Almost two years busy with conversations with Ministry of housing and ministry of environment. They had all small projects I said if you want someone like VO to come you need to put several projects together to make it achievable. Many conversations and time discussing how and why you should do this. I talked to the ministry of environment, in small assignment bad practices occur such as a hopper rainbowing in a sensitive area. I said we do this different. Difficulty in this discussion is that they say oke demonstrate/ indicate this. Then I say again give us the job and I show you how we do it. It is a game of the chicken and the egg. This took a long while. Then we managed not to make it one project but to get three projects on the same tender date and we gave it as one offer. Many people at VO don't know this and think this is one project.*	Start Project
42	4	3	Economic Performance	After Hand-In Tender	*Then we offered it and had many conversations. It progressed but then we got stuck on the financing of the project. We had many conversations about this. I was doing it together with Sierra from Colombo. Long term relation/collaboration with them. Our collaboration is from before the tsunami (2004). The Maldives did not have any money, so we had conversations about financing from VO. They wanted (but we didn't) that we as VO would take the loan and Maldives would pay us back*	Start Project
43	4	4	Economic Performance	After Hand-In Tender	*This I cannot do, also never get is past our board. But I am always willing to facilitate for you. Then Atradius can into the picture (as financer), with all the sustainability demands, CSR, local impact etc. This we could manage fine but then the EMF and world bank said, this will not happen because the ministry of finance does not have any credit space. So finally we set up a payment schedule that would be sufficient for us to start the works. Again this all took two years and then November 15 is signed the contract.*	Start Project
44	4	5	Biodiversity	Project Preparation	*Then we looked at the ships. There were intentions to add new hydraulic measures to the ships but we decided let's do this a project later because we don't want any risks in such a sensitive area. This happens in the project preparation phase*	Ship
45	4	6	Local Communities	Project Preparation	*We also looked at how can we do our work without upsetting everything. This is the PM and his team who focussed on this. But beforehand we also looked at it. You don't want to have your feet on shore there. We had a huge floating container with a workshop and fuel supplies. Everything on the floating container and only took it off when we needed it*	nuisance
46	4	7	Transport	Execution	*Look we had never been in the Maldives before. It seems a lot nicer than it is. It consist of all small islands in atolls. In the start we did not look at the enclosed bunds but we had problems with managing this. The PM was in Male and we started in Fydoo and that is 800 kilometre the other side. We misjudged the situation. The hopper has laid still because we were not ready yet.*	
47	4	8	Economic Performance	General	*Client was very happy and therefor helped us. We really did what we promised we would do. That is definitely something the project team did very well.*	stakeholder

48	4	9	General TBL	Project Preparation & Execution	*you felt it in the office we are going to do this well because the Maldives is popular. There was a high motivation of the team to do it well. Also if the PM said I want the EE to come again then no problem let him come. I think values from the company is embedded in the people.*	vibe office
49	4	10	General TBL	Project Preparation	*PM also changed something if people were not joining in on this. Also the small works after hand. People who say he I've been doing this for 40 years, but that is not how it works anymore. I think it does not work like this anymore because from yourself and from a company you have the duty to take care of the planet. We live now and I think more generations are coming and let's face it the Maldives is a unique place*	
50	4	11	General TBL	Project Preparation	*The attitude of the government of the Maldives is conscious of their unique place and they want to cherish this. It is an interaction, in this time if you want Atradius you are also obliged to have your project set to a certain standard. And then I don't only mean environment but also social aspects are coming more in the picture. Set aside if you already do this as a company or not, many places in the world this is not taken into account. We are now building in India and to build that harbour many people are being forced from their homes*	
51	4	12	Materials	Project Preparation	*We did look at the blocks from BAM. But that would not work there because there is no room to make this also the president did not want us to make it somewhere else.* *Maybe little bit faint but the sand was local however the stones were imported, the steel came from Belgium and people already said imported.*	Stones
52	4	13	Local Communities	Execution	*But during the project we did look very much at the impact. The EE and the fisheries, not like here but many small fishers. Contact with them and addressing planning with them. By being very open there were no disturbances.*	stakeholder
39	4	14	General TBL	After Project	*Many people referring to this project. Now in Angola project we are busy with the area we work in how are we impacting the surrounding environment and people. Things we must do and things we want to do. It will create a win-win because it this goes smooth it is an advantage in our work. This should spread more within the company*	
53	4	14	Biodiversity	Before Tender	*All the works were cutter works. The sand before the beach we cut and then putt it all in the reclamation. This ruins all the coral. So we went proactive and addressed we should not use a cutter at this kind of work but should use a hopper. Then you get sand from*	Ship
54	4	15	Indirect economic impact	Before Tender	*The president said also at the start when we did our sales pitch of local collaboration etc. He said no we don't want that, bring what you need we want quality. This was adjusted in the tender as the option was left open which local competitors did not like.*	Local employment
55	4	16	General TBL	After Hand-In Tender	*I want a certain mentality in team preferably a mix with young people. The younger generation who is more involved in these issues they should be given room for their initiatives and the PM did that very well.*	
56	4	17	General TBL	General	*Freedom* *Give your PM budget to do this. Look there is money available so use it because we took in consideration that we want to do this well* *I know the EE sometimes had a rough time but he did it so well! Difficult to measure (When we Look at the pictures of the project you only see our steel on it)*	
58	5	1	General TBL	Project Preparation	*Sometimes the area does not initially involve the EE department. So when I heard there was a project in the Maldives I called the Area manager. We were not involved in the Tender phase but I was already busy with the Atradius request. So I congratulated him on the project but asked what should we do with the environment. Then they said there is no environment there (I think he means there are no demands and then I should act as conscious of the company in accordance with Dutch and international regulations). So made me laugh because if not identified now there are things that could arise. At first they did not know what to do with it but then the area manager sent the PM to me. We knew each other from previous project where I had been difficult for them but afterwards they acknowledged that taken into account the environment more would have been beneficial. So he was turned we need to do this now because otherwise we will be following the facts. Much of the success plays together with the Area manger acknowledging oke incorporate this and the how is done by the PM. Giving our EE the space and freedom to do their work. Get the message in the Area manager and PM in crucial. I always ask it but in this project is was really well received and then continued.*	
59	5	2	Biodiversity	Project Preparation	*First we have Atradius request could you look at it. Then we had to start running because we were not involved in the tender phase. This is not our usual practise because we want to be involved earlier. In this project this was not addressed in the project. Our estimators have an excel with all the estimated costs, they often do take into account something of monitoring and EE. They don't do this because of knowing what should happen but just because it should be in there. Initially we heard monitoring needed to happen which is always a good idea to also protect yourself from damages that did not occur due to your actions (think of coral bleaching). We need monitoring data to cover our ass because it is easy to give us the fault. I do it because I want to know what happens there but we sell it as a protection move.*	Credit Insurance
60	5	3	Local Communities & Biodiversity	Project Preparation & Execution	*The EE needed to be there for monitoring, but always a good addition with very knowledgeable people. I think they saw if you want to do extra works on the Maldives these are often resorts so you should keep them as a friend. They want people who also take them in consideration before so there could be a budget for this. The project was so successful because of the efforts of the EE. The way they talk to stakeholders and keep them in their value. In the commercial world it is very important relation management, value people is difficult in many cultures, such as Arabia. Why not treat everyone as you would like to be treated. It is a challenge to do this in the right way in international. The PM very difficult task, whole project successful according to the board then you need good people to do this, you need people people. Often everything needs to be done quick, there is pressure it needs to start now, and this date we need to start.*	stakeholder
61	5	4	General TBL	After Project	*The point is I don't know if you look at usage of fossil fuels and what will be there. We make land but we have nothing to say about what happens afterwards. There was no consideration oke you immediately put a windmill there because we need electricity but don't leave anything behind. I think if you look sustainable, we are part of a much larger project, what we do can we do something that is also beneficial later. I hope they continued in their plans to realise the hospitals etc. This was very much a selling point for us that it would have a function not everyone going to male. How corrupt is it that is will eventually really happen. I think by doing finance there will be a checking party that looks at will it eventually be completed because otherwise the local people are always set back.* *If nothing is built there now than out project was not sustainable, we ruined an area for nothing. The governance should be looked at. I think as semi large organisation we can ask questions about this, but many people think scar and we don't want to interfere and ask difficult questions. We still do business in very corrupt places and I think we should have an opinion about that.* *We are a ship that is slowly turning and if I keep on screaming it keeps on changing*	
62	5	5	Materials	Project Preparation	*The stones from this project were from our subcontractor and I don't remember we looked at them. With the Atradius coverage we did make an assessment of the quarries. If we come somewhere we buy stones. For this to happen in a project the PM should, although not direct their task, to think about this. To do this he needs advisors such as us to help. We can also approach the area but it needs to be with the PM because it is their decision.*	Stones
63	5	6	Biodiversity	Project Preparation	*Yes definitely, not only the relocation of coral but also the outflow of the reclamation. This is something you need to think of, when you do this works also water with sand comes out and this should not be at coral. Also you need to consider your opening so you don't trap wildlife in your reclamation.*	coral outflow
64	5	7	General TBL	Project Preparation	*I put myself in projects. But I select people from my department. We select people in GRIP, competencies/skills are difficult. The PM is selected on experience and knowing how to work, but others are selected on availability. I know who my people are and what they want, and you want people to also be selected on their wishes and not only their competences/skills*	
65	5	8	General TBL	Project Preparation	*Yes very much, we have had the opportunity with the PM. He indicated I was done with always doing bad thing with the client but I want to do the best and open relationship. When he came in he said let's do it completely different which was nice because I don't want to swim against the current*	
57	5	18	General TBL	General	*Start of conversation we talked about motive not to get in the papers. But it is a mix in offshore we want much safety but this is done to not get in the news. From our organisation e want through training and knowledge we want them to operate safe and aware. In England there is a list of things you can do but more Scandinavian countries everything is based of knowledge an ability to do things. In NL we are in between but it should always be in the people. I think the board does promote it. With giving money to the fauna guard and other initiatives. In the last directors meeting we talked about this to make it our business. You can see it as a burden but you can also see it as your point of differentiation to get new works*	
66	6	1	General TBL	After Hand-In Tender	*First we had received the Maldives transaction. Then we determine the category of the project. For our environmental social due diligence we follow USO common approaches. The USO agreements for credit agencies is used and then based on the application we assess. Alongside we use local regulations and international IFC and on that basis do your assessment. Ideal for us is when a company itself already does due diligence good so we do not have to do it anymore. It is not a bad thing when this is not the case, every company's has its own process, but Van Oord has embedded its own risk system and due diligence in a certain way.* *Pretty quickly we identified the Maldives project of Van Oord as a category A project. Land reclamation projects are standard category A. In addition, the work takes place in a sensitive area. Then Van Oord Environmental department knows how to report impact to us and the standard list to start with. This provides us with insight into methods, permits, management plans, sensitive areas, small-scale fishing, stakeholders in the area, etc. and we use all this to assess the project.*	
67	6	2	Indirect economic impact	After Hand-In Tender	*First we receive the EIA's, there were 3 for the different islands. The quality can change a lot an in this case they were not of very good quality, but workable. I think it was a sufficient document for Van Oord could get started. We also look at the positive aspects of a project. This differs per project but I think there were many positive aspects in this project. These include resilience of islands, improves quality of life, protection against erosion and third employment (of homework there and employment there). We have gained insight into what was to come after the project, such as utilities and schools*	Credit Insurance, Island Plans

68	6	3	Biodiversity	After Hand-In Tender	*In addition, looked at the potential negative effects and how they would be mitigated. Always important is the maritime water quality and how VO ensures that the turbidity is mitigated. Also looked at biodiversity in the project. We wanted insight on this (also basis situation) because coral was reasonably dead. The coral transplantation was mandatory in one EIA of one island. An inventory is made everywhere and how feasible is the coral transplant this can be lead back to IFC standard 6 biodiversity. Concerning actions that modified your effects less, when critical you should look more to the measures to limit. At first we see the importance to look carefully how it should be done should the project be there and is it the most favourable project. I think this process happened before Van Oord came in the picture.* *We also expect from and VO that they think about adjusting the method, monitoring and other measures in the broadest sense to prevent turbidity and prevent disruption. We understood there had been Inventory and feasibility studies in the area and looked at 1 location to really do the transplantation happened. Between Van Oord and us there was always a Q & A atmosphere.* *In the EIA it said the should be monitoring between 3 and 5 years of the coral. I understand, because Van Oord is gone again that the client continues this work. But as a company they have contributed and they don't know if the monitoring has proceeded. We don't take this in our assessment but I can imagine as a company that you want to know. Maybe Van Oord odes know this but for us it stopped as we are very much a paper exercise, but sometimes we also visit the project. We had a lot of information here and think were the measures on Biodiversity is also sufficient. I just wanted to raise the question: Where does your responsibility end in the longer term? I understand it takes time and manpower if you are already gone.*	Coral
69	6	4	Materials	After Hand-In Tender	*Another aspect we focused on in the Maldives was the supply chain part. Van Oord had a subcontractor that they worked with and also got the rocks from them. We look at supply chain responsibility so here raised the question of What about the quarries? Subcontractor Sierra had also again parties who they contracted for the rocks. I have contact at Van Oord with the Treasury but also a lot with the Environmental department directly, because she knows very good what we want. In the Maldives project, stone quarries in India were used. Then you are right in a risk atmosphere. We ask questions about what is the management system of the quarry and how is dealt with the employees. Then it comes down to the own due diligence of the company of their own supply chain. The environmental engineer of Van Oord went after this and made sure when the quarry's were not up to standard that the subcontractor made adjustments and followed Van Oord guidelines. How to monitor or track that further is the responsibility of Van Oord. You show us we think this as important to us and we are working on it and then we have gained sufficient insight.*	Stones
70	6	5	Indirect economic impact	After Hand-In Tender	*With all of this is included we then write an advice, permit situation. We are also practical because know no project is the same so understand that the permits can change. We also heard from Van Oord about the island councils, so we got the impression that the social aspect are taken into account. What we also included in the project that Maldives had a lot of donor support. UN development program, Asian development bank, and other large multilateral institution made money available to the government for projects and sustainability. This helps in our realisation that the Maldives is a country under construction which also receives help in the international community.*	Credit Insurance
71	6	6	General TBL	After Project	*In the yearly sustainability report we always include a case. Last year we did the Maldives project of Van Oord. We wanted to reflect on this project. Van Oord provided us with the content.* *Our involvement is early on. We do not see what happens in the execution phase of a project. Preferably a client wants to have their credit insurance at the time of the contract signing.*	
72	6	7	General TBL	General	*Collaboration, We have been working with VO and Heidi for a long time. We know very well what we need from our point of view and communicated with Heidi this is often also what she needs. On social aspect we often need more and our role in local stakeholder is under development. Besides environment and biodiversity, the social aspect social is more included now. I would not say that we demand something. We start with sometimes asking something that is not yet there because an environmental management plan often comes later, sometimes even not yet an EIA and then we would classify it category A.* *We put the projects on our website, to publish our projects so that the outside world knows what we are involved with. Often these are kept an eye on by NGO's.* *Overall the process with Van Oord went well because we are used to working with each other but sometimes compromises are needed.*	
73	7	1	General TBL	Project Preparation	*First to arrive on site. This was a decent amount of time before the work started. Van Oord had not been in the Maldives for the past 20 years so I was there to contact the client and other people. Together with the EE went through the EIA and from there the EE had contact with everyone around the client and I had direct contact with the client.*	
74	7	2	General TBL	Project Preparation	*I was included in the project through the usual Van Oord way. What do we need, who is available. First short phone call with the area manager and then later meeting at the head office with the area manager and a managing director was also involved.*	
75	7	3	Materials	Project Preparation	*In the preparation, searching for sand, first soil research to evaluate if there is suitable sand. This was done for all three locations. Then per island started the works which contained a number of cubic meters of land reclamation that need to be flat at handover and then stone work. Effective execution time has lasted a month or 8.*	sand
76	7	4	Transport	Project Preparation & Execution	*the only thing that took longer than expected was the shifting from island to island. You know we moved from north to south, 800 kilometre. From atoll to another atoll you also make a crossing on open ocean. You need a certificate insurance to make the crossing and this was not explicitly taken into account in the budget*	
77	7	5	Indirect economic impact	After Project	*Currently the warranty has expired so the project is fully completed. The reclaimed land in Male is quite full of buildings also I looked on google maps and the other three islands are not. Considering the industrial area in Male was already budget for and the islands had to look afterwards at a budget for development. When we were working there, the idea was not that there was money for it . The two extra works we did are already being developed*	Island Plans
78	7	6	Indirect economic impact	Project Preparation & Execution	*However we did not use local employment. The local community does not have an 7 to 5 mentality. We first employed a local secretary however she stopped showing up and eventually texted that her cat was sick so never heard of her anymore. We did invest in local content in the form of hotel accommodation and food but not in the works. We actually did use local diver but they were from the NGO safe the beach so we gifted the NGO for their supportive work.*	Local employment
79	7	7	Materials	Project Preparation	*As soon as the word Maldives was discussed, I went on to google to search on the topics of dredging and our competitors names. The first ten hits were much media on our direct competition. Around Male they did projects and all the fine sand that became visual made sure they were in the newspapers a lot. Many pictures showed how turbid the water was.* *Then I went to Heidi van der Meij what can we do? It will influence our finances of the project because of the longer production period but I think that for VO and the Maldives is was an important decision. Boskalis was using the rainbow technique which gave a large scandal of fine dust. And we don't want that. I think my google search showed dredging in the Maldives was going to be difficult to not be in the papers and that made sure form the start it was a certain approach.*	sand
80	7	8	Materials	Project Preparation	*We did try to search for more coarse sand. The electronic equipment that we have onboard the ships we use and a geologist can look at the reflection. Under the first layer of sand we look at the sand layer and the thickness of the layer. We scan the area kilometre by kilometre and take a steel frame and with a hydraulic system we take open the pipe and the geologist looks at is. The visual is already an indication. It should be coarse sand to resist the waves and I had addressed that we should look for more coarse sand because of our long presence that can cause much damage. For me there was budgeted at 350 mu sand but eventually we used 400-450 mu sand. That costs production so that we have as least as possible plumes. We had a free letter to look for sand except some areas in relation to stingrays and were not allowed close the coral riffs. On the boat there is a surveyor that maps the ground for the hopper*	sand
81	7	9	Local Communities	Project Preparation	*There have been stakeholder meetings. That is an extension of our approach with Safe the Beach. EE did this and went to the island before we started. We pushed our client to do these meetings. Every time there were two meetings. First with island council this is often the mayor and some business people, the second meeting is for the people who live there. When we were dredging at a resort our client did not want to have contact with the international resorts, we ourselves did want to approach them.*	stakeholder
82	7	10	Local Communities	Execution	*In the most southern island of the project there was a Dutchmen who had a diving school in the stingray area he was allowed to dive. He started very negative towards the project and wanted to approach the client, but he calmed down when we approached him during the project to rent his diving equipment with our research dives.*	stakeholder
83	7	11	Biodiversity	Project Preparation & Execution	*The monitoring and protecting we took serious together with NGO safe the beach. They used a renowned system and then every few meter we took pictures underwater of one by one meter. With these pictures safe the beach had software and this with their knowledge we could determine what needed to be protected. We took this very serious before and after the project. Also if we had to hire boats to go to the islands with the diver we did it to make sure it was done.* *Collaboration with safe the beach was initiated proactive. With the background of the EE we approached the client (ministry of environment) then safe the beach arose as they might cause difficulty so we should first approach them. We requested the client for a meeting with them asap. Two days later we had the meeting and they were completely against the dredging. However I do believe better the meeting before than afterwards.*	Coral

84	7	12	Local Communities & Biodiversity	Project Preparation	*An EE employee in the Netherlands plays an important role in this philosophy. As un surrounding manager he has worked for 6 to 7 year in the Netherlands. Internationally I had never heard of this. Through Heidi I had a conversation with him and he showed me these kind of proactive methods.* *So we approached Safe The Beach with questions such as what do you think of the project and how would you want it. Safe the beach approach is fundamentally against the dredging but if everyone is open for it we can look together at ways to minimize the damage. After the project they also recognised officially that we always tried to minimize the impact. The EE did all the contact with Safe the Beach about the EIA of each island because of the different areas of the islands. With Safe the Beach they made a checklist and then feedback to me what is needed. With Safe the Beach we always had open and transparent communication. We send then 1 on 1 our environmental report that we also shared with the client during our weekly meeting with the client.*	stakeholder coral
85	7	13	Local Communities	Execution	*An example is our interaction with the local communities is the Ramadan. We contacted restaurants with now windows because our employees did need to eat. Also everyone got a memo from me explaining what the Ramadan was and that we were guest in their culture and demand people to keep to the rules. This was also sent to employees as they were traveling to the Maldives to join the project. This was a way to make people conscious of the Ramadan and respect towards the local community is a small gesture but it improves contact.*	nuisance
86	7	14	Local Communities	Project Preparation	*I had walked on the island and the land reclamation we were going to do was 10 meter in front of a house and then damage is quickly done especially at night. I deliberately put one Dutch as start director and he indicated who he wanted in the night shift. On the technical side we had three Dutch operators. From my experience it is better to have Dutch employees on difficult work. This causes for me continuity and normal work. I know that houses won't be flooded. This is more based on experience than nationality.*	Local employment
87	7	15	General TBL	Execution	*Through communication on site, through talking and telling. The EE was more often on site, and made it a conversation topic because we have come here to cope with everything well.*	
88	7	16	Biodiversity	Project Preparation	*In the preparation phase we talked about the hydraulic system on the ships. This could improve the system however I wanted it to be taken off because I wanted certainty about no oils leaks or other risks that come with this system. So during the final preparation of the ships in the Middle East before the ships came to the Maldives it was taken of. This happened first through the ship management, also in communication with works manager (he has 5 people under him) and finally back to the planning in Rotterdam. If this costs money then it is at the expense of the project. If I explain no risk then it is done, it is in the best interest of the project to minimize risks, technology department says risk is small but I say get rid of that junk, hydraulics can cause a lot of damage and that's what I do not want experience.*	Ship
89	7	17	General TBL	General	*Image is a big motivator of VO to do these extra things. But also when you are working in a country such as the Maldives you want to keep the environment because of the feeling for yourself or to keep you from getting a bad name. I think name/image is number one it might sound stage but I think priority of the work*	
90	7	18	General TBL	After Project	*I think there is a culture within the company, I understood that in the year plans there is more budget for the environmental engineering department. I also heard that the environmental engineering department is put more on the agenda from the ships management. I think awareness is something that always happens but can be enlarged through training.*	
91	7	19	General TBL	After Project	*Don't know for sure, what I hear to my right and left is that it was different. No that I think my colleagues leave a project site and think done good luck with it. However I don't think these kind of initiatives are always budgeted. I think an EE stakeholder manager is a good trigger as it is now not budgeted an there for the project manager needs to first undertake the steps themselves. VO could try this to enable everyone to think 'he, I should do something with that' in the broadest sense.*	
92	8	1	Biodiversity	Project Preparation	*Initially I was involved in protesting the project along with my General Manager during stakeholder meetings with the Council where I provided the Government and the Himmafushi council with scientific evidence of why the project should not take place, from an environmental standpoint. Issues raised included the abundance of Green Sea Turtles, presence of endangered sea grass beds, high coral cover of many bleaching resistant species in the face of an upcoming El Nino, the effect of sedimentation compounding on the effects of the upcoming El Nino, and the presence of juvenile lemon sharks, which are rare in the atoll. The General Manager of the Resort was also upset from an aesthetic standpoint. The project went ahead anyway, and I was approached later on to help Van Oord conduct impact surveys, and to help mitigate the impact of the reclamation project, which I tried to do.*	Coral
93	8	2	Biodiversity	Project Preparation & Execution	*Following our protest to the project, I was emailed by a Van Oord representative (Tijmen) and we invited him to the island (I think?). We had discussions and I helped to conduct surveys on the reefs surrounding the proposed reclamation site before the work took place, along with Maldives charity 'Save the Beach' employees. I believe the aim was to conduct these surveys during and after the project as a comparison to determine impact, however I was not involved with this, and I don't know if this went forward or what the results were. I also worked to relocate corals from the reclamation site to a safe site.*	Coral
94	8	3	Biodiversity	Project Preparation & Execution	*I believe Van Oord worked with the construction team and/or local council and persuaded them to mitigate the project, mainly by the use of bunding around the sand pump to prevent sedimentation to the reef. This probably came about several weeks before the planned start date.*	coral outflow
95	8	4	Biodiversity	Project Preparation & Execution	*My own team, along with the charity 'Save the Beach' began attempting to relocate the corals in the construction site to a reef outside the reclamation zone, and I believe Van Oord had a hand in postponing the reclamation project to give us time to do this. They managed to get us 3 weeks, within which time we were able to remove several hundred kgs of coral and clams from the area that would have inevitably died, however there was still a lot more that we couldn't save. Beyond this, seagrass beds were destroyed which were used by green turtles as feeding grounds. The project then took place over several months, as planned, where sand arrived and was pumped as per the council's schedule.*	Coral
96	8	5	Biodiversity	Project Preparation	*They had little time to sort out the mitigative plans, and my team could have done more had we been given more notice. Whether this is because we were not kept in the loop by the Council or Van Oord, or because Van Oord were also given little time by the council who were on a deadline, I don't know.*	Coral
97	8	6	Biodiversity	Project Preparation	*No initiative until Van Oord intervened, and mitigative measures were undertaken. EIA was conducted, but in my opinion it was done poorly.*	Coral
98	8	7	Indirect economic impact	Project Preparation	*No- their EIA was not an accurate representation of the area. I felt as though the stakeholder conference was more just to let us know it was happening, not to listen to our side.*	stakeholder
99	8	8	Biodiversity	Execution	*I would also point out that we did a lot of work off our own back, and were not remunerated, despite a lot of money going into the project. Of course, we wanted to save the reef, so we did not want any money, but if this is to become something that is done as standard, the workers should be paid.*	Coral
100	8	9	General TBL	General	*I don't believe the managers of this project had any thoughts about the sustainability. They just wanted to complete the project as quickly and cheaply as possible. Little legislation is needed in Maldives, and often EIAs are pushed through or the officials paid off, so it's a tricky one to get managers to care.*	
101	8	10	Biodiversity	Project Preparation	*I think the same strategy of relocation was previously employed by local people in an attempt to mitigate the reclamation of Hulhumale. Both times it was not done by the project managers, and instead done by what I like to call 'environmental vigilantes' who participate in spite of the project management.*	Coral
102	8	11	General TBL	General	*I just think it's a really tricky subject that needs addressing so I'm glad you're studying it and I hope some serious change comes from this thesis. Ideally, the Gov. need to ensure someone environmental (unbiased, 3rd party like van oord) is always involved in projects like this to ensure mitigation is built into the project from the outset. Budget needs to be given to them in order to achieve this.*	
103	A	1	General TBL	Project Preparation	*Environmental department was involved during this early stage since PM team decided that Maldives requires in the first place a more than serious and pro-active approach towards the environment, . Secondary team considered it important to perform a good job in Maldives in order to make sure Van Oord would be well appreciated by authorities and other important parties in the region. A quick search on google for competitor names and combination with Maldives mainly resulted in "bad" news articles related to environmental effects. Looking around the internet and through publications there were never any bad publications made in relation to Van Oord's jobs in Maldives in 2016.*	
104	A	2	Materials	Project Preparation	*In order to be in control of the turbidity caused during dredging and reclamation works the material to be dredged should be coarse grained and should contain the least amount of fines possible. Therefore the sand search team was instructed to look out for material which would comply with these requirements. Clay and silty material was considered unsuitable.*	sand
105	A	3	Biodiversity	Project Preparation & Execution	*The Maldives are known for their pristine fringing reefs being home to very diverse marine life. Many hundred-thousand of tourists visit the Maldives every year for its rich and colourful ecosystem. As the Himmafushi and Feydhoo reclamation were in the close vicinity of high-end resorts and frequently visited dive sites the project had to comply with strict EIA requirements and an environmental monitoring program, amongst others:* *- Construction of peripheral bunds at the reclamation area to prevent outflow of fine sediment* *- Turbidity requirements (limitations 29 NTU) and extensive water quality monitoring campaign* *- Coral monitoring program prior to the works and after completion* *- Coral relocation effort for live coral in the footprint area.*	coral outflow

106	A	4	Materials	Project Preparation & Execution	*One of the contract requirements was the execution of a sand search program in order to investigate the possible borrow areas in the various atolls. Since working in environment sensitive area, the project requested to sand search team to find coarse material that turbidity can be control during dredging and reclamation. Additionally, according to Maldivian regulations the borrow areas could not be located within 500 meter of any reef or island.* *For Feydhoo reclamation works the area inside the Addu Atoll was investigated. Subsequently for Thinadhoo reclamation the area inside the Gaafu Dhaalu atoll close to the reclamation area was studied, both previous borrow thus (very) close to the reclamation areas. For Himmafushi however the Ari Atoll was stipulated to be investigated for an potential borrow area. (distance + 100 km from reclamation area). This is because the area in the vicinity of Himmafushi has been used for dredging sand by other companies for previous projects (Boskalis and JdN); these previous actions caused major plume issues. During the preparation of the project, however, MHI requested to investigate possible use of suitable borrow areas in the North Male Atoll. It turned out that the areas were either depleted or only containing high percentages of fines. Therefore unsuitable. An quite suitable but small area was found in North Male Atoll, close to Male. This area was utilized for the dredging of sand for the Male Industrial Village work. (additional scope).* *Blackbird (a push buster owned by Van Oord) was deployed to perform sand search campaign. First, the survey was conducted using a Parametric Echo Sounder (PES). Based on the PES result the geologist evaluate the data and found potential borrow area for further vibro-core investigation. Van Oord engaged Marine Sampling Holland to execute the vibro-core. A winch system specially installed on Blackbird deck crane to lower/retrieve the high power electric vibro-core machine which was constructed and operated by MSH to extract the samples from seabed. The extracted samples was logged and selected samples were sent to Fugro in Dubai for lab analysis.* *Most vibrocore samples indicated a suitable sand thickness of 1 meter. Approximately all vibrocore samples were terminated in limestone. This is because the material is considered as a solid basement rock situated below the suitable sand layer. Based on the vibrocore results the borrow area outline was further specified.* *In the end for each reclamation project a borrow area was proposed to the client. By means of geological notes the explanation was given what material was found in the borrow area and why certain borrow areas were unsuitable for the works.*	sand
107	A	5	Materials	Project Preparation	*A quarry joint inspection visit was made together with MHI, Van Oord and Sierra at Tuticorin, India on March 10 2016. Rob Slangen attended the visit on behalf of Van Oord. After satisfactory inspection it was mutually agreed to use boulders for this works from 3 different suppliers by Sierra.*	stones
108	A	6	Occupational Health	General	*Getting Sierra up to the required safety standard and attitude took some time, but after all was clearly instructed and accepted by site responsible persons of Sierra all went well.*	
109	A	7	Biodiversity	General	*Most of the reclamation sites are in close vicinity to resorts and c frequently visited dive locations. Additionally, Maldivian waters are filled with valuable marine life (turtle's, whale sharks, dolphins, Manta rays) all Van Oord employees were asked to pay extra attention to the marine fauna to not cause any injuries to them.*	Coral
110	A	8	Local Communities	Project Preparation	*In order to be aware of the opinions of the stakeholders and the possible complaints that could rise during the execution of the works, the project team had decided to proactively manage the project stakeholders. Prior to the start of the dredging works WM and Environmental Engineer made contact with as many stakeholders as were willing to meet, this included local authorities, resorts, dive school owners, fishermen, airport authorities, etc. During the meetings a brief description of the project was given and questions from concerned stakeholders were answered. By informing and involving the local stakeholders a better support base for the project was created. Additionally by knowing the stakeholders and sharing contact information, complaints during the execution could be settled quickly without interference of local press. Showing Van Oord's track record and achievements on other environmental sensitive projects (Australia, Bahamas, EU) increased the confidence of the stakeholders. In the end only one complaints was received which could not be solved to satisfactory, the complaint was from Nika Island resort situated in the North Ari Atoll. The island resort claimed to be uninformed (which was not the case), additionally the remaining complaint was partly from a political point of view. The project team clearly informed the Client that Van Oord would not interfere nor get involved in political discussions, as this is not in Van Oord's interest. In Himmafushi a high-end resorts (Gili Lankanfushi) was within 1000m of the reclamation area. The resort protested against the project prior to the start of the works and successfully managed to delay the final EIA approval with approximately 3 months. Therefore contact had been established with the resort manager and the marine biologists of the resort. After completion of the works no complaints had been received regarding turbidity or noise.*	stakeholder
111	B	1	Local communities	Project Preparation	*'This project was the first time we were contacted by a dredging company to see whether we could collaborate and minimise the impact of a project. We first met Van Oord when their environmental engineer contacted us last year. He told us about the upcoming land reclamation project on the island of Himmafushi, the possible impact it would have on the environment, and the measures they wanted to take to minimise that impact.'* *Name: Josie Chandler, Marine Biologist at Gili Lankanfushi*	stakeholder
112	D	1	Biodiversity	General	*They sought our services for the said surveys and to the best of their capabilities sought to minimize the impacts of the reclamation to the nearby reefs, by ensuring community consulation and monitoring.*	Coral
113	E	1	Local Communities	Project Preparation	*Early involvement of Environmental related parties was well appreciated and very important. Environmental Authorities and other parties are keen to and happy to communicate with Environmental Engineers on behalf of contractors side; they feel to be taken serious and the topic to be treated provisional and with respect.*	stakeholder
114	F	1	Biodiversity	Project Preparation	*The Ministry of Housing and Infrastructure planned an extensive reclamation for Himmafushi in order to provide more space for housing and industries on the island. For the project an EIA was drafted by MEECO and one of the mitigating measures following from the EIA was the relocation of coral which was situated inside the footprint of the reclamation area,*	Coral
115	F	2	Biodiversity	Project Preparation	*Multiple in surveys of the coral cover were executed by StB together with the marine biologist of Gili-Lankanfushi and the Environmental Engineer of Van Oord, prior to the relocation works. The first survey was conducted on 30th of March 2016. Within the area to be filled in for reclamation, in the South Eastern lagoon of Himmafushi, there are various species of hard corals, fish and invertebrates. Using a 100 meter transact, a survey was carried out to estimate the coral, fish and invert species and their numbers.*	Coral
116	H	1	Indirect economic impact	General	*The purpose of the project is to alleviate the problem of congestion in the capital city Male, for even distribution of resources throughout the country and for regional and social development. Client is the Ministry of Housing and Infrastructure of the Government of Maldives. Dredging activities will start early 2016 and the project is scheduled for completion one year later.*	Island Plans
117	H	2	Biodiversity	Project Preparation	*A method Statement has been prepared and formed part of the tender submission of Van Oord. The same method statement is also part of the Main Contract and Subcontract with Sierra. The aforementioned Method Statement is attached to this questionnaire. Also, based on the EIA's (that are available on the internet) and VO's Management System including the Env. Impacts and Aspects Register we are already preparing the Environmental management plan for the 3 Islands. When these are ready and to be submitted to the Client, we will send these to Atradius as information. However, formally no EIA's and permits have been received to date*	Coral
118	H	3	Biodiversity	Project Preparation	*This is the favourable season with respect to sea states* *The areas are not prone to large commercial fishing activities* *Environmental measures will be taken as per regulations and Van Oord Standards (these will be inserted within the EMP)* *EIA provides all sensitive areas surrounding the islands, within our work method and EMP we will take all sensitive areas into account and will design the works in order to minimize the impact on the surrounding environment.*	Coral
119	L	1	Biodiversity	Project Preparation	*Compulsory mitigation measures according the EIA are for all three reclamation projects:* *• Construction of peripheral bunds, surrounding the reclamation area, prior to the dredging works.* *• Water quality monitoring program* *• Coral health monitoring program* *Mitigation measures for Himmafushi only:* *• Coral relocation program*	Coral
120	L	2	Biodiversity	Execution	*In the EIA it was stated to construct peripheral bunds at the reclamation area, before the area could be reclaimed. The bunds prevent the loss of material and also prevent the spreading of plumes and sedimentation in the direct vicinity of the reclamation area.*	Coral
121	L	3	Biodiversity	Project Preparation & Execution	*For each island (Feydhoo, Thinadhoo, Male and Himmafushi) a water quality monitoring plan has been designed and executed. The monitoring program included monitoring activities at the borrow area as well as monitoring at the reclamation site. As the reclamation areas were in the vicinity of reefs, resorts and villages the water quality was checked on a daily basis. For the Borrow areas, depending on the location, a different monitoring frequency was used.* *For the monitoring a YSI EXO sonde was used. The measurements included the following water quality parameters:* *• Acidity (pH)* *• Salinity (psu)* *• Temperature (deg C)* *• Depth (m)* *• Turbidity (NTU)*	Coral

Appendix I – Systematic Event Comparison per Outcome

Table 11 – Systematic Event Comparison Economic Performance

Start Project	40	41	42	43
40	1			
41	2			
42	3			
43	4			

Credit Insurance	1	2	3	5	9	59	67	70
1	1							
2	4							
3	3							
5	8							
9	6							
59	5							
67	2							
70	7							

Table 12 - Systematic Event Comparison Indirect Economic Impact

Local employment	8	54	78	86
8		x	x	x
54	1			
78	3			
86	2			

Island plans	15	27	67	77	116
15			x		
27	2				
67	1				
77	4				
116	3				

Table 13 - Systematic Event Comparison Materials

Stones	51	62	69	107
51	1			
62			x	
69	2			
107	3			

Sand	16	18	31	75	79	80	104	106
16	2		x	x		x	x	
18	3							
31								
75								
79	1							
80								
104								
106	4							

Table 14 - Systematic Event Comparison Biodiversity

Ships	44	53	88
44			x
53	1		
88	2		

Coral	7	17	32	63	68	83	84	92	93	94	95	96	97	99	101	105	109	112	114	115	117	118	119	120	121	122	123	127
7	5																											
17																x												
32	7																											
63	18																											
68	6																											
83	13																											
84	10																											
92	11																											
93	12														x													
94																												
95	16																	x										
96	8																											
97	2																											
99	17																											
101																												
105	1																		x				x	x				
109	3																											
112																												
114																												
115	14																											
117	4																					x						x
118																												
119																												
120																												
121	9																											
122	19																											
123	15																											
127																												

Table 15 - Systematic Event Comparison Local Communities

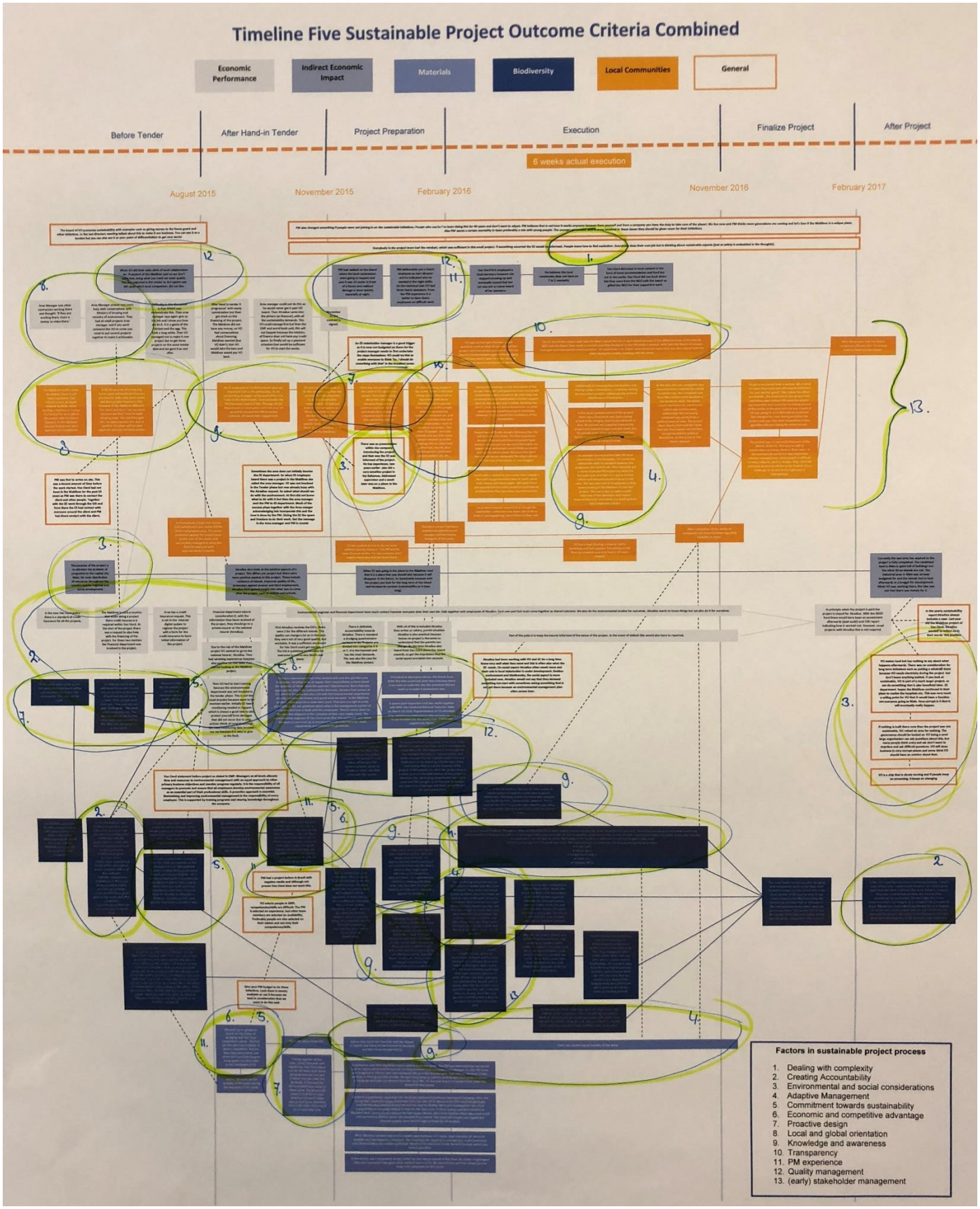
Nuisance	22	45	85
22			x
45	1		
85	2		

Stakeholder	14	19	20	21	25	30	33	38	47	52	60	81	82	84	98	110	111	113	124	125
14	4																			
19	3							x												
20	5																			
21	2																			
25	11																			
30										x		x						x		
33																	x		x	
38																				
47	12																			
52																				
60	7																			
81																				
82	10																			
84	1																			
98	8																			
110	6																			
111																				
113																				
124																				
125	9																			

Appendix J – Preliminary Identification of Factors in Case Study Timeline

Factors		Occurrence in timeline
1.	***Ability to deal with complexity***	During the execution knowing all the responsibilities and who does what, for initiatives to connect to the right people.
2.	***Creating Accountability***	Incorporation of EIA in tender phase alongside other demands in the project
		Atradius demands taken into consideration throughout the project on all aspects of the TBL
3.	***Environmental and social considerations***	Considerations brought into the project by mitigating the outcome in the preparation and execution phase. They are brought in by demands, regulations, the PM and team members association with the project location.
		Lack of environmental considerations in the outcome, as the project is not focused on improving the environmental aspects of the islands.
		Team members are brought in that have a high affiliations with social and environmental aspects. Their potential is seen as the project is made visible in presentations to the whole company.
4.	***Adaptive Management***	In the case study it had to do with changing and adapting in the situation at the project location. An example given was adopting to the local culture by incorporating the Ramadan in the operations. This was done on the project site and set up during execution.
		The close monitoring of water and coral was required in the EIA but also needed due to the effect of El Niño to show that Van Oord was not causing the bleaching effects. The monitoring was used to identify which coral species were good enough to relocate.
5.	***Commitment towards sustainability***	The PM was committed to staying out of the papers and other team members were also committed to accomplishing this. Especially the function of the EE was important in realising this.
		Through the EIA and Atradius demands, accountability from VO was created. This resulted in commitment from the financial department, EED, the EE on the project and the PM in the preparation and execution phase. Indicated in the process it could better be incorporated in the tender phase.
6.	***Economic and competitive advantage***	Project executed by Van Oord because of economic motive
		By researching previous projects in area (this was done by multiple team members), there was knowledge about how competitors executed there. The research took place before tender and execution phase. This knowledge of the competitors experience was used to do it better than competitors.
		Taking into account the competitive advantage demands looking at the longer term. By earning money now but damaging the reputation more is lost then spending a little more on a project but maintaining a good reputation and increasing business in the future. This was reflected in the PMs actions.
7.	***Proactive design***	In the early stage of the project, the tender was adjusted after the area manager suggested a different type of ship but also later the sand search was also approached proactive. The stakeholder meeting were also initiated proactive.
8.	***Local and global orientation***	Ships and team members from across the whole world.
		This was set up by the EE through stakeholder involvement. They knew the approach how it is done in the Netherlands but now wanted to incorporate this in the case study location.

9.	***Knowledge and awareness***	VO also has much more knowledge inhouse and the PM was sent to the EED to gain knowledge on other aspects, by learning from an employee of the EED department who had many years of experience in stakeholder engagement.
		Also other knowledge of VO was used in the project, an example is the knowledge on the impact of dredging and reclamation projects. By knowing the impact of coarse sand in comparison to fine sand the design can be adjusted accordingly.
		In the case study there were several instances where VO broadened their knowledge. Due to the contact with the stakeholders, VO opened up and used the knowledge of the NGO and local environmental expert on how to monitor the coral and how to relocate it.
		The whole execution team aware of why they operate in a certain way and for them to also understand the reasons behind it.
10.	***Transparency***	After having set up measures to mitigate the impact on the environmental and social aspects of the project the PM was very transparent with the reports. It was required to share environmental reports with the client but it was also shared with the NGO that was collaborating in the project.
		The stakeholder meetings also indicate transparency as VO wants to share what they are doing.
11.	***PM experience***	From previous projects he had learned important lessons that were implemented in the project case. During a project before the case study the PM had experienced bad publicity on the project even though they did not do anything wrong. To prevent this the PM set a goal of no bad publicity and therefore, being very aware of how the project would reflect on people. This led to actions in multiple outcome criteria. It triggered the stakeholder engagement approach, search for other sand and the focus of incorporating biodiversity plans.
12.	***Quality management***	This focus was initiated by the client by addressing it when VO wanted to incorporate local content in their tender. The President demanded quality and suggested this cannot be achieved with local content.
		Also during the project the PM focussed on quality when works were either more difficult or should be done precise to prevent damage. The actions had much to do with experience of the PM and focus of considerations. The PM was focussed on not creating any damage thus pumps were taken of the ships, Dutch crew was put on night shift and the sand search was stared resulting in a better quality.
13.	***(early) stakeholder management***	This was visible in the local communities timeline. It started by acknowledging that the situation is different than the usual practices the Netherlands and that stakeholder engagement should be incorporated. To involve all the stakeholders at the start of the project is an actions that was initiated by the PM based on his experience and the EED. To fill in the how question he was advised by an experienced employee of the EED. Then the process started of having the EE focus on this and give him the room to operate. All the stakeholders on the island were informed on the basis of meetings. At first the client did not want this but after proactive approach form VO towards the client the meetings were organised in consultation/collaboration with the client. By keeping the stakeholders on the island in the loop many other actions regarding knowledge sharing, biodiversity actions and actions in regards to materials followed.


Timeline Five Sustainable Project Outcome Criteria Combined
Economic Performance
Indirect Economic Impact
Materials
Biodiversity
Local Communities
General
Before Tender
After Hand-in Tender
Project Preparation
Execution
Finalize Project
After Project
6 weeks actual execution
August 2015
November 2015
February 2016
November 2016
February 2017
Factors in sustainable project process
1. Dealing with complexity
2. Creating Accountability
3. Environmental and social considerations
4. Adaptive Management
5. Commitment towards sustainability
6. Economic and competitive advantage
7. Proactive design
8. Local and global orientation
9. Knowledge and awareness
10. Transparency
11. PM experience
12. Quality management
13. (early) stakeholder management

Appendix K – Preliminary Identification Signals Project Management Process from Case Study

The events brought forward in the case study form a complex process that is shown in the total visual representation of the project (the fold-out page). By using the factors identified in appendix J an indication is given of what is present in the process. Several conclusions can be taken from this when comparing the process to the literature in chapter 3:

- Section 3.3 introduced three methods of project management that take into account sustainability. When looking at sustainability in the project process it can be incorporated in the general project management or be a separate process that is managed. In the case study sustainability was brought forward through the general project management thus relating to the SPM method (Silvius & Schipper, 2010). An part of the method is integrating in project management the managing of and for stakeholders (Silvius & Schipper, 2010). This is present in the case study. The environmental considerations in the case study have a separate Environmental Management Plan (table 7, document M). This plan is not referred to by any interviewees and although present as a separate plan, it is incorporated in the general project management. In the case study many actions from the Environmental Management Plan are demands from the EIA and the responsibility of the EE who is given the support, budget and freedom by the PM to execute this properly. These measures are taken into account in the project preparation and execution.
- The underlying signals in the project process (3.3.3) are leadership, people and resources. Through specific questions (from the PSEM) in the interview protocol these events were brought forward. They came back in the events list and the visual timeline. Leadership is referred above as an important factor and the PM experience plays a large role but also the ability to communicate the sustainability considerations to the whole team was closely followed in the process. However leadership also goes beyond the PM. The question rises not only from his own experience but within the company there is also a stimulus.
  The final underlying signal refers to the people on the project. The right PM on the project is key but also other team member should have the skills and be motivated. The PM addresses the issue of young people having a different mindset that should be incorporated. Also the EE on the project was an essential puzzle piece in the process of the case study. He was involved in the project because he had heard of it at an internal presentation and felt his experience on the Bahamas would contribute.
- The integration of sustainability in the project process can be identified along the factors found in literature. Based on the factors in 3.3.1 and 3.3.2, section 6.2 identified the factors in the case study process with each actions. Overall the PM experience was a big driver in the case study project which was not brought forward by many literature in 3.3.1. Most literature focussed on knowledge and awareness and the early and broad stakeholder involvement which also played an important role in the project process. The PM experience was based on environmental and social considerations but also an economic perspective that aims at a competitive advantage resulted in his commitment towards sustainability. The created accountability by the EIA and Atradius demands also resulted in in many positive actions. However, proactive and adaptive management that were brought forward in 3.3.2 as specific for this sector were present in the project process but did not have such a significant role as previous mentioned factors.

Appendix L – Validation Protocol

Creating a sustainable operating environment in dredging and reclamation projects

No of Validation Session:	**#**
Date:	
Participant:	

I would like to thank you in advance for your time and your contribution to my research!

Introduction

First short introduction who I am:

- Master Construction Management and Engineering at the TU Delft, Civil Engineering with extra graduation annotation of 'Sustainable Development and Technology'
- Master thesis conducted in collaboration with Van Oord, working together with Erik van Eekelen and Sander Dekker
- Interest in project management and the role it can play when incorporating sustainability in a project. Involved in multiple construction project during master projects and internships however new field dredging.

Motivation

In my research I search to answer the following question: How does project management create a sustainable operating environment in an international dredging and reclamation project?

For the research I have looked into one case study in the Maldives. After conducting interviews with several team members and researching project documents I completed the project timeline. For the final step of my research I indicated factors that arose in the process and brought forward recommendations.

Aim of the session

The session will be used to validate the identification of factors in the process. Also to indicate the most important actions and reproducibility of the process and recommendations.

Structure of the interview

The validation session consists of three parts. The first part will focus on general questions. Then in the second part will be a questionnaire that identifies factors in the case study process and the final part will focus the reproducibility of the results.

Confidentiality

Before starting with the main part of the interview I would like to raise the issue of confidentiality regarding the information you provide in this interview. I will refer to you as project manager with x years of experience, if you would like differently how would you like to be cited?

Other:_____

May I record our meeting?

☐ Yes ☐ No

Before we start with the questions, I would like to clarify that there are no right or wrong answers as this is about your perspective and opinions. Should you consider any of the questions as unpleasant and prefer not to reply, you are free to do so. Additionally, should you have any difficulty in understanding the questions, do not hesitate to ask me for further explanation.

Do you have any questions so far?

Validation Part I – General information

To start the validation session I would like to ask some general questions

1. How many years of experience do you have as a project manager?
2. How would you define sustainability?
3. How do you see sustainability in regards to executing projects?
4. Are you familiar with the term triple bottom line?

Validation Part II – Questionnaire

Explain the case study timeline and the factors from literature

The following questionnaire responds to the factors that I identified in the project process timeline.

Factors	Occurrence in timeline	Agree/Disagree	Comments/Suggestions
Ability to deal with complexity	During the execution knowing all the responsibilities and who does what, for initiatives to connect to the right people.	Agree/Disagree	
Creating Accountability	Incorporation of EIA in tender phase alongside other demands in the project	Agree/Disagree	
	Atradius demands taken into consideration throughout the project on all aspects of the TBL	Agree/Disagree	
Environmental and social considerations	Considerations brought into the project by mitigating the outcome in the preparation and execution phase. They are brought in by demands, regulations, the PM and team members association with the project location.	Agree/Disagree	

	Lack of environmental considerations in the outcome, as the project is not focused on improving the environmental aspects of the islands.	Agree/Disagree
	Team members are brought in that have a high affiliations with social and environmental aspects. Their potential is seen as the project is made visible in presentations to the whole company.	Agree/Disagree
Adaptive Management	In the case study it had to do with changing and adapting in the situation at the project location. An example given was adopting to the local culture by incorporating the Ramadan in the operations. This was done on the project site and set up during execution.	Agree/Disagree
	The close monitoring of water and coral was required in the EIA but also needed due to the effect of El Niño to show that Van Oord was not causing the bleaching effects. The monitoring was used to identify which coral species were good enough to relocate.	Agree/Disagree
Commitment towards sustainability	The PM was committed to staying out of the papers and other team members were also committed to accomplishing this. Especially the function of the EE was important in realising this.	Agree/Disagree
	Through the EIA and Atradius demands, accountability from VO was created. This resulted in commitment from the financial department, EED, the EE on the project and the PM in the preparation and execution phase. Indicated in the process it could better be incorporated in the tender phase.	Agree/Disagree
Economic and competitive advantage	Project executed by Van Oord because of economic motive	Agree/Disagree
	By researching previous projects in area (this was done by multiple team members), there was knowledge about how competitors executed there. The research took place before tender and execution phase. This knowledge of the competitors experience was used to do it better than competitors.	Agree/Disagree
	Taking into account the competitive advantage demands looking at the longer term. By earning money now but damaging the reputation more is lost then spending a little more on a project but maintaining a good reputation and increasing business in the future. This was reflected in the PMs actions.	Agree/Disagree

Proactive design	In the early stage of the project, the tender was adjusted after the area manager suggested a different type of ship but also later the sand search was also approached proactive. The stakeholder meeting were also initiated proactive.	Agree/Disagree
Local and global orientation	Ships and team members from across the whole world.	Agree/Disagree
	This was set up by the EE through stakeholder involvement. They knew the approach how it is done in the Netherlands but now wanted to incorporate this in the case study location.	Agree/Disagree
Knowledge and awareness	VO also has much more knowledge inhouse and the PM was sent to the EED to gain knowledge on other aspects, by learning from an employee of the EED department who had many years of experience in stakeholder engagement.	Agree/Disagree
	Also other knowledge of VO was used in the project, an example is the knowledge on the impact of dredging and reclamation projects. By knowing the impact of coarse sand in comparison to fine sand the design can be adjusted accordingly.	Agree/Disagree
	In the case study there were several instances where VO broadened their knowledge. Due to the contact with the stakeholders, VO opened up and used the knowledge of the NGO and local environmental expert on how to monitor the coral and how to relocate it.	Agree/Disagree
	The whole execution team aware of why they operate in a certain way and for them to also understand the reasons behind it.	Agree/Disagree
Transparency	After having set up measures to mitigate the impact on the environmental and social aspects of the project the PM was very transparent with the reports. It was required to share environmental reports with the client but it was also shared with the NGO that was collaborating in the project.	Agree/Disagree
	The stakeholder meetings also indicate transparency as VO wants to share what they are doing.	Agree/Disagree
PM experience	From previous projects he had learned important lessons that were implemented in the project case. During a project before the case study the PM had experienced bad publicity on the project even though they did not do anything wrong. To prevent this the PM set a goal of no bad publicity and therefore, being very aware of how the project would reflect on people. This	Agree/Disagree

	led to actions in multiple outcome criteria. It triggered the stakeholder engagement approach, search for other sand and the focus of incorporating biodiversity plans.	
Quality management	This focus was initiated by the client by addressing it when VO wanted to incorporate local content in their tender. The President demanded quality and suggested this cannot be achieved with local content.	Agree/Disagree
	Also during the project the PM focussed on quality when works were either more difficult or should be done precise to prevent damage. The actions had much to do with experience of the PM and focus of considerations. The PM was focussed on not creating any damage thus pumps were taken of the ships, Dutch crew was put on night shift and the sand search was stared resulting in a better quality.	Agree/Disagree
(early) stakeholder management	This was visible in the local communities timeline. It started by acknowledging that the situation is different than the usual practices the Netherlands and that stakeholder engagement should be incorporated. To involve all the stakeholders at the start of the project is an actions that was initiated by the PM based on his experience and the EED. To fill in the how question he was advised by an experienced employee of the EED. Then the process started of having the EE focus on this and give him the room to operate. All the stakeholders on the island were informed on the basis of meetings. At first the client did not want this but after proactive approach form VO towards the client the meetings were organised in consultation/collaboration with the client. By keeping the stakeholders on the island in the loop many other actions regarding knowledge sharing, biodiversity actions and actions in regards to materials followed.	Agree/Disagree

5. In addition to the proposed occurrence of factors would you suggest more?

6. What would you identify as key factors in the project?

Suggestion: Stakeholder management, PM experience, accountability, knowledge and awareness

Validation Part II – Transferable Actions

From the identified factors several recommendations were brought forward. The following question focus on the applicability of the recommendations to other projects.

7. Do you think the project in the Maldives was different from you usual practices? On what aspects yes/no?

8. Do you understand the motives from the project manager in the case to incorporate other aspect?

9. Who do you think is responsible for the environmental and social aspects of a project? Who do you think should be?

10. In projects who would take the role of incorporating stakeholder management?

11. In the case study the EE incorporated this do you think this is logic?

12. In the case study the project manager approached the EED. The board of Van Oord has added social stakeholder to the sustainable policy and it is embedded in the EED . Do you think this is logic for your next project to approach the EED?

13. When you work on a project are you conscious to what the project outcome contributes? Impact on the TBL?

14. Do you make sure in your projects all the team members are aware of social and environmental considerations? If yes, how?

15. What do you think contributes to employees incorporating environmental and social aspects in a project? And what motivates or would motivate you?
Suggestions: demands, regulations, support from the board for these initiatives, team members association with the project location or motivated employees.

16. In your projects do you use the requirements from an EIA or Atradius? If yes how?
In the case study it had much impact on the outcome. Do you recognize this?

17. An environmental management plan is set up before execution. Do you think this should be broadened to a sustainable management plan or should other sustainability aspects be integrated in project management or other suggestion?

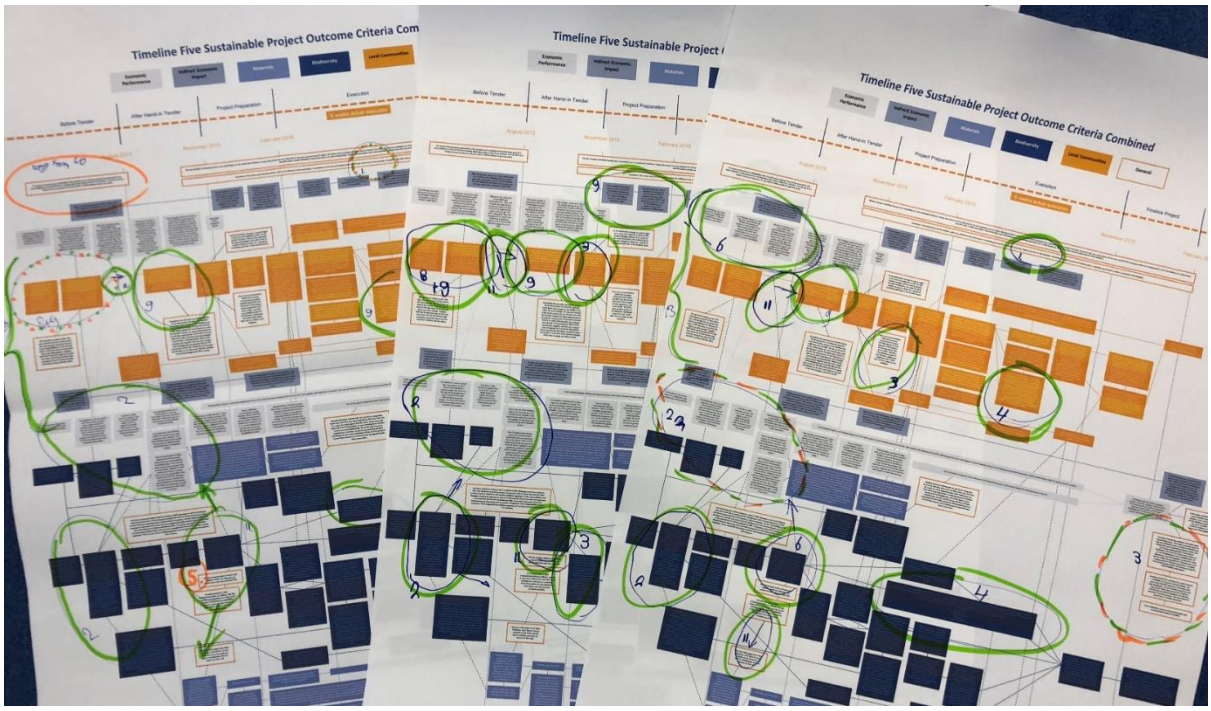
18. When you come into the project do you feel much has already been determined in the tender phase?

19. Is there enough support, budget and freedom to make decisions on environmental and social aspects as a PM? If yes/no could you illustrate an example?

Final - Thank you for your time and participation!

Appendix M – Validation Factor Identification Results

During the validation sessions the visual timeline from 6.1.3 was used to look at the factors with the PMs. This way the PMs were introduced to the project process of the case study and could see the interaction between the outcomes and factors. Given below are the validation timelines of three PMs . The green circles indicated that the PM agrees with the factor and red indicates he or she does not. During the circling exercise notes were taken about the comments these support the validation list in Appendix L.



Factors	Occurrence in timeline	PM1	PM2	PM3	PM4	PM5	Validation
Ability to deal with complexity	During the execution knowing all the responsibilities and who does what, for initiatives to connect to the right people.	+	+	-	-	+-	Adjusted
Creating Accountability	Incorporation of EIA in tender phase alongside other demands in the project	+	+			+	Accepted
	Atradius demands taken into consideration throughout the project on all aspects of the TBL	+	-			+	Adjusted
Environmental and social considerations	Considerations brought into the project by mitigating the outcome in the preparation and execution phase. They are brought in by demands, regulations, the PM and team members association with the project location.	+	+		+	+	Accepted
	Lack of environmental considerations in the outcome, as the project is not focused on improving the environmental aspects of the islands.	+	-			+-	Adjusted
	Team members are brought in that have a high affiliations with social and environmental aspects. Their potential is seen as the project is made visible in presentations to the whole company.	+	+	+	+	+	Accepted
Adaptive Management	In the case study it had to do with changing and adapting in the situation at the project location. An example given was adopting to the local culture by incorporating the Ramadan in the	+	+			+	Accepted

	operations. This was done on the project site and set up during execution.						
	The close monitoring of water and coral was required in the EIA but also needed due to the effect of El Niño to show that Van Oord was not causing the bleaching effects. The monitoring was used to identify which coral species were good enough to relocate.	-	-	+			Adjusted
Commitment towards sustainability	The PM was committed to staying out of the papers and other team members were also committed to accomplishing this. Especially the function of the EE was important in realising this.	+	+			+	Accepted
	Through the EIA and Atradius demands, accountability from VO was created. This resulted in commitment from the financial department, EED, the EE on the project and the PM in the preparation and execution phase. Indicated in the process it could better be incorporated in the tender phase.		+			+	Accepted
Economic and competitive advantage	Project executed by Van Oord because of economic motive	+	+	+	+	+	Accepted
	By researching previous projects in area (this was done by multiple team members), there was knowledge about how competitors executed there. The research took place before tender and execution phase. This knowledge of the competitors experience was used to do it better than competitors.	+	+	+	+	+	Accepted
	Taking into account the competitive advantage demands looking at the longer term. By earning money now but damaging the reputation more is lost then spending a little more on a project but maintaining a good reputation and increasing business in the future. This was reflected in the PMs actions.	+				+	Accepted
Proactive design	In the early stage of the project, the tender was adjusted after the area manager suggested a different type of ship but also later the sand search was also approached proactive. The stakeholder meeting were also initiated proactive.	-					-
Local and global orientation	Ships and team members from across the whole world.						-
	This was set up by the EE through stakeholder involvement. They knew the approach how it is done in the Netherlands but now wanted to incorporate this in the case study location.		+	-	+	+	Accepted
Knowledge and awareness	VO also has much more knowledge inhouse and the PM was sent to the EED to gain knowledge on other aspects, by learning from an employee of the EED department who had many years of experience in stakeholder engagement.	+			+		Accepted
	Also other knowledge of VO was used in the project, an example is the knowledge on the impact of dredging and reclamation projects. By knowing the impact of coarse sand in comparison to fine sand the design can be adjusted accordingly.	+					-
	In the case study there were several instances where VO broadened their knowledge. Due to the contact with the stakeholders, VO opened up and used the knowledge of the NGO and local environmental expert on how to monitor the coral and how to relocate it.	+	+			+	Accepted
	The whole execution team aware of why they operate in a certain way and for them to also understand the reasons behind it.	+	+		+	+	Accepted

Transparency	After having set up measures to mitigate the impact on the environmental and social aspects of the project the PM was very transparent with the reports. It was required to share environmental reports with the client but it was also shared with the NGO that was collaborating in the project.	-	-			-	Adjusted
	The stakeholder meetings also indicate transparency as VO wants to share what they are doing.	+	+	+	+	+	Accepted
PM experience	From previous projects he had learned important lessons that were implemented in the project case. During a project before the case study the PM had experienced bad publicity on the project even though they did not do anything wrong. To prevent this the PM set a goal of no bad publicity and therefore, being very aware of how the project would reflect on people. This led to actions in multiple outcome criteria. It triggered the stakeholder engagement approach, search for other sand and the focus of incorporating biodiversity plans.	+	+	+	+	+	Accepted
Quality management	This focus was initiated by the client by addressing it when VO wanted to incorporate local content in their tender. The President demanded quality and suggested this cannot be achieved with local content.	+					-
	Also during the project the PM focussed on quality when works were either more difficult or should be done precise to prevent damage. The actions had much to do with experience of the PM and focus of considerations. The PM was focussed on not creating any damage thus pumps were taken of the ships, Dutch crew was put on night shift and the sand search was stared resulting in a better quality.	+					-
(early) stakeholder management	This was visible in the local communities timeline. It started by acknowledging that the situation is different than the usual practices the Netherlands and that stakeholder engagement should be incorporated. To involve all the stakeholders at the start of the project is an actions that was initiated by the PM based on his experience and the EED. To fill in the how question he was advised by an experienced employee of the EED. Then the process started of having the EE focus on this and give him the room to operate. All the stakeholders on the island were informed on the basis of meetings. At first the client did not want this but after proactive approach form VO towards the client the meetings were organised in consultation/collaboration with the client. By keeping the stakeholders on the island in the loop many other actions regarding knowledge sharing, biodiversity actions and actions in regards to materials followed.	+	+	-	+	+	Accepted