

The Sustainable Footprint Methodology

*Including sustainability in the project management of the
Bergermeer Gas Storage project*

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Author: Iris Oehlmann

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Jaffalaan 5, 2628 BX Delft
University: Delft University of Technology

The research is performed by order of

TAQA Energy B.V.
Prinsenhof
Prinses Margrietplantsoen 40
Postbus 11550
2502 AN The Hague

Graduation Committee

Chairman: Dr.ir. Herman Mooi, Associate Professor Project Management

First supervisor: Marian Bosch-Rekvelde, PhD Candidate and Researcher at the Centre for Project Management

Second supervisor: Dr. Wim Ravesteijn, Associate Professor at the section of Technology Dynamics and Sustainable Development

External supervisors: Maurits Gerver, Technical Manager Bergermeer Gas Storage Project
Paul van der Post, HSSE Manager Bergermeer Gas Storage Project

Executive Summary

Sustainability has become one of the most important challenges of today's society. Companies feel the external pressure to include principles of sustainable development in their business and often also have a strong internal drive to improve on sustainability. The activities of many companies are organized by projects, but in project management literature, the concept of sustainability has not been recognized yet.

In this explorative study, an attempt is made to operationalize sustainability for project management. Projects are a main part of business, and therefore, it is evident that when the strategy of a company is to act sustainable, this has to result in actions in their projects. However, there are no frameworks available to do so. This results in the following main research question:

What assessment criteria should be included in a generic framework to incorporate sustainability in project management?

To answer this question, a new generic framework was designed. First, a literature study was performed in the field of sustainability in project management. It was found that the literature on sustainability in project management was scarce. Next, sustainability tools that are already available were investigated. Furthermore, expert interviews were carried out and the framework was developed and evaluated in two expert panel sessions. By integrating the existing sustainability tools and incorporating a life-cycle view, a new framework was designed: 'The Sustainable Footprint Methodology'. This framework analyzes and determines several relevant social, environmental and economical impacts of a project for different phases of project management.

The framework is presented by a 3-by-3 matrix. On the vertical axis of the framework, three levels are displayed: (1) Project Pre-Phase, (2) Project Execution and (3) Operation of the Asset. These three levels ensure a broad view, not limited to project execution. The horizontal axis of the framework consists of the three pillars of 'the triple bottom line': (1) People, (2) Planet and (3) Profit. These three pillars are a recognized concept in the sustainability literature. In each cell in the resulting matrix, several sustainability indicators are defined. Hereby, it is detailed which sustainability aspects to consider along the different project phases. The project manager can use this framework to understand the consequences of the project and to balance trade-offs between the three pillars of the triple bottom line. Additionally, this framework can be used to benchmark projects regarding sustainability.

It is advised to apply the framework from the start of a project and to continue its use flexibly throughout all project management phases.

The new framework was validated with TAQA's Bergermeer Gas Storage project. At the same time, the framework was used to evaluate the project on sustainability.

The outcome of evaluating the Bergermeer Gas Storage project with the 'Sustainable Footprint Methodology' is that the project scores relatively good on all pillars of the framework. This confirms that the company pays major attention to People, Planet and Profit aspects.

The main strong point of the new framework is that it makes a unique start to benchmark projects in terms of sustainability; until now this had not been done. Furthermore, the framework enables to understand the trade-offs within the sustainability and to develop a life-cycle approach within project management. A less strong point is that to reach stakeholder consensus, much more efforts are needed besides the use of the technocratic framework by the project manager.

It is recommended to further investigate how the 'Sustainable Footprint Methodology' can be developed as a general sustainability benchmarking tool for projects. Next, it is advised to use the 'Sustainable Footprint Methodology' in other projects. Hereby, benchmarking figures get established and the framework can be further improved. Last, it is recommended to further investigate how the framework can be applied in the existing project management procedures and how to link the framework to the existing industry policies like ISO 14000 and other sustainability reporting.

Preface

This report represents the thesis of my MSc in Management of Technology at Delft University of Technology. Writing this thesis would not have been possible without the support of several people whom I need to wholeheartedly thank.

If I were to create a list, it would without doubt be topped by my parents. They have given me constant encouragement and advice throughout my whole life, and also made my studies possible in the first place. Although they live in France, we have many warm conversations via Skype.

I would like to thank some very diverse groups of close friends: first, my MoT friends for making studying so much more fun, secondly, my Curius board buddies with which I experienced such an exiting and entertaining year, and last but definitely not least, my best female friends from 'Sfinx', which made the overload of male students here in Delft very manageable by compensating this with the best girly activities you can think of. Some extra special thanks go to my lovely friend Ingrid, with whom I have contact almost daily. She advised me in so many personal as well as in professional questions. I sincerely hope that I will keep in touch with all these fantastic friends that I met here in Delft.

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I truly enjoyed working as an intern at TAQA and I am looking forward to start my first 'real' job after this.

*Iris Oehlmann
Delft, September 2010*

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List of Abbreviations

3BL

Triple Bottom Line; People, Planet, Profit, or the three pillars of sustainability, also named the 'Triple P'

BDF

Bergen Drying Facilities, the gas treatment installation of TAQA Energy B.V.

BMP

Bedrijfs Milieu Plan

BGM

Bergermeer

BKM

Boekelermeer

BGS

Bergermeer Gas Storage

CAPEX

Capital Expenditures

COSHH

Control Of Substances Hazardous to Health

CSD

Commission on Sustainable Development of the United Nations

CSR

Corporate Social Responsibility

CVP

Capital Value Process

DAFWC

Day Away from Work Case

EBN

Energy Beheer Nederland B.V.

EIA

Environmental Impact Assessment

EZ

Economische Zaken, the Dutch ministry of Economic Affairs

FED

Front End Development

FID

Final Investment Decision

FTE

Full Time Equivalent

GDP

Gross Domestic Product

GDR

Group Decision Room

HS

Health and Safety

HSE

Health, Safety and Environment

HSSE

Health, Safety, Security and Environment

IPA

Independent Project Analysis

IUCN

International Union for the Conservation of Nature

KPI

Key Performance indicator

LCA

Life Cycle Assessment

LNG

Liquefied Natural Gas

LNV

Landbouw, Natuur en Voedselkwaliteit, the Dutch ministry of Agriculture, Nature and Food quality

NOGEPA

Nederlandse Olie en Gas Exploratie en Productie Associatie

OPEX

Operating Expenditures

OR

Ondernemers Raad

OSHA

Occupational Safety and Health Administration

PGI

Peak Gas Installation, a project of TAQA Energy B.V. in Boekelermeer Noord

PM

Project Management

STEG

Steam and Gas Turbine

TAQA

TAQA Energy B.V., the initiator of the Bergermeer Gas Storage project

UNEP

United Nations Environmental Program

VROM

Volkshuisvesting, Ruimtelijke Ordening en Milieubeheer, the Dutch ministry of Housing, Spatial Planning and the Environment

V&W

Verkeer en Waterstaat, the Dutch ministry of Transport and Water

WKK

Warmte Kracht Koppeling

WWF

World Wildlife Fund

YTD

Year To Date

1. Introduction

Sustainability has become one of the most important challenges of our society. This is also true for business. Many companies feel the pressure to include principles of sustainable development into their policies and activities (Keeble, Topiol et al. 2003). Additionally, companies increasingly experience an internal drive to improve on sustainability. In literature, however, the concept of sustainability is not really recognized in project management yet (Silvius, Brink et al. 2009). Projects are a main part of business, and therefore, it is evident that when the strategy of a company is to act sustainable, this has to result in actions in their projects.

The business principle behind sustainable development is often expressed as 'People', 'Planet', 'Profit', or as the triple bottom line (Redclift 1987; Mulder 2006). The project manager should find a good balance between these three aspects because currently the focus tends to be placed on the 'Profit' value (Dijkstra-Hellinga 2009). Next, trade-offs do not only have to be made between 'People', 'Planet' and 'Profit', but also between the project management constraints: scope, time, quality and budget (Meredith and Mantel 2008).

Both sustainability and project management are important nowadays and are expected to become even more important in the future. First, this holds for sustainability because the carrying capacity of the earth is limited. At the same time, the number of people living on earth is rising and we want to increase the quality of life too (Ehrlich 1994). Long-term increase of the quality of life for all humans can only be realized if natural resources are used responsibly. Secondly, this holds for project management because the complexity of projects is assumed to be increasing (Baccarini 1996; Williams 1999; Hermanides 2009). This explorative research makes first attempts to integrate these two different fields. To be able to implement the principles of sustainable development into project management, a clear understanding of both fields is necessary.

This research project is carried out in corporation with TAQA Energy B.V., which is a 100% subsidiary of Abu Dhabi National Energy Company (TAQA), an independent water- and power company with the state of Abu Dhabi being its major shareholder. TAQA Energy operates onshore and offshore installations of oil and gas production and storage in the Netherlands.

TAQA Energy and its partners are currently developing an underground gas storage facility in the Bergermeer. This research is focused on this gas storage project. The underground gas storage facility will be used to deliver gas in all seasons. This project is highly complex in terms of technical, social, environmental and economical aspects. Managing sustainability aspects is therefore extremely relevant. TAQA places a high priority on safety and environmental issues and is therefore interested in exploring the opportunities of adding sustainability as a value driver in its project management.

To operationalize sustainability in project management, a new generic framework will be designed named the 'Sustainable Footprint Methodology'. This framework will be used to evaluate the Bergermeer Gas Storage project on sustainability. Furthermore, this framework intends to help improving the sustainability of the project and to come to recommendations on how the project management in the Bergermeer Gas Storage project should incorporate sustainability. The 'Sustainable Footprint Methodology' is a generic framework with criteria that represent the effect that a project has regarding sustainability along the project management phases. The framework intends to help the project manager in making trade-offs between 'People', 'Planet' and 'Profit'.

The structure of this research report is as follows. A thorough research design is given in Chapter 2. Following, this report is divided into three parts:

- *Part 1: Designing the framework*
Chapter 3 presents a literature review on sustainability in project management, followed by the design of the new framework in Chapter 4.
- *Part 2: Case study Bergermeer Gas Storage*
- *Part 3: Evaluating the framework*
Chapter 8 evaluates the new framework and this research project in general.

This research report is completed with final conclusions and recommendations in Chapter 9.

Some parts of the initial report are strictly confidential. Therefore, it was edited for open publication. For this public version, Chapter 5, Chapter 6, Chapter 7, several sections in the conclusions and some appendices were removed.

2. Research Design

In this chapter, the research design of this explorative study is presented. In Section 2.1, the research object is shortly explained. Section 2.2 outlines the problem analysis, Section 2.3 the research goal and Section 2.4 the research questions. Following, Section 2.5 presents the research approach, Section 2.6 the research strategies and information sources. Next, in Section 2.7, the applicability and validity of this research are discussed. Finally, in Section 2.8, the relevance of this research is explained.

2.1 Research Object: The Bergermeer Gas Storage Project

TAQA Energy B.V. and its partners are developing an underground gas storage installation close to Alkmaar. This project is called the Bergermeer Gas Storage (BGS) project. The goal of the BGS project is to deliver peak gas when this is necessary in periods of higher demand, this will most likely be in the winter.

For this project, natural gas will be stored in an almost depleted gas reservoir that is located between Alkmaar and Bergen. An intersection of the BGS project is presented in Figure 1. Above ground, an installation will be built to treat the gas. This installation will be located at an industrial area in the south of Alkmaar, named Boekelermeer Zuid.

There are four main factors that make this project attractive to TAQA:

- There is a clear demand for more seasonal storage in the near future for NW-Europe.
- The reservoir has excellent physical, geographical and technical conditions.
- The project fits the Dutch ambition to become the NW-European gas roundabout. The Netherlands can become an important gas hub.
- The BGS project complements TAQA's existing midstream portfolio.

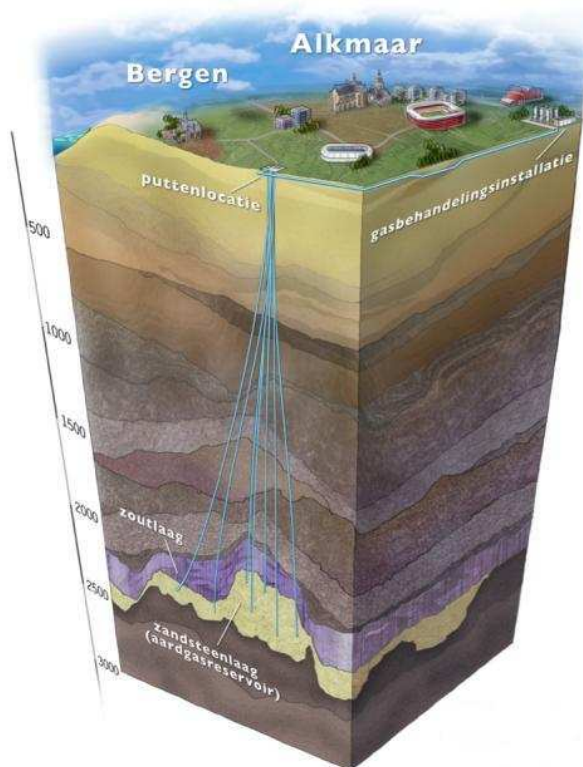


Figure 1: Intersection of the BGS Project

To realize this project the following activities must be executed:

- Design, engineering and construction of the installation.
- The drilling of 14 new wells into the gas reservoir and modifying the existing Bergermeer well location above ground.
- Building a new gas compression and treatment installation in the industrial area Boekelermeer Zuid.
- The installation of pipelines between the well location and the new gas treatment installation (around 8 km) and between the gas treatment installation and the existing distribution gas grid (another 8 km).
- Bringing the gas field on initial pressure by injecting natural gas from the gas grid.
- The actual operation of the installations, consisting of the delivery of gas during peak demands and injecting gas into the field to store gas.
- After the operation period: abandon activities by removing the installations and bringing the location in its original state.

A map with the locations of the BGS project is presented in Appendix 7. In Figure 2, a futuristic view of the Boekelermeer Zuid site and the Bergermeer site is shown.



Figure 2: Futuristic View Boekelermeer Zuid and Bergermeer (TAQA 2010)

2.2 Problem Analysis

One of the main difficulties for the BGS project is the public acceptance of this project. Several actors are trying to prevent that TAQA develops this project. TAQA places a high priority on long-term sustainable growth and is building on the commitment to people, safety and the environment. Therefore, TAQA is committed to organize its projects in a sustainable way.

One main part of projects are the project management procedures. There are, however, no theories on how to incorporate sustainability into such project management procedures. This research project has the aim to investigate and develop a new framework, named the 'Sustainable Footprint Methodology' that will be used to evaluate and implement sustainability in the project management of the BGS project.

2.3 Research Goal

The goal of this explorative research is to improve the understanding of sustainability in project management. It will be investigated how trade-offs can be made within the three pillars of sustainability 'People', 'Planet' and 'Profit', while at the same time managing the project management constraints: scope, time, quality and budget (Meredith and Mantel 2008). The goal is to design a new framework to account for sustainability in project management. The BGS project will be used as a case to apply and evaluate this new framework. Additionally, the new framework will be used to evaluate and improve the sustainability of the BGS project.

2.4 Research Questions

The main research question is:

What assessment criteria should be included in a generic framework to incorporate sustainability in project management?

This main research question can be broken down into several partial research questions:

- Part 1: Designing the framework
 1. How and to what extent is sustainability incorporated in project management today?
 2. How should sustainability be incorporated in project management?
 3. What are relevant assessment criteria for sustainability in project management?
- Part 2: Case Study Bergermeer Gas Storage
 4. Which role has sustainability in the project management of the Bergermeer Gas Storage project?
 5. How does the Bergermeer Gas Storage project score on the criteria of the new framework?
 6. How can the Bergermeer Gas Storage project improve on sustainability?
- Part 3: Evaluating the framework
 7. What are the strong and weaker points of the framework and how can the framework be improved?

2.5 Research Approach

The explorative research can be visualized as a funnel with three parts as is presented in Figure 3.

- Part 1: The first part of this research is to design a generic framework that evaluates and implements sustainability in project management. This is done by a literature study and several expert interviews. The framework is evaluated and developed further in two expert panels. Questions arise like: To what extend is sustainability incorporated in project management today? Which methods, tools or criteria are used to incorporate sustainability into project management? Which trade-offs are being made? When is sustainability a value driver?
- Part 2: When the general framework has been designed, the Bergermeer Gas Storage project comes in. The BGS case is used to:
- (a) Illustrate the framework. The case shows how the framework works.
 - (b) Applying the framework. It is tested if the framework is valid. Furthermore, the framework will perform an assessment of the sustainability of the BGS project.
 - (c) Recommendations. With the framework recommendations will be made on how to the BGS project can improve on sustainability.
- Part 3: The final part of this research is the evaluation of the framework, which results from using the framework in the second part. It will be assessed what the strong and weak points of the framework are and how the framework can be improved.
- This evaluation would be stronger when the framework is used in more cases, but this will not be done in this explorative research project.

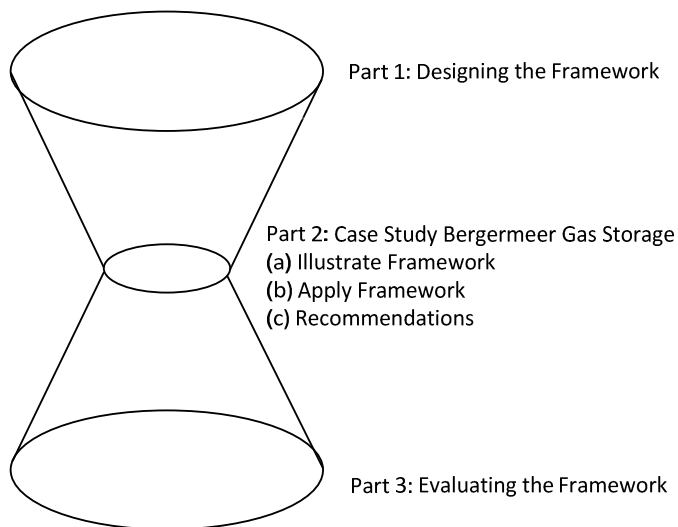


Figure 3: Funnel representing Research Approach

2.6 Research Strategies and Information Sources

In Table 1, the type of knowledge, the research strategy and the information sources for each research question are presented.

Table 1: Research Questions, Type of Knowledge, Research Strategy and Information Sources

		Research Strategy		Information Sources				
1. Research Questions	2. Type of Knowledge	3. Desk Research	4. Case Study	5. Literature	6. Interviews	7. TAQA Documents	8. TAQA Meetings Site visits	9. Expert Panels
Part 1: Designing the framework								
1. How and to what extend is sustainability incorporated in project management today?	analytical, descriptive	x		x	x			
2. How should sustainability be incorporated in project management?	evaluative	x		x	x			x
3. What are relevant assessment criteria for sustainability in project management?	evaluative	x		x	x	x		x
Part 2: Case Study BGS								
4. Which role has sustainability in the project management of the Bergermeer Gas Storage project?	analytical		x		x	x	x	
5. How does the Bergermeer Gas Storage project score on the criteria of the new framework?	evaluative		x		x	x	x	
6. How can the Bergermeer Gas Storage project improve on sustainability?	prescriptive		x	x	x	x	x	
Part 3: Evaluating the framework								
7. What are the strong and weaker points of the framework and how can the framework be improved?	analytical, evaluative	x	x	x	x			x

The first column outlines all research questions that were defined for this explorative research. The second column displays which type of knowledge is generated: analytical, descriptive, evaluative or prescriptive (Verschuren and Doorewaard 1999).

The third and fourth columns show the research strategy for each question. Desk research involves the collection, analysis and reflection on already existing research and the development of new theories. Case study research is defined here as a detailed observation of the BGS project.

The fifth till ninth column show which information sources were an input for answering the research questions. It is shown that in Part 1, the framework was designed by desk research with the information from literature and interviews. In these interviews, employees of TAQA, employees of Delft University of Technology or partners and connections of those two were asked about project management and sustainability topics. Additionally, the available literature on sustainability in project management was analyzed and furthermore, five well-known sustainability tools were investigated.

When the framework was designed with the input of literature and interviews, the framework was tested twice in an expert panel with the use of 'Group Decision Room' (GDR). The GDR is a set of software and laptops to support evaluation meetings. All experts in the meeting are following the evaluation process on their own laptop and can anonymously react on several topics.

In these GDR meetings, first, the relevance of each individual indicator of the general framework was evaluated. Secondly, it was assessed if each indicator was applicable to the BGS project. Thirdly,

suggestions were given for further development the framework. The outcomes of the two expert panels are presented in Appendix 1 and 2. The experts in these panels were employees of TAQA and employees of Delft University of Technology.

In Part 2, the BGS case was used to validate the newly developed framework. Applying the framework to more cases would have improved this validation. However, because of the explorative character of this research, one accurate case study was appropriate.

With the new framework, a detailed assessment was performed of the sustainability of the BGS project. The main information sources were semi-structured interviews with TAQA employees and contractors of the project. Next, all sorts of TAQA documents were analysed, from permit applications to monthly reports. Furthermore, relevant BGS meetings were attended. Additionally, the locations of the Bergermeer Gas Storage project and the site of a similar TAQA project ‘the peak-gas installation’ in Alkmaar were visited twice.

In Part 3, the desk research and the case study were combined to evaluate the framework. The main input for this evaluation came from the literature and from interviews. A list of all these visits, interviews and meetings is presented in Appendix 8.

2.7 Applicability and Validity

2.7.1 External Applicability and Validity

This explorative study provided insight into how sustainability can be incorporated in project management. The new framework was developed for TAQA and specifically to be applicable to the BGS project. As can be seen in Appendix 8, most personal communication that served as an input for the development of the framework came from TAQA and TU Delft employees. However, requirements were set to ensure a much wider use. In Chapter 4, the application area of the framework and the requirements on the type of project are further explained.

Furthermore, a literature study was performed in the field of sustainability in project management to acquire a wider external validity. It was analyzed how sustainability is currently incorporated in project management.

In this research, more than one method was used to gather data such as interviews, observations, literature, and TAQA documents. This use of more methods in one research is called ‘methodological triangulation’ (Morse 1991). Hereby, the external validity was increased. The new framework is generic and could be used in other TAQA projects as well as in projects of other companies, for example in Shell’s Barendrecht project.

2.7.2 Internal Applicability and Validity

To ensure that the new framework was applicable to the BGS project, the framework was tested twice in an expert panel, as was explained earlier in Section 2.6. Especially the second expert meeting, which was attended by core team members of the BGS project team, was organized to make the new framework fitted for the existing sustainability issues in the BGS project. Furthermore, all interviews and meetings with TAQA employees ensured the author’s understanding of the BGS project and hereby supported that the new framework was internally applicable.

Next, internal validity was increased by a literature review in the field of sustainability in project management. Next, five sustainability tools that are already available were investigated. Combining all these data to design the framework, named methodological triangulation, improved the internal validity (Morse 1991).

After the framework was designed, a literature check was performed to check how much of the initial literature was still present in the final version. This also strengthened internal validity.

2.8 Relevance

2.8.1 Scientific Relevance

Scientific research into sustainability in project management is a relatively new and unexplored field (Labuschagne and Brent 2005; Brink 2009; Dijkstra-Hellinga 2009; Silvius, Brink et al. 2009). The proposed research aims to contribute to this field by investigating how sustainability is incorporated in project management today and to make recommendations on how it should be incorporated in the future.

As stated before there is a relevant pressure on companies to incorporate principles of sustainable development into policies and activities (Keeble, Topiol et al. 2003), but there is no scientific basis on how to incorporate sustainability principles in the project management procedures (Silvius, Brink et al. 2009). This study aims to fill that gap by designing a framework that can be used to evaluate and implement sustainability principles in project management.

2.8.2 Management Relevance

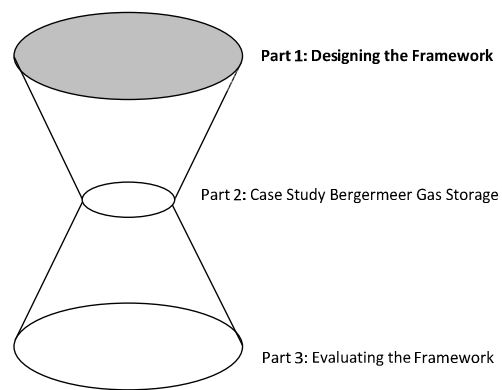
Business is one of the three pillars of society, next to government and civil society (Wartick and Wood 1998), and has a responsibility to increase its policies and activities on sustainability (Holliday, Schmidheiny et al. 2002). Furthermore, companies are also increasingly held responsible for the impacts of an implemented project after the project has been completed, long after the normal project life cycle. The global sustainability trend is that companies are forced to internalize social and environmental externalities (Visser and Sunter 2002). Next, project management is becoming increasingly complex as well because it is generally assumed that complexity in engineering projects has increased since World War 2 (Baccarini 1996; Williams 1999; Hermanides 2009).

This study in particular is meant to make a start with creating an understanding of how sustainability can be incorporated in project management and thereby ensure that project management methodologies facilitate the internalization of social and environmental externalities. This understanding should enable companies to execute the right activities to increase the chances of a successful sustainable project. This project has a focus on the Bergermeer Gas Storage project and is specifically intended to be useful for TAQA Energy B.V. However, the generic framework can be used for other projects as well. This can be for other projects of TAQA but also projects of other company's, for example the Barendrecht project of Shell.

- **Part 1: Designing the Framework**

Chapter 3: Literature Review on Sustainability in Project Management

Chapter 4: A new Framework: The Sustainable Footprint Methodology



3. Literature Review on Sustainability in Project Management

In this Chapter, the results of a literature review on sustainability in project management are presented. The structure of this chapter is as follows: in Section 3.1, this chapter is introduced by explaining the relevance of incorporating sustainability in project management. In Section 3.2, some theory on project management is outlined. This is followed by theory on sustainability in Section 3.3 and the explanation of several already available sustainability tools in Section 3.4. Next, Section 3.5 presents a literature overview on sustainability in project management. Finally, conclusions are drawn in Section 3.6.

3.1 Introduction: Why Incorporate Sustainability into Project Management?

There is a mounting pressure on companies to include sustainability theories in their policies and activities (Keeble, Topiol et al. 2003). Companies are already integrating the ideas of sustainability in their marketing, corporate communications, annual reports and in their actions. It is evident that sustainability has to find its way into project management methodologies as well because both sustainability and project management will become more complex and thereby more important as was explained in Chapter 1. However, the current project management frameworks do not effectively address all three P's of sustainability: 'People', 'Planet' and 'Profit'. The focus tends to lie on 'Profit' because for most projects, economical performance is most important. First attempts to relate sustainability and projects can be found in literature and practice. But the challenges and potentials of relating sustainability and project management have not yet been researched in depth (Labuschagne and Brent 2005; Gareis, Huemann et al. 2009).

Besides the external pressure to include sustainability, companies realize very well themselves that sustainability could be a business case in the long-term. Studies show that pursuing sustainable development makes firms more competitive, more flexible in a fast-changing world and more likely to win and maintain customers. Involving sustainability in the companies' policies and actions can also help them to find and keep some of the best employees. Additionally, other benefits are that companies become more attractive to investors and insurers, even as it reduces their exposure to regulatory and other liabilities (WBCSD 2010).

Embedding sustainability involves some risks as well. It requires long-term investments in terms of time and money and very often it is not possible to determine exactly if and when sustainability investments will pay back. Returns may occur in three ways (Cramer and Aarsen 2002; Mulder 2006):

- Economic value creation in terms of product performance and production costs: this can be both short-term and long-term.
- Long-term value creation by increasing the coherence of various parts of the company and increasing their effectiveness and flexibility.
- Long-term value creation by improvements to the company's reputation and image: this is not only important to external stakeholders, but also to internal stakeholders, for example for the motivation of the companies' own employees.

Studies indicate that reputation is responsible for a considerable part of the total value of the company (Cramer 2002; Mulder 2006):

- A 60% improvement in reputation explains a 7% increase in stock value.
- A reputation crisis statistically leads to a stock value decrease of 8%.
- About 40% of the market value of a company is linked to its reputation.

To help achieving this sustainable reputation, the International Institute for Sustainable Development (IISD) defined the following definition of sustainable development for the business community in 2002: *‘For business, sustainable development means adopting business strategies and activities that meet the needs of the enterprise and its stakeholders today, while protecting, sustaining and enhancing the human and natural resources that will be needed in the future’*. This definition strongly recognizes that short-term gains are extremely important for a company but should go together with long-term sustainability. In Figure 4, the relation between sustainability actions and long term corporate financial performance is clarified. First, a corporate and business unit strategy leads to sustainability actions, which in turn have an effect on sustainability performance and stakeholder reactions, which finally have an effect on long-term corporate financial performance.

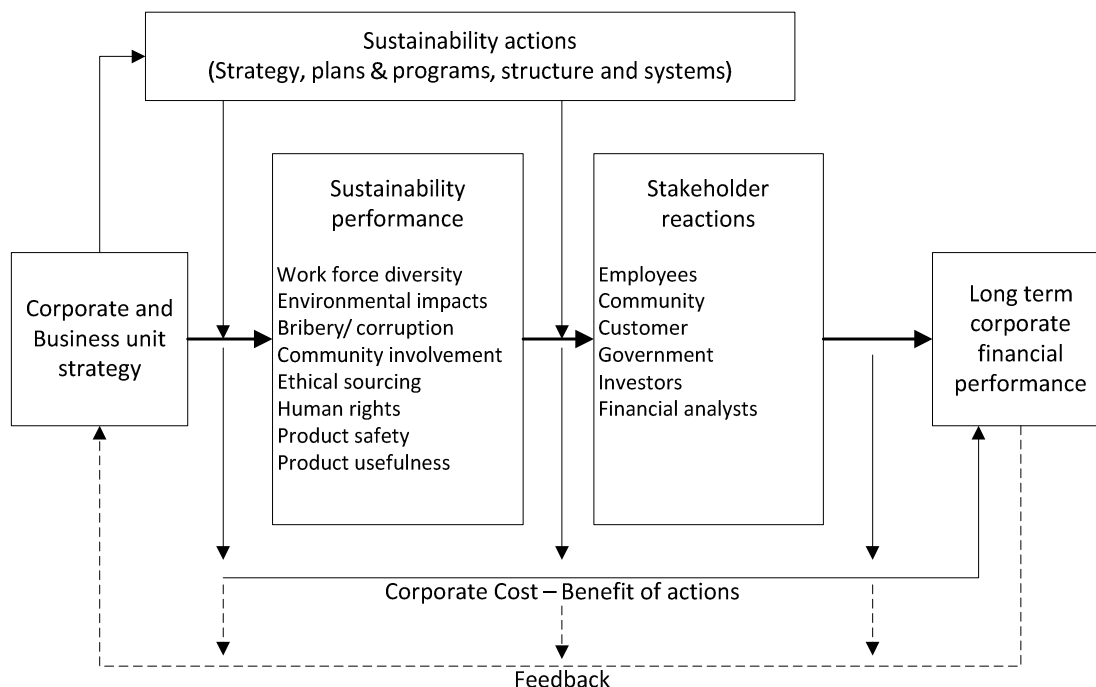


Figure 4: Drivers of Sustainability and Financial Performance (Epstein and Roy 2001)

The above clearly shows the benefits of embedding sustainability in companies. It is assumed, that the consideration of sustainability in project management will improve the sustainability of projects. It is, however, unknown how to incorporate sustainability in project management (Labuschagne and Brent 2005; Gareis, Huemann et al. 2009). This missing part is illustrated in Figure 5. This figure is based on the fact that companies are increasingly integrating sustainability in their mission statements, strategic planning, actions and reports but that sustainability in more temporary organizations, such as projects, is rarely considered (Epstein and Roy 2001; Mulder 2006; Gareis, Huemann et al. 2009; Silvius, Brink et al. 2009).

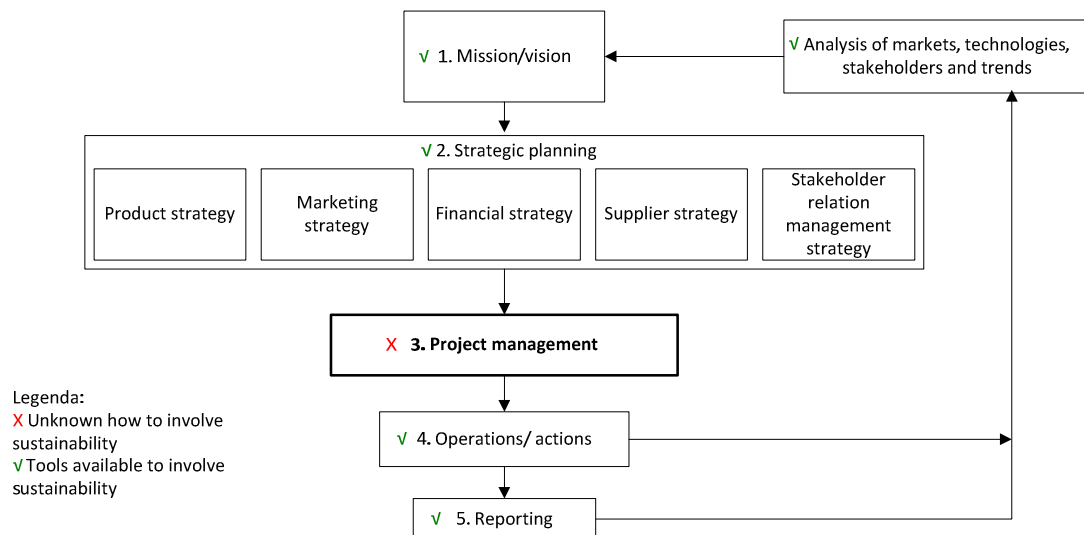


Figure 5: Embedding Sustainability in a Company, based on fig 7.1, p.175 of (Mulder 2006)

3.2 Theory on Project Management

A project can be defined as a temporary undertaking that has a specific objective and a definite beginning and end (Kerzner 2005). Project management is the discipline of planning, organizing, and managing resources in order to successfully complete the specific project goals and objectives (Meredith and Mantel 2008). Project management provides managers with powerful planning and control tools (Meredith and Mantel 2008).

According to multiple studies, a company's effectiveness partly depends on the success of its projects (Kerzner 2000; Cooper 2001). Consequently, many researchers have investigated those factors affecting project success, including project management techniques (Might and Fisher 1985; Pinto 1987; Cooper 2001; Milosevic and Patanakul 2005). For example, Brown and Eisenhart suggested that critical success factors can hinge on the degree of standardization of project management (Brown 1997).

The project management framework specifies major activities and deliverables for each project phase as well as typical guideline questions for each phase (Buttrick 2000). Typical phases in the project life cycle are: idea generation, pre-feasibility, feasibility, development and execution, commissioning, launch and post-implementation review (Buttrick 2000). In the literature, these phases have many alternative names and sometimes phases are combined as well. The main challenge of project management is to achieve all project goals and objectives within the project constraints; these are scope, time, quality and budget (Meredith and Mantel 2008). While managing the trade-offs, the project manager needs to integrate all aspects of the project, ensure that proper knowledge and resources are available when and where needed, and above all ensure that the expected results are produced in a timely, cost-effective manner.

Some authors make a critical note on project management. They state that in the current world, there is less and less need for project management, but rather for process management because nowadays companies consult and negotiate with external parties in their decision making process. This rise of these so-called 'multi-actor networks' makes that projects have become processes (de Bruijn and Heuvelhof 2008). It can be said that 'sustainability' already fits very well in process management, in contrast to project management. This is because sustainability needs a long-term view and deals with an enormous amount of parties, which are the typical characteristics of process management (Ravesteijn 2010). This in contrast to more temporary undertakings, such as projects, where sustainability is rarely considered (Gareis, Huemann et al. 2009).

As a reflection on the above, it must be noticed that current project management can involve a long-term view. This is clearly shown by for example involving the business case and return on investments in project management (Mooi 2010).

3.3 Theory on Sustainability

In this part, relevant theory on sustainability is outlined, that will serve as an inspiration to get to the design of the framework in Chapter 4. First, several definitions of sustainability are presented in Section 3.3.1. Secondly, in Section 3.3.2, it is explained what 'Corporate Social Responsibility' is.

3.3.1 Definitions of Sustainability

The first formal definition of sustainability was published by the Brundtland Commission of the United Nations in 1987 as, *'development that meets the needs of the present without compromising the ability of future generations to meet their own needs'* (Redclift 1987). But with this definition the concept of sustainable development is still inherently vague (Rennings and Wiggering 1997). This macro-economic definition does not provide any guidance on how this concept should be transferred into operation at the company level (Epstein and Roy 2001). Despite its vagueness this definition is viewed as a major political turning point for the concept of sustainable development (Mebratu 1998). Since then the concept has been further developed and is a core element in policy documents of governments as well as in business.

A second definition of sustainable development was defined by the International Union for the Conservation of Nature, the United Nations Environment Program and the World Wide Fund for Nature in their report 'Caring for the Earth' in 1991 as, *'Improving the quality of human life while living within the carrying capacity of supporting ecosystems'* (IUCN/UNEP/WWF 1991). This definition is simple and clear, but there are some difficulties as well. In order to test against it, criteria or indicators need to be available for the improvements in quality of life and for staying within environmental carrying capacities. Next, the IUCN/UNEP/WWF definition can be regarded as an alternative wording of the more widely used Brundtland definition (George 1999).

Today there are more than 100 definitions of sustainability and sustainable development (Labuschagne and Brent 2005). Most authors agree on the three pillars or objectives of sustainable development. These three pillars are the aims to satisfy social, environmental and economic goals (Sillanpää 1999; Azapagic and Perdan 2000; Adams 2006). These three pillars are also named the triple bottom line (3BL): People, Planet and Profit (Redclift 1987; Elkington 1997; Mulder 2006).

- The *People* aspect deals with the communities and workers who have a stake in corporate activities; important issues are reducing poverty, providing good working conditions, contributing to community activities and community development, integration of immigrants, supporting democracy, etc.
- The *Planet* aspect involves reaching a balance between the environmental burden and the capacity of the Earth to carry environmental burdens.
- The *Profit* aspect implies that all economic activities must create prosperity for the company as well as for its workers and owners. It is important to distinguish between short-term and long-term perspectives.

Although the sustainability concept is thus understood by instinct it is still difficult to express it in concrete, operational terms (Briassoulis 2001). Some authors state that a different interpretation of sustainability is not a problem for companies because of the enormous diversity of business conditions and the unique set of actors and factors that a company deals with which will result in different actions. Sustainable entrepreneurship generally implies that companies are willing and able to behave responsibly towards society and the environment (Mulder 2006). This is further explained in Section 3.3.2.

3.3.2 Corporate Social Responsibility

Corporate social responsibility (CSR) is about the core behavior of companies and the responsibility for their total impact on the societies in which they operate. CSR is also known as corporate responsibility, corporate citizenship, responsible business, sustainable responsible business (SRB), or corporate social performance. Chris Marsden, Chair of Amnesty International Business Group, states *'CSR is not an optional add on nor is it an act of philanthropy. A social responsible corporation is one that runs a profitable business that takes account of all the positive and negative environmental, social and economic effects it has on society'* (Richter 2005).

To summarize, CSR is the intentional inclusion of public interest into corporate decision-making by reducing the negative effects and by enhancing the positive effects that a company has on the 3BL.

3.4 Tools on Sustainability

Several tools are available to evaluate the sustainability performance of products, services or companies. Below, five of those tools are explained because they will all serve as an inspiration for the design of the new framework in Chapter 4. In Section 3.4.1, Life Cycle Assessment is outlined, this is a much used tool and the life-cycle concept will return many times in this report. Next, in Section 3.4.2, the GRI framework is explained. In Section 3.4.3, a sustainability indicator framework of the United Nations Commissions on Sustainable Development is summarized. In Section 3.4.4, the 10 WWF principles for sustainability are outlined. Finally, in Section 3.4.5, the sixteen objectives are summarized on which Sweden's environment policy is based.

3.4.1 Life Cycle Assessment

Life Cycle Assessment (LCA) is a much used tool to identify all environmental costs and benefits, both internal and external, of products and services. The life cycle of a product plays a central role in this tool and consists of five phases: (1) pre-manufacturing, (2) product manufacturing, (3) product delivery, (4) product use and refurbishment, and (5) recycling and disposal (Graedel and Bell 1998; Guinée 2002). The goal of LCA is to compare the full range of environmental and social damages assignable to products and services, to be able to choose the least burdensome one.

Common categories of assessed damages are depletion of abiotic resources, impacts of land use, climate change, stratospheric ozone depletion, human toxicity, ecotoxicity, photo-oxidant formation, acidification and eutrophication. In terms of the 3BL, it can be said that LCA has a strong focus on the 'Planet' pillar.

3.4.2 GRI Performance Indicators for Sustainability

There are several methods to evaluate sustainability but the only internationally recognized method that is focused on reporting the sustainability of an entire organization is the Global Reporting Initiative (GRI). The GRI is a network-based organization that has pioneered in the development of the world's most widely used sustainability reporting framework. This framework is used by a 1000 to 3000 companies (Brown, Jong et al. 2009; GRI 2010), including Ahold, Philips, Schiphol Group and TNT. An overview of how to use this framework is presented in Figure 6. This framework sets out the principles and a list of more than 100 indicators that organizations can use to measure and report their social, environmental and economic performance. The list of these indicators is presented in Appendix 3. These indicators can be subdivided in the 3BL: People, Planet and Profit, and show the enormous range and variety of the field of sustainability. Sustainability reports based on the GRI framework can be used to benchmark companies on sustainable development and compare organizational performance over time.

Research by Hedberg and von Malmborg at Swedish companies that use the GRI guidelines concludes that companies use the GRI guidelines mainly to seek organizational legitimacy and that the main reason for use is an expectation of increasing credibility of the CSR. Next, it provides a template for

how to design a sustainability report. Moreover, they found that the GRI guidelines are of more help for internal than external communication. It could help corporations to learn about themselves and to see what has actually been done in the organization. To conclude, the GRI guidelines could have the potential for gaining visibility and control of the 3BL on a corporate level (Hedberg and von Malmberg 2003).

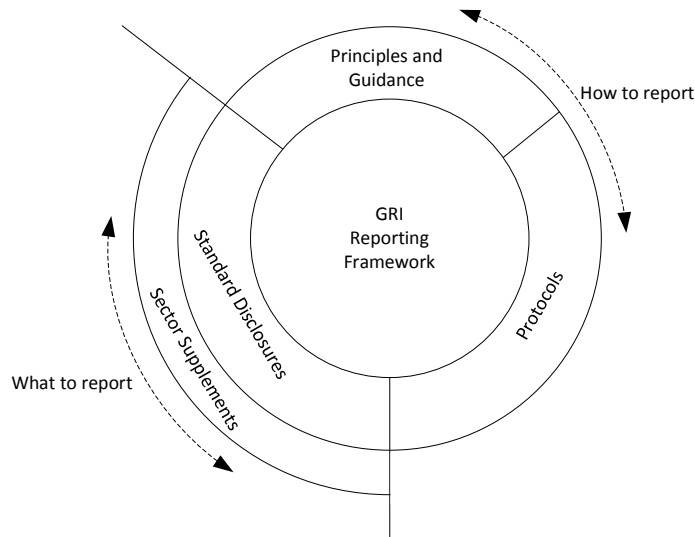


Figure 6: How to Use the GRI Reporting Framework (GRI 2010)

3.4.3 United Nations CSD Indicators of Sustainable Development

The United Nations Commission on Sustainable Development (CSD) has created a list of sustainability indicators for the evaluation of governmental progress towards sustainable development. The indicators are categorized into 14 themes:

- Poverty
- Governance
- Health
- Education
- Demographics
- Natural hazards
- Atmosphere
- Land
- Oceans, seas and coasts
- Freshwater
- Biodiversity
- Economic development
- Global economic partnership
- Consumption and production patterns

The complete list of indicators is outlined in Appendix 4. The main difference between these CSD indicators and the GRI indicators is the fact that these are designed for governments instead of companies. Therefore, the CSD indicators entail many aspects that are at first sight not that relevant for companies. However, it is presented here because the framework provides insights into what sustainability entails and because the framework gives insight into the areas in which companies can make a contribution. In the two previous versions of the framework from 1991 and 2001, the CSD Indicators were categorized in the People, Planet and Profit pillars of the 3BL. In this latest version, the indicators are not explicitly categorized.

3.4.4 WWF Principles for Sustainability

The World Wildlife Fund (WWF) has designed the 'Ten One Planet Living Principles for Sustainability' (Gonçalves 2008). These principles are taught to business leaders and senior executives from all over the world to help them build a more sustainable business. Below, the ten WWF principles are summarized from course material that was used by the Managing Director at TAQA, in the 'One Planet Leaders Training'. In this research, these principles will serve as an inspiration for the design in Chapter 4.

1. *Zero Carbon.* Our climate is changing because of human-induced build up of CO₂ in the atmosphere. The goal is to have net CO₂ emissions of zero. This means investing in energy efficiency, and generating energy from renewable sources.
2. *Zero Waste.* Waste from useless products and packaging creates disposal problems and means discarding valuable resources. The goal is to eliminate waste sent to landfill or for incineration. This means reducing the generation of waste by better design, and encouraging the re-use, recycling and composting of waste and using waste to generate clean energy.
3. *Sustainable Transport.* Travel by car and airplane is contributing to climate change, air and noise pollution, and congestion. The goal is to reduce the need to travel and the dependence on private vehicles and thereby achieve major reductions in CO₂ emissions from transport. This means investing in good quality transport infrastructure that reduces reliance on fossil fuels, and supporting technologies which are effective substitutes for business meetings.
4. *Sustainable Materials.* Destructive resource exploitation (e.g. in construction and manufacturing) increases environmental damage and reduces benefits to the local community. The goal is to build a world where sourcing, manufacture and supply of raw and finished materials can have a net positive impact. This means valuing local, reclaimed, renewable and recycled materials, as well as investing in natural resource stocks and ensuring that the supply chain brings benefits to local communities.
5. *Sustainable Food.* Industrial agriculture produces food of uncertain quality, harms local ecosystems, and may have high transport impacts. The goal is to produce and supply food that has a net positive impact on local communities and the environment. This means supporting local and low-impact production that delivers healthy, good quality food that boosts local economies in an environment-beneficial manner.
6. *Sustainable Water.* Local supplies of freshwater are often insufficient to meet human needs, due to pollution, disruption of hydrological cycles, and depletion. The goal is to manage water resources sustainably. This means implementing strategies regarding water-efficiency, re-use and recycling. It also means minimizing water extraction and pollution, fostering sustainable water and sewage management, and restoring water cycles.
7. *Habitats and Wildlife.* Loss of biodiversity is caused by the development in natural areas and over-exploitation of natural resources. The goal is to regenerate degraded environments and to halt or even reverse loss of biodiversity. This means protecting and recovering natural environments and the habitats they provide for plants and animals as well as creating new ones.
8. *Culture and Heritage.* Local cultural heritage is being lost throughout the world due to globalization, resulting in loss of local identity and knowledge. The goal is to protect and build on diversity. This means celebrating and reviving local history and identity, and fostering a new culture of sustainability.

9. *Equity and Fair Trade.* Many people in the developing world cannot meet their basic needs, and there are also people in the developed world who live in relative poverty. The goal is to have a positive impact of consumption on other communities. This means developing equitable and fair trading relationships that have a beneficial effect on communities locally and globally.
10. *Health and Happiness.* Rising wealth and greater health and happiness increasingly diverge, raising questions about the true basis of well-being and contentment. The goal is to actively work on increasing quality of life. This means promoting healthy lifestyles, vibrant communities, and physical, mental and spiritual well-being.

As a reflection, these ten WWF principles are subdivided in the three P's of the 3BL in Table 2.

Table 2: WWF Principles for Sustainability and the 3BL

The WWF Principles for Sustainability											
The 3BL		1. Zero Carbon	2. Zero Waste	3. Sustainable Transport	4. Sustainable Materials	5. Sustainable Food	6. Sustainable Water	7. Habitats and Wildlife	8. Culture and Heritage	9. Equity and Fair Trade	10. Health and Happiness
	People				x	x			x	x	x
	Planet	x	x	x	x	x	x	x			
	Profit				x	x				x	

From this table, it can be noted that some principles have aspects that fit in more than one 'P'. Furthermore, it can be observed that most WWF principles are related to 'Planet'.

3.4.5 Sweden's Environmental Objectives

Sweden's environment policy is based on sixteen environmental quality objectives for different areas. These sixteen objectives describe the quality and the state of the environment that are sustainable in the long term. Next to the sixteen objectives, there are more than 100 national indicators, which track the results to meet these objectives. The indicators are outlined in Appendix 5. These objectives and indicators were recommended by Wim Ravesteijn, Associate Professor at the section of Technology Dynamics and Sustainable Development at TU Delft. Below, the objectives are summarized:

1. *Reduced Climate Impact.* The UN Framework Convention on Climate Change provides for the stabilization of concentrations of greenhouse gases in the atmosphere at levels which ensure that human activities do not have a harmful impact on the climate system. Sweden must assume responsibility for achieving this global objective.
2. *Clean Air.* The air must be clean enough not to represent a risk to human health or to animals, plants or cultural assets.
3. *Natural Acidification Only.* The acidifying effects of deposition and land use must not exceed the limits that can be tolerated by soil and water.
4. *A Non-Toxic Environment.* The environment must be free from man-made or extracted compounds and metals that present a threat to human health or biological diversity.
5. *A Protective Ozone Layer.* The ozone layer must be replenished so as to provide long-term protection against harmful UV radiation.
6. *A Safe Radiation Environment.* Human health and biological diversity must be protected against the harmful effects of radiation in the external environment.

7. *Zero Eutrophication*. Nutrient levels in soil and water must not be such that they adversely affect human health, the conditions for biological diversity or the possibility of varied use of land and water.
8. *Flourishing Lakes and Streams*. Lakes and watercourses must be ecologically sustainable and their variety of habitats must be preserved. Natural productive capacity, biological diversity, cultural heritage assets and the ecological and water-conserving function of the landscape must be preserved.
9. *Good-Quality Groundwater*. Groundwater must provide a safe and sustainable supply of drinking water and contribute to viable habitats for flora and fauna in lakes and watercourses.
10. *A Balanced Marine Environment, Flourishing Coastal Areas and Archipelagos*. The North Sea and the Baltic Sea must have a sustainable productive capacity, and biological diversity must be preserved. Coasts and archipelagos must be characterized by a high degree of biological diversity and a wealth of recreational, natural and cultural assets. Industry, recreation and other utilization of the seas, coasts and archipelagos must be compatible with the promotion of sustainable development.
11. *Thriving Wetlands*. The ecological and water-conserving function of wetlands in the landscape must be maintained and valuable wetlands must be preserved for the future.
12. *Sustainable Forests*. The value of forests and forest land for biological production must be protected, while biological diversity, cultural heritage and recreational assets are safeguarded.
13. *A Varied Agricultural Landscape*. The value of the farmed landscape and agricultural land for biological production and food production must be protected, while biological diversity and cultural heritage assets are preserved and strengthened.
14. *A Magnificent Mountain Landscape*. The pristine character of the mountain environment must be largely preserved, in terms of biological diversity, recreational value, and natural and cultural assets. Activities in mountain areas must respect these values and assets, with a view to promoting sustainable development.
15. *A Good Built Environment*. Cities, towns and other built-up areas must provide a good, healthy living environment and contribute to a good regional and global environment. Natural and cultural assets must be protected and developed. Buildings and amenities must be located and designed in accordance with sound environmental principles.
16. *A Rich Diversity of Plant and Animal Life*. Biological diversity must be preserved and used sustainably for the benefit of present and future generations. Species habitats and ecosystems and their functions and processes must be safeguarded. Species must be able to survive in long-term viable populations with sufficient genetic variation.

Reflecting on this method, these objectives together with its indicators show many similarities to the indicators in the GRI method, the indicator framework of the United Nations and the ten WWF principles. The main difference is that these sixteen objectives and its indicators are specifically designed to be appropriate for the Swedish environment. This is confirmed by objectives as: 'A Balanced Marine Environment', 'Flourishing Coastal Areas and Archipelagos', 'Thriving Wetlands' and 'A Magnificent Mountain Landscape'. Additionally, this is confirmed by indicators as: 'Number of Reindeer in Mountain Areas' and 'Number of Wolverines in Mountain Areas'.

To conclude, Sweden's environmental objectives and indicators are well designed and structured, but not all indicators are relevant for the design of the framework in Chapter 4.

3.5 Current Research on Sustainability in Project Management

In this section, four studies by researchers studying the involvement of sustainability in project management are explained and reflected by the author of this report. First, the study on ‘Sustainable Project Life Cycle Management’ by the South-African duo Labuschagne and Brent from the University of Pretoria is outlined in Section 3.5.1. Next, research on the recognition of sustainability in project management by the Dutch researchers Silvius, van den Brink and Köhler from the Utrecht University of Applied Sciences is discussed in Section 3.5.2. Thirdly, the conceptual model to relate sustainability and project management by Gareis, Huemann and Martinuzzi from the WU (Vienna University of Economics and Business) in Austria is presented in Section 3.5.3. Fourthly, recent research by Turner is discussed in Section 3.5.4.

3.5.1 Sustainable Project Life Cycle Management

A first relevant framework for the development of sustainability in project management was provided by Labuschagne and Brent in the paper ‘Sustainable Project Life Cycle Management: the need to integrate life cycles in the manufacturing sector’. Next to confirming the triple-P aspect, the Labuschagne and Brent add the concept of life-cycles. They state that, when considering sustainability in project management (PM), the total life-cycle of the project (e.g. initiation, development, execution, and launch) should be taken into account.

Next to the project life cycle, the life-cycle of the asset that the project delivers and the life cycles of the products that the asset produces are relevant. In Figure 7, the project life-cycle, the asset life-cycle and the product life-cycle are displayed. Additionally, the interfaces between these three life-cycles are shown. Labuschagne and Brent conclude that a prerequisite for aligning PM frameworks with sustainability is a clear understanding of the various life-cycles involved in a project and the interactions between these life cycles.

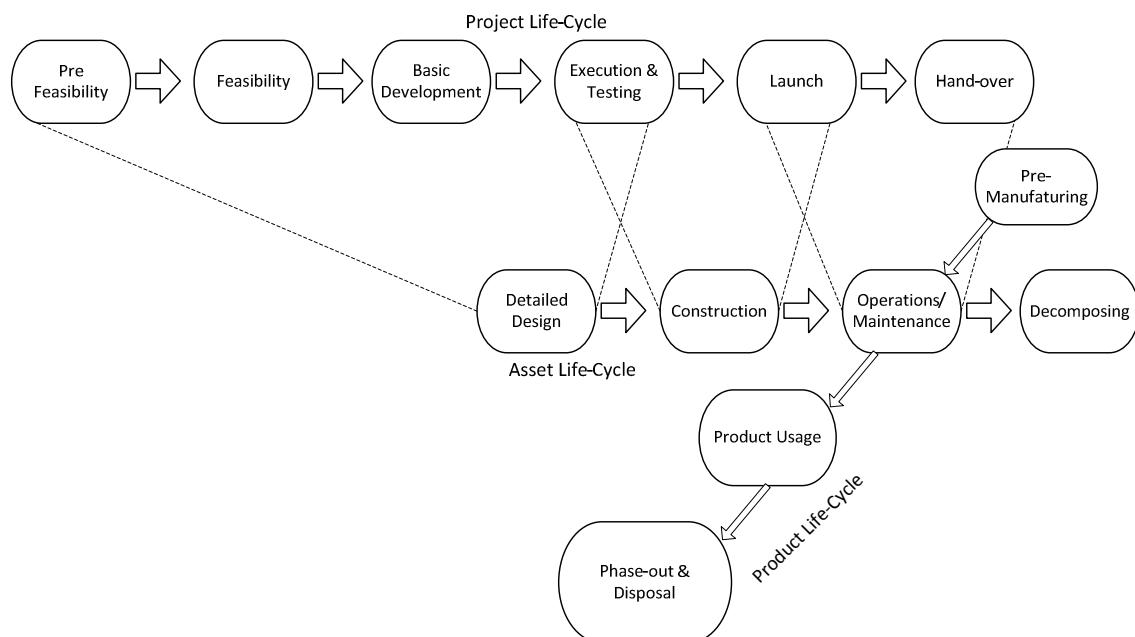


Figure 7: Interaction between Project, Product and Asset Life Cycle (Labuschagne and Brent 2005)

To align PM methodologies with sustainability, Labuschagne and Brent propose a framework to assess the sustainability of operational activities as is presented in Figure 8. This framework only shows the high level criteria. The indicators of each criterion have to be further investigated. This framework will serve as an inspiration for the new framework that will be designed in Chapter 4.

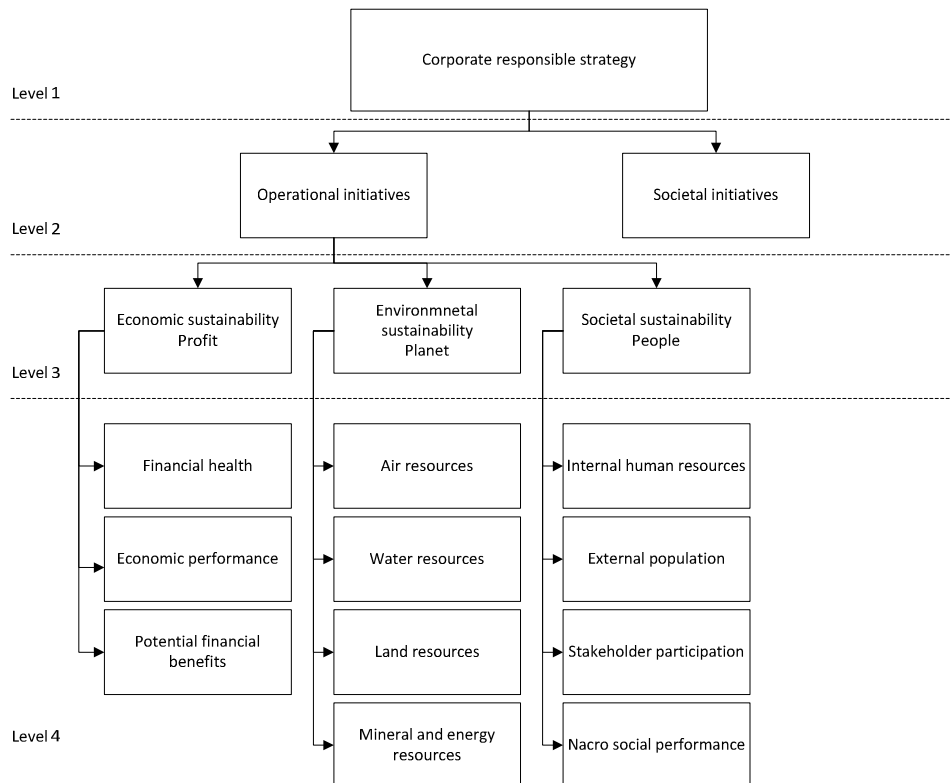


Figure 8: Framework to assess the Sustainability of Operational Activities (Labuschagne and Brent 2005)

In the study of Labuschagne and Brent, the focus is on projects in the manufacturing sector, in which projects generally realize assets that produce products. In other sectors, the result of a project might not be an asset, but an organizational change or a new policy.

Labuschagne and Brent recognize that the framework in Figure 8 must be further developed by investigating the indicators for the criteria in Level 4. As a reflection on this research, it must be mentioned that it is unclear how these criteria and indicators must be incorporated into real decision-making by the project manager. Therefore, it is still vague how this framework could help to incorporate sustainability into project management methodologies.

3.5.2 Recognition of Sustainability in Project Management

In 'Views on Sustainable Project Management' by Silvius, van den Brink and Köhler, research is presented on the recognition of sustainability in project management. It is stated that it is inevitable that sustainability will find its way to project management (PM) in the very near future. The authors have studied the understanding of sustainability in PM by questioning academics and practitioners. The research questions were:

1. 'Do you think sustainability will be increasingly important in PM?'
2. 'What aspects do you consider as characteristics of sustainable PM?'
3. 'Do you experience any aspects of sustainability already implemented in PM?'

Below, the answers on these research questions are outlined.

1. On the first question, 12 of the 14 experts responded that they believe that sustainability will become more important in PM.
2. The answers to the second question are summarized in Table 3. Surprisingly, the respondents include the social aspect more often than the environmental aspect. Silvius, van den Brink and Köhler expected that the understanding of sustainability would be focused on the environment. As a reflection, it must be mentioned that it is not clear what the respondents had in mind with

these three aspects. It could very well be that the thoughts behind ‘environmental’ were totally different for the respondents.

‘What aspects do you consider as characteristics of Sustainable PM?’

	Economical	Social	Environmental
Respondent 1	X	X	
Respondent 2		X	
Respondent 3		X	
Respondent 4	X	X	
Respondent 5	X		X
Respondent 6		X	X
Respondent 7	X		
Respondent 8		X	
Respondent 9		X	
Respondent 10		X	X
Respondent 11	X		
Respondent 12	X	X	X
Respondent 13		X	
Respondent 14		X	
	43 %	79%	29%

Table 3: Perceived Characteristics of Sustainable PM (Silvius, Brink et al. 2009)

- The answers to the third question are summarized in Table 4. This table shows that the respondents do see that environmental aspects are included in PM, although they do not see this as a part of sustainable PM as was shown in Table 3. Again, the same reflection holds as for question 2, it is unclear what the respondents had in mind with these three categories.

‘Do you experience any aspects of sustainability already implemented in PM?’

	Economical	Social	Environmental
Respondent 1	Yes	Yes	
Respondent 2	Yes	Yes	Yes
Respondent 3	Yes		Yes
Respondent 4	Yes	Yes	
Respondent 5			Yes
Respondent 6	Yes	Yes	Yes
Respondent 7	Yes		Yes
Respondent 8	Yes	Yes	Yes
Respondent 9	Yes		Yes
Respondent 10	Yes	Yes	
Respondent 11	Yes	Yes	Yes
Respondent 12	Yes		
Respondent 13	Yes	Yes	Yes
Respondent 14	Yes		Yes
	93%	57%	71%

Table 4: Aspects of Sustainability already Implemented (Silvius, Brink et al. 2009)

The authors conclude that the concept of sustainability is not really recognized in PM yet. However, it might be questioned whether this can be concluded from the above analysis since Table 4 shows that respondents do see sustainability aspects implemented in PM.

To realize recognition of sustainability in PM, Silvius, van den Brink and Köhler propose a framework to identify sustainability aspects of projects, as shown in Figure 9. The criteria or indicators should be applied on three levels: the project itself, the result, and its effect. As a reflection, it can be observed that this framework can be further developed by adding the ‘pre-phase’ or ‘design phase’, before the actual project. In this phase, decisions regarding sustainability will also be important and might differ from sustainability aspects during the project itself. Currently, it is assumed that this pre-phase is part of the ‘project phase’. Furthermore, the definition of ‘the result’ and ‘its effect’ is not unambiguous at first sight.

	People 'Social Sustainability'	Planet "Environmental Sustainability"	Profit "Economic Sustainability"
The Project			
The Result			
Its Effect			

Figure 9: Framework for developing Sustainability Indicators (Silvius, Brink et al. 2009)

Finally, the authors state the following definition: *'Sustainable Project Management is the management of project-organized change in policies, assets or organizations, with consideration of the economical, social and environmental impacts of the project, its result and its effect, for now and for future generations.'*

Their general conclusion, as presented in Figure 9 and in the definition, can be regarded as similar to the one presented in the life-cycle framework of Labuschagne and Brent in Figure 7: sustainability in project management should be regarded on the level of the project, its result (the asset) and its effect (the product).

3.5.3 A Conceptual Model to Relate Sustainability and Project Management

Gareis, Heumann and Martinuzzi make further attempts and have designed a conceptual model to relate sustainability and project management. It is recognized that the focus lies on the achievement of sustainability in the project results, rather than the consideration of sustainable development in PM. The authors state that it is unknown how to explicitly integrate both. Therefore, first attempts are made to bring the two concepts of sustainable development and PM together.

The authors give a possible answer to the question: 'How can sustainable development be related to PM? This answer is presented in Figure 10. The authors have marked the boxes where they see 'potential'.

Project Management Sustainable Development	Project objectives	Project scope, schedule	Project resources, income, costs, risks	Project organization, culture, personnel, infrastructure	Project context	Design of the project management process
Holistic approach – considering ecological, economic & social issues	X	X	X	X	X	X
Long-term orientation			X	X	X	
Large spacial and institutional scale	X				X	
Risk reduction			X		X	X
Values and ethical considerations	X			X	X	X
Participation and Capacity Building	X			X	X	X

Figure 10: Draft Model Sustainable Development and PM (Gareis, Heumann et al. 2010)

Gareis, Heumann and Martinuzzi state that sustainable development principles are of relevance in most objects of consideration of project management, such as project objectives, project scope, project schedule, project costs, resources, and project risks, project organization, project culture, project personnel, project infrastructure and the project context. Next, they say that considering sustainable development is important in the overall project management process.

The paper is closed by presenting their further research, consisting of (1) analyzing if and which principles of sustainable development are implicitly considered in PM, (2) conceptualize how sustainable development can be explicitly considered in project management, (3) further analyze which challenges and potentials arise from the consideration of sustainable development in project management, and (4) draft instruments for explicitly considering sustainable development in project management.

As a reflection, it can be said that the model as the one in Figure 10 is not of much use. In the vertical bar, a list of characteristics of sustainable development is given. In the horizontal bar, the same is done for project management. However, it is unclear how those two will be combined and what is meant with 'potential'.

3.5.4 Sustainability and Project Management Continued

In a recent paper on this topic, presented at the IPMA Expert Seminar in 2010, Turner tries to give an answer to the question of Gareis, Heumann and Martinuzzi: 'How can sustainable development be related to PM?' This answer is presented in Figure 11. In the rows, six guiding principles for sustainable development are given (Fergus and Rowney 2005; Hopwood, Mellor et al. 2005). In the columns, five objects are displayed that are considered relevant to project management. As a reflection, the model only gives a starting point to relate project management to sustainability, not anything on what needs to be done to achieve the integration of sustainability and project management.

Project Management Sustainability Principles	Project objectives	Scope and schedule	Resources and income	Organization	Context	Design of the process
Holistic approach	High	High	High	High	High	High
Long-term view	Low	Low	High	Low	High	Low
Large scale	High	Low	Low	Low	High	Low
Risk reduction	Low	Low	High	Low	High	High
Values and ethics	High	Low	Low	High	High	High
Participation	High	Low	Low	High	High	High

Figure 11: Sustainable Development and PM (Turner 2010)

Next, Turner presents a model for the responsibilities that different project governance roles may have for the six principles of sustainability, as is presented in Figure 12. Turner suggests that this model can be used to stimulate discussion on the responsibilities of the key players. Again, it remains vague how to achieve these sustainability responsibilities by the different players. Furthermore, the relation between the Figure 11 and Figure 12 is not explained by Turner.

Sustainability Principles	Project Governance Roles					
	Client Owner	Program Manager	Sponsor	Project Manager	Senior User	Senior Supplier
Holistic approach	High	Med	Med	Med	Med	Med
Long-term view	High	Med	Med	Low	Low	Low
Large scale	High	High	Med	Low	Low	Low
Risk reduction	High	High	Med	Med	Low	Low
Values and ethical	Low	High	Med	High	High	High
Participation	Low	Med	Med	High	High	High

Figure 12: Sustainable Development and Project Governance Roles (Turner 2010)

Zooming in on the column with the role of the project manager in Figure 12, the responsibilities of the project manager are presented as quite narrow. According to Turner, the project manager is only highly responsible for ‘participation’ and ‘values and ethics’ but having a ‘long-term view’ is not the role of the project manager.

In contrast to Turner, the author of this report does think that a project manager should have a long-term view. In Chapter 4, it is aimed to design a new framework for project managers to facilitate that long-term view and to evaluate and implement sustainability in project management.

3.6 Conclusions

To conclude the literature review, it can be said that the research on sustainability in project management (PM) is scarce and further research is needed to integrate sustainability in PM. However, the need to integrate sustainability in PM is recognized and first attempts are made to give meaning to this new approach. Labuschagne and Brent state that, when considering sustainability in PM, the total life-cycle of the project (e.g. initiation, development, execution, and launch) should be taken into account. Next, Silvius, van den Brink and Köhler give the following definition: *‘Sustainable Project Management is the management of project-organized change in policies, assets or organizations, with consideration of the economical, social and environmental impacts of the project, its result and its effect, for now and for future generations.’* (Silvius, Brink et al. 2009)

Furthermore, Gareis, Heumann and Martinuzzi make first attempts to bring the two concepts of sustainable development and PM together by developing a model that is used to discuss the relationship between the two concepts and to offer first propositions on the challenges and potentials when considering sustainability in PM. Finally, Turner suggests a model to stimulate the discussion on the responsibilities regarding sustainability of the key players.

The view of the author of this report is that the research of Gareis, Heumann and Martinuzzi and Turner is not valuable since their research does not give any insight in how to operationalize sustainability in PM. Therefore, it will not be an input for the development of the new framework in Chapter 4. This in contrast to the life-cycle view of Labuschagne and Brent and the levels of Silvius, van den Brink and Köhler, that will serve as inspiration.

In Table 5, the characteristics of the five tools that were investigated in this chapter are summarized. These five tools will be an input for the design of the new framework in Chapter 4. This new framework will be a 3x3 matrix. The life-cycle view of the LCA tool will be an input for the design of the levels of the framework to ensure a long-term view. Additionally, the triple bottom line (3BL) will be an input for the pillars of the new framework because it is aimed to take account for the trade-offs that have to be made in PM.

Table 5: Characteristics of Sustainability Tools

<i>Sustainability Tools</i>	<i>Characteristics</i>				
	Life- Cycle view	Indicators structured by 3BL	Contains aspects of 3BL	Designed for Companies	Designed for Governments
3.4.1 LCA	x		x	x	
3.4.2 GRI Indicators		x		x	
3.4.3 CSD Indicators			x		x
3.4.4 WWF Principles			x	x	
3.4.5 Sweden's Indicators			x		x

To summarize, the following aspects will be used to build a new framework in Chapter 4 as follows:

- The triple bottom line: People, Planet, Profit, will be the main pillars for the framework.
- The life-cycle view combined with the 3 levels of Silvius, van den Brink and Köhler: the project itself, the result, and its effect will be used as an inspiration for the levels of the framework.
- The life-cycle view of Labuschagne and Brent, Life Cycle Assessment (LCA), the GRI indicators, the indicator framework of the United Nations Commission on Sustainable Development, the Ten WWF Principles for Sustainability and Sweden's Environmental Objectives will be used to design the indicators in the framework.

4. A New Framework: The Sustainable Footprint Methodology

In this Chapter, a new framework is designed to operationalize sustainability in project management. The structure of this chapter is as follows: in Section 4.1, the relevance of designing this framework is explained. In Section 4.2, it is outlined how and under which constraints the framework was designed. In Section 4.3, the new framework named 'the Sustainable Footprint Methodology' is presented and explained. In Section 4.4, the content of the framework is discussed. Following, in Section 4.5 it is advised how to use of the framework. Finally, in Section 4.6, a summary is given.

4.1 Introduction

After outlining the benefits of incorporating sustainability in a company and presenting the current state of research on sustainability in project management in Chapter 3, the question is how to prepare project managers for a future in which sustainability needs to be integrated in the job. *'Practical tools, which systematically include sustainability within the evaluation process, are needed to align business methodologies with the principles of sustainable development'* (Labuschagne and Brent 2005). Projects are a main part of business, and therefore, it is evident that when the strategy of a company is to act sustainable, this has to result in actions in their projects.

This will imply that the project manager needs to develop a broader focus by including social ('People') and environmental ('Planet') aspects, next to the focus on cost ('Profit'), time and quality. This will consequently make their job more complex. The project manager has to balance trade-offs between 'People', 'Planet' and 'Profit' aspects of sustainability, next to balancing trade-offs between the project management constraints; scope, time, quality and budget (Meredith and Mantel 2008). Additionally, the project manager has to develop a life-cycle view. This entails to not only catch the 'quick wins' in terms of money but also to look at long run sustainability. This calls for the development of tools, in order to deal with the wide variety of new considerations. In order to facilitate this, a new framework will be designed in this chapter.

The name of the new framework is the 'Sustainable Footprint Methodology.' In the literature, well-known 'footprints' are: (1) the ecological footprint (Wackernagel and Rees 1998), (2) the carbon footprint (Wiedmann and Minx 2007) and (3) the water footprint (Hoekstra and Chapagain 2008). These footprints express the environmental burden in one final unit: the 'footprint'.

The new framework uses the concept of combining different aspects of the 3BL into one new methodology. The Sustainable Footprint Methodology analyzes several relevant social, environmental and economical impacts of a project for different phases of project management. Hereby, it is determined how the project scores on sustainability: 'the Sustainable Footprint'.

4.2 Designing the Framework

To come to a design of the new framework, a literature review in the field of sustainability in project management was performed in Chapter 3. Besides, two expert panel meetings were organized. During these two meetings, the framework was evaluated on relevance and on applicability to the BGS project. Additionally, suggestions were given for further development of the framework. The outcomes of these two expert panels can be found in Appendix 1 and 2. In these appendixes, it is summarized how the framework changed accordingly. As a short recap, the research until now is summarized in Figure 13. It is shown which elements of the literature study in Chapter 3 are inputs for the design of the framework. Additionally, it is shown that the 2 expert panel meetings provided significant inputs.

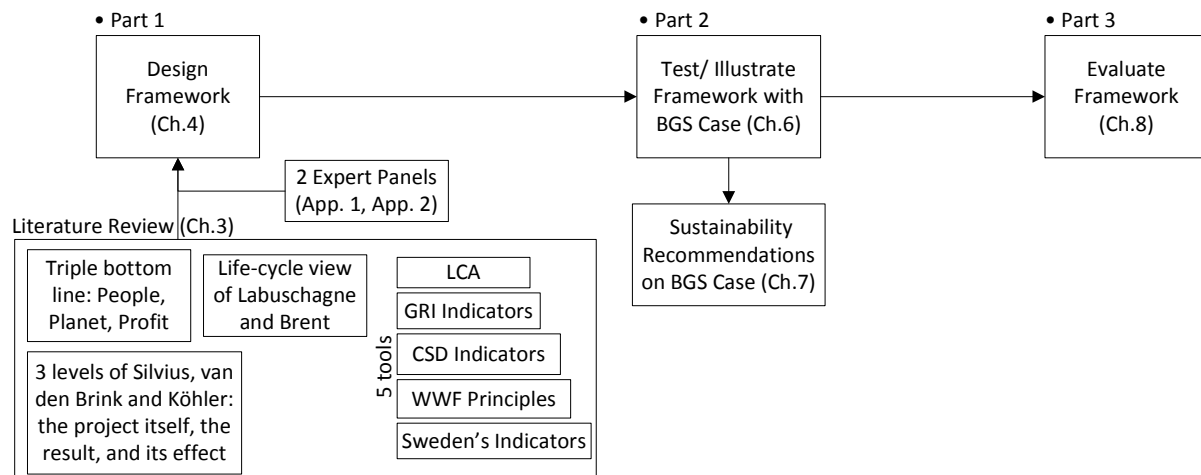


Figure 13: Summary of Research

4.2.1 Goal of the Framework

The design goal is: providing project managers with a tool to evaluate and implement sustainability in project management. This is necessary because now, sustainability and project management are completely separate fields, but both are expected to become increasingly important in the future.

4.2.2 Constraints of the Framework

The design constraints refer to: (1) the requirements of the framework itself and (2) the application area of the framework.

(1) Requirements of the framework:

- The framework assists the project manager in understanding sustainability issues in general.
- To provide project managers the overview which 'People', 'Planet' and 'Profit' aspects to consider in each project phase. (This requirement is derived from the literature study in Chapter 3)
- It enables project managers to take a life-cycle view, which means looking further than the project execution phase and hereby taking into account sustainability aspects of the produced asset and, to a lesser extent, of the product. (This requirement is derived from the literature study in Chapter 3)
- The framework is practical, which means that the project manager is able to incorporate the framework in real projects.
- The framework is complex enough to treat all relevant aspects of sustainability, and is simple enough to understand it quickly and to use it in an efficient and effective way.
- The framework can be used for benchmarking projects on sustainability.

(2) Application area of the framework, requirements on the type of project:

- The project produces an asset. This means that the goal of the project is to realize an asset. For example: the goal of the project is to build a plant. This framework is not designed for service projects.
- The asset produces a product. The asset that is realized by the project can produce a product. For example: the realized plant produces coffee machines. Furthermore, if there is no product produced, there should be a product involved. For example: Gas that is stored, transported or treated.
- Many stakeholders are involved. This means that different stakeholders have different interests concerning the project.

- Considerable impact on the environment and on society. This means that the project manager needs to balance People, Planet and Profit aspects in a responsible way.

4.3 Presenting the Framework

In this section, the final version of the framework is presented and explained in 4.3.1. In 4.3.2, the indicators of the framework are summarized.

4.3.1 Overview of the Framework

Below, in Figure 14, an overview of the new framework named ‘The Sustainable Footprint Methodology’ is presented.

<i>The Triple Bottom Line</i>			
	<i>1. People</i>	<i>2. Planet</i>	<i>3. Profit</i>
<i>Level 1 Project Pre-Phase</i>	1.1.1 Stakeholders	1.2.1 Design Options	1.3.1 Expected Economic Performance
	1.1.2 Customers	1.2.2 Land & Biodiversity	1.3.2 Expected Financial Health & Stability
	1.1.3 Politics and Legislation	1.2.3 Environmental Plan	1.3.3 Expected Shareholder Involvement
	1.1.4 Team Participants	1.2.4 Product	
	1.1.5 Health & Safety Plan		
<i>Level 2 Project Execution</i>	2.1.1 Stakeholders	2.2.1 Transport	2.3.1 Market Presence
	2.1.2 Society	2.2.2 Emissions & Waste	2.3.2 Macro Economic Effect
	2.1.3 Suppliers	2.2.3 Materials	2.3.3 Commercial Performance
	2.1.4 Communication	2.2.4 Water	2.3.4 Capability Management
	2.1.5 Human Resources	2.2.5 Energy	2.3.5 Environmental Expenditures
	2.1.6 Health & Safety	2.2.6 Noise & Vibrations	
<i>Level 3 Operation of the Asset</i>	3.1.1 Stakeholders	3.2.1 Transport	3.3.1 Market Presence
	3.1.2 Society	3.2.2 Emissions & Waste	3.3.2 Macro Economic Effect
	3.1.3 Suppliers	3.2.3 Materials	3.3.3 Efficiency of the Asset
	3.1.4 Community Capital	3.2.4 Water	3.3.4 Environmental Expenditures
	3.1.5 Human Resources	3.2.5 Energy	3.3.5 Long-Term Planning
	3.1.6 Occupational Health & Safety	3.2.6 Maintenance of the Asset	3.3.6 Realized Economic Performance
		3.2.7 Decomposing of the Asset	

Figure 14: The Sustainable Footprint Methodology

On the rows, there are three levels of consideration. These three levels are: (1) Project Pre-Phase, (2) Project Execution and (3) Operation of the Asset. These three levels are chosen because it is aimed that the project manager not only takes into account the sustainability aspects of its project, but that he also reflects on the sustainability aspects that are relevant during the operation of the asset. With these three levels, the project manager knows which sustainability aspects to consider in each phase of the project. These three levels are inspired by research on sustainability in project management by Silvius, van den Brink and Köhler and by the life-cycle views of Labuschagne and Brent, as was presented in Chapter 3.

The Project Pre-Phase is consciously separated from the Project Execution Phase because research shows that the Pre-Phase of the project, also known as the front end development (FED) phase, is determinative for the success of the complete project (Hermanides 2009). In this phase of a project expenditures are still low, while influence on the project outcome is high, making it an important part of project management. This is also true for sustainability: decisions made in the Project Pre-Phase have significant effect on the sustainability performance in later phases of the project.

As an illustration of the three levels, they are applied to the BGS project below:

Level 1: Project Pre-Phase

- Determine feasibility and alignment with business strategy, basic design, choice for location and other preferred project options, final investment decision.

Level 2: Project Execution

- Detailed design, engineering, procurement and construction.
- The drilling of 14 new wells into the gas reservoir and modifying the existing Bergermeer well location above ground.
- Building a new gas compression and treatment installation in the industrial area Boekelermeer Zuid 2.
- The installation of pipelines between the well location and the new gas treatment installation (around 8 km) and between the gas treatment installation and the existing distribution gas grid (another 8 km).
- Bringing the gas field on initial pressure by injecting natural gas from the gas grid.

Level 3: Operation of the Asset

- The actual operation of the BGS, consisting of the production of gas during peak demands and injecting gas into the field to store gas.
- Abandon activities by removing the installations and bringing the location in its original state.

It is consciously decided to limit the levels in the framework to three, instead of listing more of the phases that are typically used in project management. A benefit of adding more levels is that it is more precisely specified which sustainability aspects to consider in each phase of the project. However, the result of listing more phases on the rows of the framework is that several indicators would re-appear in more levels. This would make the framework unnecessary complex. Therefore, it is decided to list three overarching levels. However, it is unavoidable that still some indicators re-appear in the different levels because they are relevant to more levels of the project.

On the columns of the framework the triple bottom line (3BL) of sustainability is displayed: (1) People, (2) Planet and (3) Profit. For an explanation of the 3BL, see Chapter 3. The three pillars from the 3BL are used in this framework because all relevant aspects of sustainability can be categorized in these three pillars and in the literature on sustainability, the 3BL the most recognized concept (Mulder 2006). Furthermore, the three pillars display the trade-offs that have to be made within sustainability.

The three pillars of the 3BL differ considerably. In short, it can be said that the 'People' pillar is the social pillar: it is mostly qualitative and needs a process approach. The main point of this pillar is to achieve consensus between all stakeholders, both internally and externally. Secondly, the 'Planet' pillar covers the environmental 'facts' of the project, this is a more quantitative pillar. To give an example: the outcomes of 'Emissions and Waste' indicator, in 'Planet', can be expressed in numbers, in contrast to most indicators in 'People'. Thirdly, the 'Profit' pillar entails the business case of the project. Without satisfying this pillar, the project would not be feasible in the first place.

The three levels on the rows and the three pillars in the columns result in a matrix. For each cell of this matrix, several sustainability indicators are defined. The indicators in the framework are classified by three numbers. The first number refers to the level of the project on the vertical axis. The second number refers to the three 'Ps' of the 3BL on the horizontal axis. And finally, the third number is given to the indicator to separate all indicators in this category. As an illustration of this numbering, an example is given:

3.2.1

3. Level 3: Operation of the Asset

2. The 3BL: 2. 'Planet'

1. The 1st indicator for 'Level 3' and the 2nd pillar of the 3BL 'Planet'

The indicators in this framework are mainly adapted from or inspired by the following sources:

- The GRI Indicators, (GRI 2010).
- The United Nations CSD Indicators of Sustainable Development, (United Nations Commission on Sustainable Development 2010).
- The Ten WWF One Planet Living Principles for Sustainability, (Gonçalves 2008).
- Sweden's environmental objectives, (Swedish Environmental Protection Agency 2010).

Some indicators are literally used from the references above. Others were adapted from these sources to make them more fit for this new framework. There are also indicators that were designed with the input of the two expert panels. Additionally, several sources made a relevant contribution (Labuschagne and Brent 2005; Taylor 2008; Gareis, Heumann et al. 2009; Dijkhuizen 2010).

4.3.2 Summary of Indicators

The indicators as presented in the framework in Figure 14 are summarized in this section. A complete list of all indicators including references for each indicator is outlined in Appendix 6. Some indicators are present in more than one level of the project. This is done, simply because some sustainability aspects are relevant for several project levels.

Indicators on People

The 'People' pillar entails indicators for external social performance as well as for internal social performance. In the levels of the 'People' pillar, these indicators are categorized accordingly: first the external indicators, secondly the internal social indicators.

Level 1: Project Pre-Phase

- 1.1.1 'Stakeholders' involves stakeholder analysis, information provisioning to the stakeholders and stakeholder influence.
- 1.1.2 'Customers' entails the impact on the quality of life by using the product, for the customer and for the whole community.
- 1.1.3 'Politics and Legislation' deals with the rules, regulations and tenders that have to be satisfied before construction can start, the interest and influence of politics and non-corruption.
- 1.1.4 'Team Participants' entails securing that in the team, someone is responsible for sustainability, and that sustainability criteria are applied when team members, contractors, suppliers and specialist are selected.
- 1.1.5 'Health and Safety Plan' involves if there is a health and safety plan to ensure a safe execution phase.

Level 2: Project Execution

- 2.1.1 'Stakeholders', see 1.1.1.
- 2.1.2 'Society' entails non-corruption, competitive behavior and compliance with laws and regulations.
- 2.1.3 'Suppliers' entails that sustainability criteria are applied when suppliers are selected.
- 2.1.4 'Communication' entails that the project manager makes sure that the stakeholders, including its employees, partners and end-users, are informed about the sustainability aspects of the project.

- 2.1.5 'Human Resources' entails the number of jobs created, the wages of the employees compared to the project budget, employment practices, capacity development, non-discrimination and prevention of child-labor.
- 2.1.6 'Health and Safety' involves the workforce that is active in monitoring and advising health and safety programs, decreasing the amount of work-related injuries and the programs in place for prevention of illness.

Level 3: Operation of the Asset

- 3.1.1 'Stakeholders', see 1.1.1.
- 3.1.2 'Society', see 2.1.2.
- 3.1.3 'Suppliers' see 2.1.3.
- 3.1.4 'Community Capital' is the net migration rate and the number of indirect jobs created by the project.
- 3.1.5 'Human Resources', see 2.1.5.
- 3.1.6 'Occupational Health and Safety', see 2.1.6.

Indicators on Planet

The 'Planet' pillar entails indicators on environmental performance. The goal is to find a balance between the environmental burden and the capacity of the Earth to carry environmental burdens.

Level 1: Project Pre-Phase

- 1.2.1 'Design Options' entails if designs of the asset are stimulated that respond to good practices regarding the environment and if the different designs are checked on environmental impacts.
- 1.2.2 'Land and Biodiversity' involves the land that is needed for building the asset, the impacts on biodiversity, the habitats that are protected and the compensation activities.
- 1.2.3 'Environmental Plan' includes the plan for separating waste and treating dangerous chemicals.
- 1.2.4 'Product' involves looking at the alternatives of the product that are more environmentally desirable, alternatives for the process of producing the product and the possibilities of environmental friendly decomposing of the product.

Level 2: Project Execution

- 2.2.1 'Transport' entails the travelling by the members of the team and all transport of products, goods and materials needed for the project execution.
- 2.2.2 'Emissions and Waste' measures emissions, initiatives to reduce those emissions, waste by type and disposal method and spills.
- 2.2.3 'Materials' involves all input materials, the percentage of those materials that are recycled and the percentage of those input materials that can be recycled in the future.
- 2.2.4 'Water' incorporates the water withdrawal, the effect on the water sources and the percentage of water that is recycled and reused.
- 2.2.5 'Energy' entails energy consumption, energy saved due to efficiency improvements, and initiatives to increase energy-efficiency or use of renewable energy.
- 2.2.6 'Noise and Vibrations' entails the noise and vibrations that are produced during the construction of the asset.

Level 3: Operation of the Asset

- 3.2.1 'Transport', see 2.2.1.
- 3.2.2 'Emissions and Waste', see 2.2.2.
- 3.2.3 'Materials', see 2.2.3.
- 3.2.4 'Water', see 2.2.4.

- 3.2.5 'Energy', see 2.2.5.
- 3.2.6 'Maintenance of the Asset' tests if there is a plan for preventive and re-active maintenance and if it is possible to run the asset during maintenance.
- 3.2.7 'Decommissioning of the Asset' involves the possibilities of environmental friendly decomposing of the asset and the effect on the environment after the asset is decomposed.

Indicators on Profit

The 'Profit' pillar implies that all economic activities must create prosperity for the company as well as for its workers and owners.

Level 1: Project Pre-Phase

- 1.3.1 'Expected Economic Performance' involves expected profits, CAPEX, OPEX, donations, and financial implications and risks due to climate change.
- 1.3.2 'Expected Financial Health and Stability' measures if there is a system for financial risk management and if financial reservations are made in time.
- 1.3.3 'Expected Shareholder Involvement' measures if shareholders and management decisions have a long-term focus and if long-term changes require shareholder approval.

Level 2: Project Execution

- 2.3.1 'Market Presence' measures the wage level compared to the local minimum wage and the proportion of locally-based employees, senior management and suppliers.
- 2.3.2 'Macro Economic Effect' involves the increase in economic activity due to the project, the contribution to GDP and the market share performance.
- 2.3.3 'Commercial Performance' tests if the project is not dependent on a limited number of stakeholders, if there is an innovation strategy, if long-term business is ensured and if is invested in new business.
- 2.3.4 'Capability Management' investigates if there is a plan for technological development, competence management, information management, quality management and business continuity and disaster recovery.
- 2.3.5 'Environmental Expenditures' measures the environmental expenditures and investments by type.

Level 3: Operation of the Asset

- 3.3.1 'Market Presence', see 2.3.1.
- 3.3.2 'Macro Economic Effect', see 2.3.2.
- 3.3.3 'Efficiency of Asset' measures how long the asset is in use compared to the hours needed for reparations and maintenance, the costs of maintenance and the fines when the product is not delivered on time.
- 3.3.4 'Environmental Expenditures', see 2.3.5.
- 3.3.5 'Long-Term Planning' tests if there is a long-term financial planning and if possible future scenarios for the business environment are analyzed.
- 3.3.6 'Realized Economic Performance', see 1.3.1.

4.4 Content of the Framework

In this section, the content of the framework is discussed. First, the levels and the pillars of the framework are reflected on in Section 4.4.1 and 4.4.2. Following, a discussion on the dependencies of the indicators is outlined in Section 4.4.3. In Section 4.4.4 it is discussed how to rate the qualitative indicators of the framework. Next, in Section 4.4.5, a reflection is given on whether the literature as described in Chapter 3 is still covered in the final version of the framework, after the review of the framework by the two expert panels. An alternative form for the framework is discussed in Section 4.4.6. Last but not least, the concept 'Footprint' is discussed in Section 4.4.7.

4.4.1 Choosing the Three Levels

The reason for listing only three levels is that companies mostly have their own specific project phases. Typical phases in the project life cycle are: idea generation, pre-feasibility, feasibility, development and execution, commissioning, launch and post-implementation review (Buttrick 2000). By limiting the levels to three, it is enabled to categorize all company specific project management phases into one of the levels of the framework. For example: three company specific project management phases can be combined as level 1 of the framework. This was also done for the specific phases of the BGS project, as will be explained in Chapter 5. If it was the other way around; if there were more framework levels than project management phases used in the company, there is the risk of overlooking several indicators if there are no defined activities for one level.

Early sustainability decisions will impact the following stages and therefore, it is required to use the framework from the start. In later stages, the sustainability aspects will become more detailed.

4.4.2 Choosing the Three Pillars

Some indicators are categorized in one pillar but actually contain aspects of several P's. An example is the indicator 'Transport'. This indicator is categorized in the 'Planet' pillar because transport has an impact on the environment. However, more transport can also have an impact on 'People'. To illustrate, more trucks driving around the project location could increase danger for kids playing on these streets or for people biking there. Even though issues of one indicator fit in more than one pillar, the decision was made to not display indicators in more pillars. This would result in a higher complexity of the framework which would decrease its usability. The choice is made to place the indicator in the most appropriate pillar. This could for example be the pillar where the impact is the highest. For 'Transport' this would be the 'Planet' pillar. Furthermore, the safety issue that 'Transport' creates is in a lesser extent covered in the 'People' indicator for 'Health and Safety'.

The question may arise if the three pillars should be in the framework at all. If the pillars were not included, the result would be a list of indicators for each project level. In this research, it was consciously chosen to categorize the indicators in the three pillars, since this benefits the general idea of the framework: understanding sustainability issues. This becomes easier by placing topics under the three pillars.

It can be argued to remove the 'Profit' pillar, since these financial aspects are already taken into account by normal project management practices. Furthermore, it can be questioned if 'Profit' should be considered for sustainability at all. The view of the author of this report is that the 'Profit' pillar should be considered since this pillar is necessary to give insights in the trade-offs within sustainability.

4.4.3 Dependencies of the Indicators

The different indicators in the framework are certainly not independent of each other. Some improvements on indicators deliver positive gains for other indicators, but negative feedback could also occur. An example of a positive dependency is the 'Transport' indicator in the 'Planet' pillar. Improving on this indicator would mean that less transportation is used, which also means a positive

effect in economic performance in the ‘Profit’ pillar. An example of a negative dependency is that choosing for a more environmental friendly ‘Design Option’ in ‘Planet’ could disadvantage the ‘Occupational Health and Safety’ in ‘People’. A more environmental friendly option would be constructing the wellheads completely below surface. However, for employees doing maintenance work at the wellheads, this is not the safest option. Because of these interdependencies, improving on one indicator does not necessarily mean that the overall ‘Sustainable Footprint’ is improved as well. It is the task of the management of the project to prioritize these aspects and to make decisions accordingly. In general, it is expected that improving on ‘People’ and ‘Planet’ conflicts most of the times with ‘Profit’.

4.4.4 Rating the Qualitative Indicators

The indicators that are not ‘measurable’ or quantitative are designed as a question. For example in 1.1.1 Stakeholder Participation: Are stakeholder meetings organized? This is explicitly not designed as ‘number of stakeholder meetings’, because more stakeholder meetings are not necessarily better. It also depends on the quality of the event. The main point is that the project manager pays attention to this indicator, not that he tries to ‘score’ high on ‘Number of planned stakeholder meetings’. To still have the possibility of rating, and to prevent that the questions in the framework are encouraging a ‘checklist’ attitude, the following levels of implementation are recommended (Dijkhuizen 2010):

- (1) No awareness and attention
- (2) Minimum attention and work practice
- (3) Awareness and recognition
- (4) Implementation is demonstrated
- (5) Implementation is consistent over the relevant period

Using this rating system, it is certainly possible to miss some important aspects. For example, nothing is said about stakeholder satisfaction. However, to really conclude on stakeholder satisfaction, stakeholders should be researched thoroughly. This could for example be by interviewing stakeholders or letting them fill in a questionnaire. A limitation of the current framework is that not necessarily all stakeholders are approached and satisfied.

4.4.5 Covering the Literature

In Chapter 3, a literature review was presented. This literature review served as an input for the design of the new framework, as is shown in Figure 15.

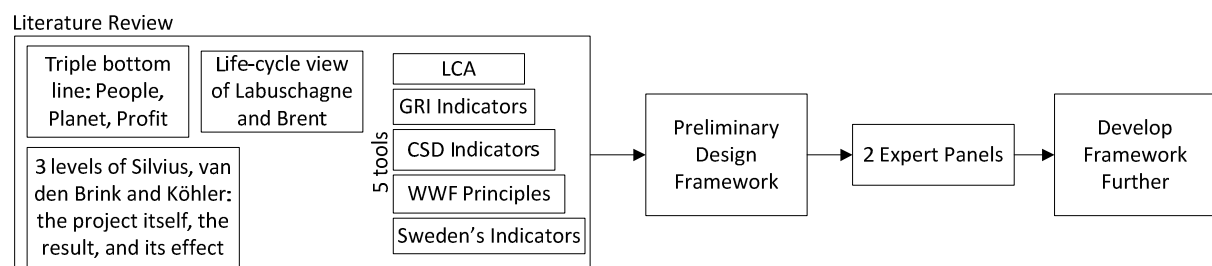


Figure 15: Literature Review and two Expert Panels as Input for the Framework

The research on sustainability in project management is scarce but the available literature on sustainability in project management is attempted to be covered in the new framework. However, the view of the author is that not all literature was suitable for this, as was explained in Chapter 3. Looking at the more general literature on sustainability and the already available sustainability frameworks, much more research material is available. It was decided to select five well known sustainability tools as an input for the new framework. Of course, there are more existing tools but these were consciously not used because of time restrictions of this research. Furthermore, many

tools have overlapping sustainability content, so it is expected that most sustainability aspects are covered by using the five selected tools.

After the preliminary design of the framework, 2 expert panels were organized to evaluate and to develop the framework further. With the feedback of these experts, several indicators were removed. It might be questioned how much of the literature is left after reshaping the framework with the input of the 2 expert panels. Additionally, in the preliminary framework design, some aspects were already not used since these were not applicable to the new framework. Therefore, total completeness is not claimed.

Furthermore, it cannot be said that all 5 tools are equally present in the final version of the framework. Most indicators in the final version of the framework are adapted from the GRI indicators or are developed by the author with the input of the 2 expert panels. In Appendix 6, all indicators are presented including the specific references used.

It can be concluded that the new framework is unique compared to the existing tools because it categories sustainability aspects for several project management phases and adds relevant sustainability aspects for projects that were not yet present in the existing tools. Examples are ‘Noise and Vibrations’ and ‘Health and Safety’.

4.4.6 Alternative Form

In Figure 16, an alternative form for the Sustainable Footprint Methodology is presented. In the current framework, the pillars are displayed on the columns and the levels on the rows. In this alternative version, this is shifted. The second change is that the indicators that reappear in more levels are listed on the same row. By doing this, it becomes possible to see more clearly which indicators reappear in several levels. A negative aspect of this alternative form is that it is larger than its usual version.

		Level 1 Project Pre-Phase	Level 2 Project Execution	Level 3 Operation of the Asset
1. People		Stakeholders	Stakeholders	Stakeholders
		Customers		
		Politics and Legislation		
		Team Participants		
		Health and Safety	Health and Safety	Health and Safety
			Society	Society
			Suppliers	Suppliers
			Communication	
			Human Resources	Human Resources
				Community Capital
2. Planet		Design Options		
		Land and Biodiversity		
		Environmental Plan		
		Product		
			Transport	Transport
			Emissions and Waste	Emissions and Waste
			Materials	Materials
			Water	Water
			Energy	Energy
			Noise and Vibrations	
3. Profit				Maintenance of the Asset
				Decomposing the Asset
		Expected Economic Performance		
		Expected Financial Performance		
		Expected Shareholder Performance		
			Market Presence	Market Presence
			Macro Economic Effect	Macro Economic Effect
			Commercial Performance	
			Capability Management	
			Environmental Expenditures	Environmental Expenditures
			Efficiency of the Asset	
			Long-Term Planning	
			Realized Economic Performance	

Figure 16: Alternative Form for the Sustainable Footprint Methodology

4.4.7 The Concept 'Footprint'

The name of the new framework is the 'Sustainable Footprint Methodology'. As was explained earlier in Chapter 4, the concept 'footprint' is not new. Well-known other 'footprints' are: (1) the ecological footprint (Wackernagel and Rees 1998), (2) the carbon footprint (Wiedmann and Minx 2007) and (3) the water footprint (Hoekstra and Chapagain 2008). These already existing footprints express the environmental burden in one final unit: the 'footprint'.

The new framework uses the concept of combining more aspects of 'the Triple Bottom Line' into one new methodology: 'The Sustainable Footprint Methodology'. The framework analyzes and determines several relevant social, environmental and economical impacts of a project for different phases of project management.

The main difference of the 'Sustainable Footprint Methodology' with the other existing footprints is that the 'Sustainable Footprint Methodology' does not give the conclusion in one final value. For example, the ecological footprint of one Dutch person is calculated to be 5.2 hectare. If there is 1.7 hectare available for each person, a value of 5.2 means a too large ecological footprint.

The 'Sustainable Footprint Methodology' cannot precisely calculate when something is good or not because many qualitative aspects are included. The score has to be determined by comparing the project with other projects. A benefit of not having one final value is that the conclusion is specified per indicator. Therefore, it can easily be seen where improvements are needed. This is what makes the outcome of the 'Sustainable Footprint Methodology' valuable for companies.

With, for example, the ecological footprint, it is less clear where improvements are needed: with a single score you can not see if you need to pay attention to your travelling or to your meat consumption.

4.5 Use of the Framework

The framework as such entails many indicators and may look quite complex and time-consuming to use in real projects. To overcome this, it is recommended to only select the indicators that are most relevant for each specific project. However, this entails the risk that only the 'easy' indicators are selected on which the project manager assumes to score high. Therefore, it is recommended to take the long term sustainability view in mind and not to go only for the quick wins. However, it is understood that it is hard to enforce this. To overcome this, it is advised to select the relevant indicators for the project with an expert panel, as was also done for the BGS project. This expert panel does not have to exist only of employees of the company, but can consist of well-informed stakeholders as well. Inviting stakeholders for this selection process would benefit an important social goal of sustainability: reaching consensus between stakeholders. It is understood that this consensus is not achieved if the technocratic framework is only used by the project manager.

The question may arise why the original framework is not adapted to be simpler in the first place. This is consciously not done, because to have a good map of what sustainability entails, all indicators of the framework are considered to be relevant. Furthermore, to be able to use the framework in different projects, all indicators need to be included in the original version. This generic version can then flexibly be made fit for purpose by selecting the relevant indicators for each specific project.

To be able to compare the performance of the different qualitative and quantitative indicators, a color score card is recommended for each indicator. Using the color score card for all indicators will result in a quick performance overview. Five colors are proposed ranging from (1) red, worst performance, to (5) green, best performance, see Figure 17. It is decided to use five different performance levels in the color score card because this matches with the levels of implementation (Dijkhuizen 2010) that will be used for the qualitative indicators, as was explained in Section 4.4.4.

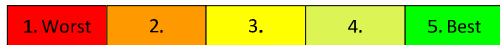


Figure 17: The Color Score Card

The question may arise which activities have to be performed at what time in order to use the framework in an effective way. Therefore, Figure 18 gives an overview on the process of using the framework. By using this approach, it is ensured that the sustainability effects of a project are identified in an early stage and that measures can be developed to improve the project's sustainability performance. The result of using the framework is determined cumulatively by the precision with which every phase is carried out.

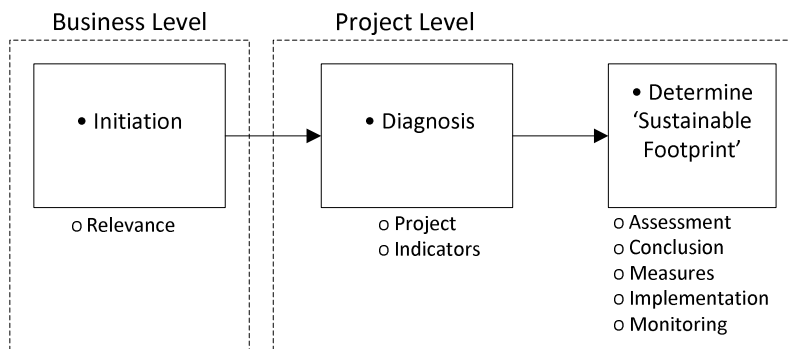


Figure 18: Process of Using the Framework

The process of Figure 18 is explained as follows:

- Initiation
 - Relevance. The starting point of using the framework is that each project has an impact on People, Planet and Profit. 'What consequences will this project have in terms of sustainability?' must be a routine question. This understanding is not only necessary for the project manager, but for the whole company. The integration of sustainability is a process that should be implemented top-down.
- Diagnosis
 - Project. Make a first overview of the project with all activities.
 - Indicators. Select the relevant indicators for the project. The selection of indicators might change during the execution of the project, however, it is recommended to make a preliminary selection in the beginning.
- Determine 'Sustainable Footprint'
 - Assessment. Fill in the selected indicators.
 - Conclusion. Use the color score card to present the results in a report.
 - Measures. Generate measures to improve on the lacking indicators.
 - Implementation. Implement the measures taken.
 - Monitoring. The improvements can be monitored with the help of the framework.

These last five points are inspired by PDCA (plan-do-check-act). This is an iterative four-step problem-solving process typically used in business process improvement. It is also known as the Deming cycle, Shewhart cycle, Deming wheel, or plan-do-study-act (Deming 2000).

As already slightly mentioned above, it is advised that sustainability awareness is stimulated from top-down, which means from directors to project managers to the whole project team. Therefore, directors must stimulate the implementation of the new framework, project managers should use it and the whole project team should be updated on the measures and results. Furthermore, stakeholders can be involved in the selection process for the indicators and following, these stakeholders should also be informed on further measures and results.

4.6 Summary

In this chapter, a framework was developed to operationalize sustainability in project management. The new framework named 'The Sustainable Footprint Methodology' analyzes several relevant social, environmental and economical impacts of a project for different phases of project management. Hereby, it is determined how the project scores on sustainability: 'the Sustainable Footprint'.

On the vertical axis of the framework, three levels are displayed: (1) Project Pre-Phase, (2) Project Execution and (3) Operation of the Asset. These three levels ensure a broad view, not limited to project execution. On the horizontal axis of the framework the three pillars of the triple bottom line are displayed: (1) People, (2) Planet and (3) Profit. These three pillars are a recognized concept in the sustainability literature. The levels and the pillars result in a 3-by-3 matrix in which the relevant sustainability indicators are presented. The project manager can use this framework to understand the consequences of the project and to balance trade-offs between the three pillars of the triple bottom line along the project management phases. Additionally, this framework can be used to benchmark projects and to report on sustainability.

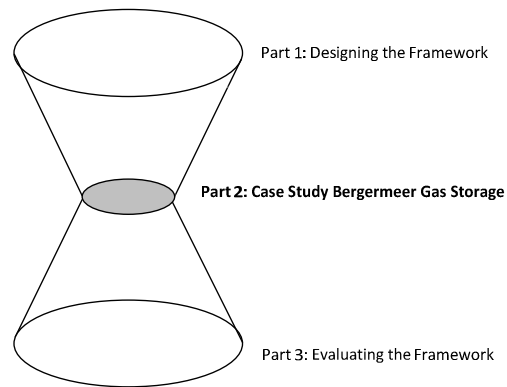
- **Part 2: Case Study Bergermeer Gas Storage**

Chapter 5: Introduction of the Bergermeer Gas Storage Project

Chapter 6: The Sustainable Footprint of the Bergermeer Gas Storage Project

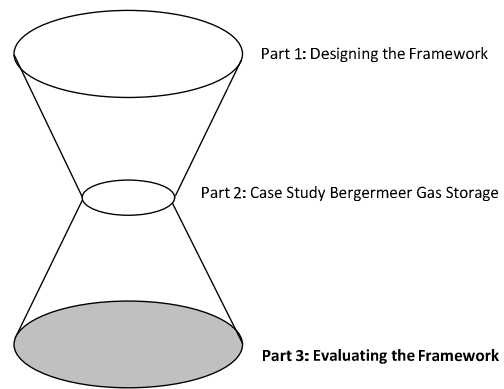
Chapter 7: Recommendations on the Bergermeer Gas Storage Project

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- **Part 3: Evaluating the Framework**

Chapter 8: Reflection on the Sustainable Footprint Methodology



8. Reflection on the Sustainable Footprint Methodology

In this chapter, reflections are given on the new framework 'The Sustainable Footprint Methodology' and on this research project in general. In Chapter 6, the 'Sustainable Footprint Methodology' was used to evaluate the Bergermeer Gas Storage project. During this evaluation, several positive and less positive aspects of using the framework became clear which are discussed in Section 8.1. Next, in Section 8.2 several limits of the framework are discussed. Finally, Section 8.3 reflects on the role of this research within TAQA.

8.1 Reflection on the Use of the Framework

In this section, the strong and less strong points are presented. These became clear during the use of the new framework. First, in Section 8.1.1 the time and resources that are needed to use the framework are discussed. Next, in Section 8.1.2, a discussion is outlined on who should determine 'the Sustainable Footprint' in the first place: an internal employee or an external consultant? Next, in Section 8.1.3, it is discussed how to select the relevant indicators for each specific project. Finally, in Section 8.1.4, it is discussed what to do after the 'Sustainable Footprint' is determined.

8.1.1 Time and Resources Needed

In this first time use of the framework, about 2 months were used to analyze the selected indicators. It must be noticed, that during these 2 months, development and reflection work was also included. Therefore, it can be roughly concluded that around 3 weeks of full-time work for one person is needed to fill in the indicators. Additionally, the specialization and experience of the researcher will have an impact on the time needed too.

In this research, about 20 meetings and interviews gave input for determining the results of the selected indicators. A list of all interviews, meetings and lectures during this research is outlined in Appendix 8. The amount of interviews needed for using the framework is highly dependent of the size, complexity and type of the project and on the experience and knowledge of the researcher. Furthermore, in smaller project teams, it is expected that information can be gathered quicker.

8.1.2 Use by Internal Employee vs. External Consultant

The question may arise who is suitable to fill in the framework in the first place. An internal manager or engineer, who knows all ins and outs of the project, might need less time than an external consultant who does not have access to all the information needed. Furthermore, an external consultant might not know who to contact to obtain the right information. Therefore, in case of time constraints, it would be advised that an internal employee determines the 'Sustainable Footprint' of the project.

However, an internal employee might be biased about the performance on several indicators because he wants his project to score 'best'. Therefore, for the sake of reliability, an external consultant seems better. The external perspective can be very important to assess whether all sustainability efforts have really landed.

Looking at the confidentiality of information, external consultants might not have access to all relevant documents. When more information is spread to people outside the company, there is a higher risk that certain information is received by stakeholders that should not have access to this information. Therefore, companies will prefer to keep confidential information in-house and to let the framework be used by an internal employee. This would also benefit the costs of using the

framework because internal employees are cheaper for of two reasons: they mostly have a lower hourly rate compared to an external consultant and they need less time for the same job since they are better informed about the project and on where to find the necessary information. Furthermore, if it is not possible to give the external consultant all confidential details, this could also result in low-quality judgment on the project's 'Sustainable Footprint'.

To conclude, it is recommended that an internal employee uses the 'Sustainable Footprint Methodology' because of time, money and confidentiality issues. Furthermore, the methodology is expected to be simple enough to be used without training or having a specific specialism into the methodology or into sustainability in general.

8.1.3 Selection of Indicators

To make the framework fit for every specific project; the relevant indicators have to be selected. Selection of the indicators by one person could result in a biased outcome and is therefore not advised.

For the BGS project, the indicators were selected by an expert panel, consisting of core team employees of the BGS project. These experts know all the ins and outs of the BGS project and could therefore quickly select the relevant indicators. An additional advantage of letting internal employees select the indicators was that people felt involved in this sustainability project and gave valuable information for analyzing the indicators of the framework. For example, suggestions were given who to interview and who to ask for specific documents. Furthermore, awareness of sustainability among the project team was raised. This was a first positive result of using the framework. It is recommended to repeat this approach in following projects since this is a kick-start for using the 'Sustainable Footprint Methodology'.

8.1.4 Follow-up Steps

To ensure that using the framework will have a positive effect on the final 'Sustainable Footprint' of the project, follow-up steps need to be carried out. In Chapter 4, the process for using the framework was presented. In the process, attention was paid on follow-up steps as well. It was recommended to generate measures on the lacking indicators for each level. After that, these measures need to be implemented and the performance needs to be monitored. If the use of the framework is limited to determining the outcome of the indicators without generating follow-up steps, the impacts of using the framework is minimal. If follow-up steps are taken, the framework becomes actually useful for improving the 'Sustainable Footprint'.

8.2 Reflection on the Limits of the Framework

In this Section, the limits of the framework are discussed. First, in Section 8.2.1 it is explained why benchmarking is difficult at this stage. Next, Section 8.2.2 reflects on why it is impossible to guarantee stakeholder consensus with the new framework.

8.2.1 Benchmarking

The framework was applied for the first time to the BGS project. The conclusions on the 'Sustainable Footprint' of the BGS project are therefore not comparable to other projects. When the framework has been used in more projects, benchmarking figures can be developed. Data of several projects can be compared and consequently, the conclusions will become more solid.

However, the researcher has to be careful when comparing the different projects. The performance on an indicator can depend heavily on the type of project. For example: it cannot simply be said that a project scores better because less energy is used if the projects are really different in energy needs. Furthermore, projects and absolute values can only be compared to a certain extent. To be able to compare projects fully, all measures need to be relative. The future value of the framework depends

on the development of benchmarking figures and it is therefore recommended to do further research in this field.

Next, benchmarking is difficult because the indicators in the framework consist of a mix of inputs and outputs; this is illustrated in Figure 19. For example: stakeholder management is a qualitative input and number of spills is an output that can be measured after the project is completed. This diversity in indicators, makes benchmarking even more complex.

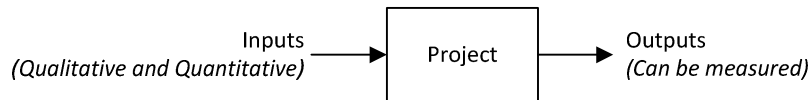


Figure 19: Mix of Inputs and Outputs in Indicators

Additionally, benchmarking is difficult because currently, the worst score is not yet determined for the indicators. Further research is necessary to fully conclude on the scores of ‘the Sustainable Footprint Methodology’. What also has to be kept in mind is that the ‘worst’ and ‘best’ scores will change over time. What can be the best score today might be an average score in the future. To give an example: technological developments can improve emissions and energy use.

In general, it can be concluded that it needs to be further investigated how sustainability benchmarking can be realized with the new framework. According to a consultant of the company IPA (Independent Project Analysis), ‘The Sustainable Footprint Methodology’ would be the first sustainability benchmarking tool for projects (Lesnie 2010). IPA is a global company specialized in evaluating individual projects and competitive benchmarking.

8.2.2 Receiving Stakeholder Consensus

One essential goal of social sustainability is to receive stakeholder consensus. This would mean that all stakeholders are somehow satisfied with the project. It is understood that the framework as such is mainly technocratic and does not necessarily increase the consensus between stakeholders. However, as was described in Section 4.5, the framework is not only intended for project managers. Stakeholders can be involved in the selection process for the indicators and following, stakeholders should also be informed on further measures and results. Hereby, stakeholder consensus can be improved. But still, it is understood that the framework can never guarantee full stakeholder satisfaction.

This is also supported by the fact that every group of stakeholders can have its own ‘truth’ or believe in their own ‘facts’. To give an example: the outcome of the framework can be that the project scores best on ‘health and safety’, but still, neighbors are worried about this aspect. Project managers then have to take these worries seriously. The framework should not be used as a checklist and used to ignore aspects that already have a best score. It is advised to use the framework flexibly during the whole duration of the project.

8.3 Reflection on the Role of the Researcher

This research project was performed in close collaboration with TAQA. The author of this report worked in the office of the BGS project team, spoke with many TAQA employees, and thereby, was basically part of the company. This working from within the core the BGS project can be best described as ‘action research’ (Mills 2000; Brydon-Miller, Greenwood et al. 2003).

This ‘action research’ made sure that the new framework was fit for purpose and that the researcher developed the deep understanding of the BGS project that was needed to evaluate the project on sustainability. However, it can be argued that this close collaboration must have biased the outcomes of ‘the Sustainable Footprint’ for the BGS project. It is understood that it can never be completely proved that this bias does not exist, but it was the true intention of the researcher to perform a trustworthy, objective and accurate analysis.

9. Conclusions and Recommendations

In this final chapter, conclusions and recommendations are outlined. In Section 9.1, the research questions are answered. Conclusions on validity are presented in Section 9.2. Finally, recommendations for further research are explained in Section 9.3.

9.1 Answering the Research Questions

This section answers the research questions, as they were presented earlier in Chapter 2. First, in Section 9.1.1, the main research question is answered. Secondly, in Section 9.1.2, the additional research questions are answered.

9.1.1 Answering the Main Research Question

What assessment criteria should be included in a generic framework to incorporate sustainability in project management?

In Figure 20 an overview of the new framework named ‘The Sustainable Footprint Methodology’ is presented.

The Triple Bottom Line			
	1. People	2. Planet	3. Profit
Level 1 Project Pre-Phase	1.1.1 Stakeholders	1.2.1 Design Options	1.3.1 Expected Economic Performance
	1.1.2 Customers	1.2.2 Land & Biodiversity	1.3.2 Expected Financial Health & Stability
	1.1.3 Politics and Legislation	1.2.3 Environmental Plan	1.3.3 Expected Shareholder Involvement
	1.1.4 Team Participants	1.2.4 Product	
	1.1.5 Health & Safety Plan		
Level 2 Project Execution	2.1.1 Stakeholders	2.2.1 Transport	2.3.1 Market Presence
	2.1.2 Society	2.2.2 Emissions & Waste	2.3.2 Macro Economic Effect
	2.1.3 Suppliers	2.2.3 Materials	2.3.3 Commercial Performance
	2.1.4 Communication	2.2.4 Water	2.3.4 Capability Management
	2.1.5 Human Resources	2.2.5 Energy	2.3.5 Environmental Expenditures
	2.1.6 Health & Safety	2.2.6 Noise & Vibrations	
Level 3 Operation of the Asset	3.1.1 Stakeholders	3.2.1 Transport	3.3.1 Market Presence
	3.1.2 Society	3.2.2 Emissions & Waste	3.3.2 Macro Economic Effect
	3.1.3 Suppliers	3.2.3 Materials	3.3.3 Efficiency of the Asset
	3.1.4 Community Capital	3.2.4 Water	3.3.4 Environmental Expenditures
	3.1.5 Human Resources	3.2.5 Energy	3.3.5 Long-Term Planning
	3.1.6 Occupational Health & Safety	3.2.6 Maintenance of the Asset	3.3.6 Realized Economic Performance
		3.2.7 Decomposing of the Asset	

Figure 20: The Sustainable Footprint Methodology

On the rows, there are three levels of consideration: (1) Project Pre-Phase, (2) Project Execution and (3) Operation of the Asset. With these three levels, the project manager knows which sustainability aspects to consider along the project management phases. On the columns of the framework the three pillars of sustainability are displayed: (1) People, (2) Planet and (3) Profit, to ensure that the trade-offs within sustainability become clear. The three levels on the rows and the three pillars in the columns result in a matrix. For each cell of this matrix, several sustainability indicators are defined. An extensive explanation of all indicators is outlined in Appendix 6. These indicators display the assessment criteria that should be included in a generic framework to incorporate sustainability in project management.

9.1.2 Answering the Additional Research Questions

- Part 1: Designing the framework

1. *How and to what extent is sustainability incorporated in project management today?*

The literature on sustainability in project management is scarce. However, the need to integrate sustainability in project management is recognized and first attempts are made to give meaning to this new approach. Labuschagne and Brent state that, when considering sustainability in project management, the total life-cycle of the project should be taken into account.

The view of the author of this report is that companies do involve parts of sustainability in project management, but there is no structured approach. For example, environmental impact and profit assessments are already performed as a part of the project management of TAQA.

2. *How should sustainability be incorporated in project management?*

Projects are a main part of business, and therefore, it is evident that when the strategy of a company is to act sustainable, this has to result in actions in their projects and project management.

This will imply that the project manager needs to develop a broader focus by including environmental ('Planet') and social ('People') aspects, next to the focus on scope, time, quality and budget. Furthermore, the project manager has to look further than the duration of the project or in other words: should consider the complete life-cycle.

This called for the development of a new framework, in order to deal with the wide variety of new sustainability considerations. This new framework details which sustainability aspects to consider along the project management phases.

3. *What are relevant assessment criteria for sustainability in project management?*

An overview of the assessment criteria for sustainability in project management is presented in Figure 20. A complete explanation is outlined in Appendix 6.

- Part 2: Case Study Bergermeer Gas Storage

4. *Which role has sustainability in the project management of the Bergermeer Gas Storage project?*

5. *How does the Bergermeer Gas Storage project score on the criteria of the new framework?*

6. *How can the Bergermeer Gas Storage project improve on sustainability?*

This part was removed for reasons of confidentiality.

- Part 3: Evaluating the framework

7. *What are the strong and weaker points of the framework and how can the framework be improved?*

The main strong point of the framework is that it makes a unique start to benchmark projects in terms of sustainability. This has so far not been done. Next, the framework stimulates a life-cycle approach within project management.

Next, categorizing the indicators in the three P's benefits the general idea of the framework: understanding trade-offs within sustainability. Finally, the framework is unique because it combines several relevant social, environmental and economical impacts of a project for different phases of project management in one framework.

A less strong point of the framework is that receiving stakeholder consensus is not guaranteed by using the technocratic framework as such. To really reach stakeholder satisfaction, stakeholders have to be informed and involved in the project. Furthermore, the 'Sustainable Footprint Methodology' cannot precisely calculate when something is good or not as is the case with other 'footprints'. The

relative scores have to be determined by comparing the project with other projects. Next, the different indicators in the framework are not independent of each other. Therefore, improving on one indicator does not necessarily mean that the overall 'Sustainable Footprint' is improved as well. This can become a strong point if, in further research, insights in the dependencies become clear.

The framework can be further improved by following the recommendations for further research that will be presented in Section 9.3.

9.2 Conclusions on Validity

The author recognizes the limitations of this research. Completeness of the framework cannot be claimed since several sustainability aspects were removed and a restricted amount of literature was taken into account because of time constraints. The framework was developed specifically to be applicable to TAQA's BGS project. However, the generic framework is designed to be valid for many more projects that meet the requirements as explained in Chapter 4. Methodological triangulation, as was described in Chapter 2, increased the external validity of the new framework.

9.3 Recommendations for Further Research

Sustainability needs to be implemented in the actions of projects and should not only be an 'idea' from the directors of a company. To facilitate this, it is recommended to continue this explorative research with more qualitative and quantitative research to develop 'the Sustainable Footprint Methodology' further. It is advised to do research in the order as presented below.

Firstly, it is recommended to investigate which project data, qualitative as well as quantitative, should result in which score per indicator. By doing this, it becomes more clear which result is 'best' (score 5) and worst (score 1). Additionally, it is recommended to investigate if a 5-point scale is appropriate.

Secondly, it is recommended to study the formulation of the indicators to avoid ambiguity. In addition, it is advised to investigate the form of the framework further. In Chapter 9, an alternative form of the framework was presented.

Thirdly, it is recommended to investigate when projects are similar enough to be able to compare them and to make sustainability benchmarking figures. The following questions arise: What characteristics of a project are important to specify differences and similarities? Can highly diverse projects, for example in terms of budget, be 'scaled' to the same level so that benchmarking on sustainability becomes possible? Further research is required to fully develop the framework as a general applicable benchmarking tool.

Fourthly, it is recommended to test the completeness of the framework further. Are all relevant sustainability aspects included in the framework? In this research, a specified amount of literature and already available tools were analyzed as an input for the development of the framework. However, more sustainability theories and tools exist. By taken more resources into account, the completeness of the framework can be tested further.

Fifthly, it is advised to investigate the positive and negative dependencies between the different indicators. For example: what would mean an improvement of one indicator for the other indicators? By drawing up this figure, the effect of generating measures on one specific indicator for the 'Sustainable Footprint' becomes clear.

Finally, it is recommended to further investigate how the framework can be applied in the existing project management procedures and how to link the framework to the existing industry policies like ISO 14000 and other sustainability reporting.

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Appendix 1: Outcomes Expert Panel 1

GDR Meeting 20.05.2010

Expert Panel 1: Herman Mooi, Marian Bosch-Rekvelde, Wim Ravesteijn, Maurits Gerver

Location: TPM, Jaffalaan 5, TU Delft

Relevance

1: not relevant at all to include in the general framework

5: very relevant to include in the general framework

Applicability

1: not important for BGS and should not be researched

5: very important for BGS and should be researched

Indicators	Relevance (Average)	Applicability (Average)
1.1.1 Stakeholders	5,00	5,00
1.1.2 Team Participants	4,25	4,25
2.1.1 Stakeholders	4,75	4,75
2.1.2 Society	4,00	3,50
2.1.3 Communications	4,50	5,00
2.1.4 Internal Human Resources	4,00	3,25
2.1.5 Project Health and Safety	4,75	4,50
3.1.1 Stakeholders	4,25	4,75
3.1.2 Society	3,50	3,00
3.1.3 Suppliers	3,50	3,00
3.1.4 Community Capital	4,00	3,25
3.1.5 Internal Human Resources	3,50	3,50
3.1.6 Occupational Health and Safety	4,25	3,00
4.1.1 Customer Health and Safety	3,75	3,50
4.1.2 Quality of Life	3,25	3,25
4.1.3 Customer Privacy	2,50	2,75
4.1.4 Products and Service Labelling	3,00	3,00
4.1.5 Marketing Communications	3,00	2,75
4.1.6 Compliance	3,50	3,50
1.2.1 Design Options	4,25	4,50
1.2.2 Land and Biodiversity	4,25	4,50
1.2.3 HSE Plan	4,25	4,25
2.2.1 Transport	3,25	3,25
2.2.2 Emissions, Effluents and Waste	4,75	4,50
2.2.3 Materials	4,50	4,00
2.2.4 Water	4,75	4,50
2.2.5 Energy	5,00	5,00
2.2.6 Food	2,00	2,00
3.2.1 Transport	3,00	2,25
3.2.2 Emissions, Effluents and Waste	4,75	4,75
3.2.3 Materials	4,00	3,75
3.2.4 Water	4,50	4,00
3.2.5 Energy	4,50	4,75
3.2.6 Food	2,00	2,00
3.2.6 Decomposing the Asset	4,25	4,25
4.2.1 Infrastructure	2,75	3,25
4.2.2 Materials/ Water/ Energy	3,50	3,00
4.2.3 Alternatives	3,25	3,25
4.2.4 Products and Services	2,75	2,50
4.2.5 Decomposing the Product	3,50	2,75
1.3.1 Expected Economic Performance	4,25	4,50
1.3.2 Expected Financial Health and Stability	4,25	4,25
1.3.3 Expected Potential Financial Benefits	4,75	5,00
1.3.4 Expected Shareholder Value and Involvement	4,50	4,25
2.3.1 Market Presence	3,50	3,25
2.3.2 Macro Economic Effect	3,50	3,50
2.3.3 Commercial Performance	3,75	4,25
2.3.4 Capability Management	3,50	3,75
2.3.5 Environmental Expenditures	3,25	3,25
2.3.6 Realized Economic Performance	4,00	4,25
3.3.1 Market Presence	3,25	2,75

3.3.2 Macro Economic Effect	3,75	4,25
3.3.3 Efficiency of asset	4,25	4,50
3.3.4 Environmental Expenditures	3,00	3,00
3.3.5 Long-Term Planning	3,75	3,75
4.3.1 Indirect Economic Impacts	2,75	2,50

Comments:

1. People

- 1.1. Stakeholders in general: consensus
 - 1.1.1. *er zijn ook methoden om conflicten te beheersen, bijv. Constructive Conflict Methodology, en ook methoden om te voorkomen dat een "meningsverschil" ontaardt in een maatschappelijke tegenstelling. I.h.a. is transparantie belangrijk en openheid; er mogen best meerderheden en minderheden zijn*
 - 1.1.2. *Vind maatschappelijk draagvlak ook wel een aardige term.....*
- 1.2. Stakeholders/communication - ik heb het idee dat in een aantal elementen in deze kolom stakeholders en communication samengevoegd kunnen worden (hetzelfde doel)
 - 1.2.1. *dat doorkruist het life cycle idee dat nu ordenend is, ook voor de planning; je kunt stakeholders niet op een moment over alle zaken raadplegen*
 - 1.2.2. *ORdening is idd handig, maar verschillende items komen in verschillende fases van het project terug, met daaronder dan verschil lende ondewerpen (dus op een andere manier*
- 1.3. Aantal indicatoren zijn reeds onderdeel van een veelal wettelijk verplicht Environmental Impact Assessment.
 - 1.3.1. *Hoort bij Planet!*
 - 1.3.2. *Alles wat onder die Env Imp Assesment vallen, kunnen dan onder één noemer komen (EIA alignment oid)*
- 1.4. Element 2.1.5: project uit de titel (alles gaat over project!)
- 1.5. 1.1.2 Team Participants: zou interne organisatie en externe contractors splitsen. Tevens de vraag stellen hoe de verantwoordelijkheden t.a.v. sustainability binnen de eigen organisatie zijn belegd.
- 1.6. 2.1.4: hoezo internal?

2. Planet

- 2.1. Materials, water, energy onder één kopje: use of sources oid
- 2.2. Met namen in deze kolom veel dubbellingen.....

3. Profit

- 3.1. Alg Projectmanagement zaken in "Profit" - volgens mij komen in deze categorie een aantal zaken voor die eruit kunnen, omdat het meer regels/procedures betreft voor gewoon PM (bijv 1.3.2)
 - 3.1.1. *Bv 1.3.1 en 1.3.3: overlap?*
 - 3.1.2. *Mee eens. Spits de indicatoren toe op sustainability.*

4. Algemeen

- 4.1. Project fasen op de y-as, Asset en Product eruit. Tevens de 'phases for using the framework' (hoe te implementeren) koppelen aan de project fasen.
 - 4.1.1. *asset mag er wat mij betreft in blijven, product idd eruit*
 - 4.1.2. *asset is idd functioneler, maar wellicht anders noemen (operation of asset oid)*
- 4.2. de dimensies van triple 3 kennen verschillende methoden, afhankelijkheid van de mate van objectieveerbaarheid: people kwalitatief, planet kwantitatief en profit economisch, althans in hoofdzaak
 - 4.2.1. *hier ligt een aanknopingspunt met de procesbenadering, die vooral voor people geldt.*
 - 4.2.2. *Procesbenadering ligt voor mij vooral in het feit dat je bepaalde items (van PPP), over de gehele lifetime vh project meeneemt.*
 - 4.2.3. *proces in de zin van dialoog en overeenstemming bereiken over niet-objectiveerbare zaken*
- 4.3. Nut levels: ik heb het idee dat veel elementen op hetzelfde level terugkomen. De verticale (life cycle) is weldegelijk belangrijk, maar volgens mij zou het één-dimensionaal kunnen.
- 4.4. Denk niet alleen aan de project manager, maar ook aan de organisatie (het management, policies etc) waarin hij werkt. Voorkom een sustainability roepende in de woestijn.
- 4.5. Zou per indicator een korte toelichting geven, afgezien van de specifieke vragen/getallen. Een centrale vraag per indicator.
- 4.6. bij transport: auto / trein en vlieg km worden gelijkgesteld, maar aanzienlijk andere sustainability belasting
- 4.7. Ik vraag me af of "product" er als level al dan niet uit moet: als je met een project op een volkomen sustainable manier een volkomen unsustainable product gaat maken...: lijkt me niet ok...
 - 4.7.1. *zie commentaar 1...*
 - 4.7.2. *Sustainability van het product is een aspect dat gedurende alle project fasen belangrijk is, van ontwerp tot afstoting/recycling.*
- 4.8. Refresh my memory: is het framework ook toepasbaar op de (projectmatige) ontwikkeling van services? Schijnt een ander licht op Asset en Product.

- 4.9. ten aanzien van people en planet ook streven naar value creation: social value en ecological value enhancement

Main developments of the framework after expert panel 1:

- Level 4, Product, was removed and partly transferred to level 1.
- The irrelevant indicators were removed: Food, Quality of Life, Customer Privacy, Indirect Economic Impacts, Marketing Communications.
- Several improvements of the indicators on the level spelling and how it is measured. (see comments)

Appendix 2: Outcomes Expert Panel 2

GDR Meeting 02.06.2010

Expert Panel 2: Hanneke de Vries, Richard Brocx, Reinout Storm, Paul van der Post, Sjoerd van der Voort, Jan Willem van Hoogstraten

Location: TAQA Energy, The Hague

Relevance

1: not relevant at all to include in the general framework
5: very relevant to include in the general framework

Applicability

1: not important for BGS and should not be researched
5: very important for BGS and should be researched

Indicators	Relevance						Applicability					
	1	2	3	4	5	Average	1	2	3	4	5	Average
1.1.1 Stakeholders				1	4	4,8				1	5	4,8333333
1.1.2 Customers				2	3	4,6		1		3	2	4
1.1.3 Team Participants			1	1	3	4,4			1	2	3	4,3333333
2.1.1 Stakeholders				2	3	4,6		1		2	3	4,1666667
2.1.2 Society				1	4	4,8				1	5	4,8333333
2.1.3 Communication				1	4	4,8				1	4	4,8
2.1.4 Human Resources			1	2	2	4,2			1	2	2	4,2
2.1.5 Health and Safety				2	3	4,6				2	4	4,6666667
3.1.1 Stakeholders			2	1	2	4		1	1	3	1	3,6666667
3.1.2 Society			1		4	4,6			1	2	3	4,3333333
3.1.3 Suppliers				4	1	4,2			1	5		3,8333333
3.1.4 Community Capital				4	1	4,2			2	3	1	3,8333333
3.1.5 Human Resources			1	2	2	4,2			2	3	1	3,8333333
3.1.6 Occupational Health and Safety					4	5				1	4	4,8
1.2.1 Design Options					5	5				1	4	4,8
1.2.2 Land and Biodiversity					5	5				3	2	4,4
1.2.3 HSE Plan			1		4	4,6			1	2	2	4,2
1.2.4 Product				1	4	4,8	1		1		2	3,5
2.2.1 Transport			2		3	4,2			2	2	2	4
2.2.2 Emissions and Waste		1		1	3	4,2			2	1	3	4,1666667
2.2.3 Materials				1	4	4,8			3	2	1	3,6666667
2.2.4 Water				1	4	4,8			2	2	2	4
2.2.5 Energy				1	4	4,8			1	2	3	4,3333333
3.2.1 Transport	1		1		3	3,8	1		2	3	1	3,4285714
3.2.2 Emissions and Waste				2	3	4,6				3	3	4,5
3.2.3 Materials				3	2	4,4			1	4	1	4
3.2.4 Water				1	4	4,8			2	2	2	4
3.2.5 Energy				2	3	4,6				3	3	4,5
3.2.6 Maintenance of the Asset	1			1	3	4	1		2		2	3,4
3.2.7 Decomposing the Asset				1	4	4,8	1		2	3	1	3,4285714
1.3.1 Expected Economic Performance			1		2	4,3333333			1	1	2	4,25
1.3.2 Expected Financial Health and Stability	1				2	3,6666667	1		1		2	3,5
1.3.3 Expected Shareholder Involvement			1		2	4,3333333			1		3	4,5
2.3.1 Market Presence			1	1	1	4			2		2	4
2.3.2 Macro Economic Effect			1		2	4,3333333				3	1	4,25
2.3.3 Commercial Performance			1		2	4,3333333			1	1	3	4,4
2.3.4 Capability Management				1	2	4,6666667				1	3	4,75
2.3.5 Environmental Expenditures			1	1	1	4			1	1	2	4,25
3.3.1 Market Presence			1	1	1	4	1		1		2	3,5
3.3.2 Macro Economic Effect			1	1	1	4			1	1	2	4,25
3.3.3 Efficiency			1		2	4,3333333	1				3	4
3.3.4 Environmental Expenditures			1		2	4,3333333	1			1	2	3,75
3.3.5 Long-Term Planning					3	5			1		3	4,5
3.3.6 Realized Economic Performance			1		2	4,3333333			1		3	4,5

Comments:

- Level 2: Put the detailed design and Construction here, instead of in level 1
- Level 1 is the conceptual phase, Concept, choice for location, business case
- Level 2, Planet, insert an indicator for Noise/Vibrations
- 3.2.7 Decomposing the Asset, name this one Decommissioning of the Asset
- 2.1.2 Society and 2.1.3 Communication, also in Pre-Phase
- Level 1, insert an indicator for Politics
- Stakeholders and Communications are linked
- 2.2.5 Energy, name 'source' -> 'consumer'
- 3.3.3 Efficiency of the Asset. Hours of non-production *due to maintenance and reparations*
- Profit is difficult to judge, especially for level 3 as the BGS project is based on CAPEX
- Material: missing biodegradable material usage
- 2.1.2 Society. Difficult pillar, hard to measure this because results differ for each country or culture
- 2.1.4 Human Resources. This depends more on the culture or on the country. As a project you do not always have influence. Example: female or immigrants as engineer
- Is the outcome of the sustainability framework of your project not very dependent of the location of the project? Or is that the purpose?
- Level 1, Planet, insert the process itself. Example: Do you want to build a nuclear plant in the first place?
- 2.1.5 Insert: Procedures & systems in place
- 1.2.4 Insert: Future expectations
- 2.2.3 Materials Insert: Compared to alternative. Sometimes it is better to use less of non-recycled material.
- 2.2.4 Water. Specify by type. Sea water/ potable water/ process/ rain/ contaminated
- 2.2.5 Energy saved due to conservation and efficiency improvements *compared to what?*
- 3.3.3 For Bergermeer: hours of missed nomination/ nominated hours
- 1.1.2 Who is the customer for BGS? The customer or the end-user of the gas?
- 2.1.2 Society, non corruption. Should also be relevant in the Pre-Phase
- In each country corruption is different
- Each company has specific names for the project phases
- For the Profit level: not possible to fill in the evaluation for that one, not enough knowledge for that
- Communication is the follow up indicator for stakeholders
- 2.2.1 What is significant? This differs per country
- 3.1.6 Rates of injury, definition? Is it a broken nail or a broken leg?
- Do research on social support (*in Dutch: maatschappelijk draagvlak*) for the project. This has a high influence on the success of the project.
- A lot of environmental aspects are important in level 1. In later levels, it becomes less important. When all permits are there, there is less criticism from stakeholders.
- Is more maintenance always better? Not always, think of the extra transport etc.
- 1.3.2 is there is a, and what? if financial reservations
- 1.3.3 'Expected Shareholder Involvement' involves if shareholders and management decisions have a long-term focus and if long-term changes require shareholder approval.
- 2.3.4 Is there a structures approach to capability management
- 2.3.5 Compared to what? I can invest millions without any effect, does the investment alone warrant a positive outcome?
- 3.3.4 See comment 2.3.5
- 2.1.6 Insert: Suppliers

Main developments of the framework after expert panel 2:

- In level 2, Planet: an indicator for Suppliers was added.
- The detailed design was transferred to level 2, instead of level 1.
- In Level 2, Planet, an indicator for Noise/Vibrations was added.
- 3.2.7 Decomposing the Asset, was named Decommissioning of the Asset
- In Level 1, an indicator for Politics was added. It can be argued that this indicator is covered already by the indicator 'Stakeholders' but since for the BGS project politics plays a major role in the Project Pre-Phase, it was chosen to name it explicitly. As Jan-Willem van Hoogstraten said during a general team meeting on the 10th of June: 'This project is no longer a cost or planning driven project but a political driven project.' This is reaction on a 14 week delay on permitting.
- Several improvements of the indicators on the level spelling and how it is measured. (see comments)

Appendix 3: GRI Indicators for a Companies' Performance on Sustainability

Below, the original GRI indicators are subdivided in the 3BL: People, Planet and Profit.

People

Social Performance: Labor Practices & Decent Work

Employment

- LA1 Total workforce by employment type, employment contract, and region. (Core)
- LA2 Total number and rate of employee turnover by age group, gender, and region. (Core)
- LA3 Benefits provided to full-time employees that are not provided to temporary or part-time employees, by major operations. (Additional)

Labor/Management Relations

- LA4 Percentage of employees covered by collective bargaining agreements. (Core)
- LA5 Minimum notice period(s) regarding significant operational changes, including whether it is specified in collective agreements. (Core)

Occupational Health and Safety

- LA6 Percentage of total workforce represented in formal joint management-worker health and safety committees that help monitor and advise on occupational health and safety programs. (Additional)
- LA7 Rates of injury, occupational diseases, lost days, and absenteeism, and number of work-related fatalities by region. (Core)
- LA8 Education, training, counseling, prevention, and risk-control programs in place to assist workforce members, their families, or community members regarding serious diseases. (Core)
- LA9 Health and safety topics covered in formal agreements with trade unions. (Additional)

Training and Education

- LA10 Average hours of training per year per employee by employee category. (Core)
- LA11 Programs for skills management and lifelong learning that support the continued employability of employees and assist them in managing career endings. (Additional)
- LA12 Percentage of employees receiving regular performance and career development reviews. (Additional)

Diversity and Equal Opportunity

- LA13 Composition of governance bodies and breakdown of employees per category according to gender, age group, minority group membership, and other indicators of diversity. (Core)
- LA14 Ratio of basic salary of men to women by employee category. (Core)

Social Performance: Human Rights

Investment and Procurement Practices

- HR1 Percentage and total number of significant investment agreements that include human rights clauses or that have undergone human rights screening. (Core)
- HR2 Percentage of significant suppliers and contractors that have undergone screening on human rights and actions taken. (Core)
- HR3 Total hours of employee training on policies and procedures concerning aspects of human rights that are relevant to operations, including the percentage of employees trained. (Additional)

Non-Discrimination

- HR4 Total number of incidents of discrimination and actions taken. (Core)

Freedom of Association and Collective Bargaining

- HR5 Operations identified in which the right to exercise freedom of association and collective bargaining may be at significant risk, and actions taken to support these rights. (Core)

Child Labor

- HR6 Operations identified as having significant risk for incidents of child labor, and measures taken to contribute to the elimination of child labor. (Core)

Forced and Compulsory Labor

- HR7 Operations identified as having significant risk for incidents of forced or compulsory labor, and measures to contribute to the elimination of forced or compulsory labor. (Core)

Security Practices

- HR8 Percentage of security personnel trained in the organization's policies or procedures concerning aspects of human rights that are relevant to operations. (Additional)

Indigenous Rights

- HR9 Total number of incidents of violations involving rights of indigenous people and actions taken. (Additional)

Social Performance: Society

Community

- SO1 Nature, scope, and effectiveness of any programs and practices that assess and manage the impacts of operations on communities, including entering, operating, and exiting. (Core)

Corruption

- SO2 Percentage and total number of business units analyzed for risks related to corruption. (Core)
- SO3 Percentage of employees trained in organization's anti-corruption policies and procedures. (Core)
- SO4 Actions taken in response to incidents of corruption. (Core)

Public Policy

- SO5 Public policy positions and participation in public policy development and lobbying. (Core)
- SO6 Total value of financial and in-kind contributions to political parties, politicians, and related institutions by country. (Additional)

Anti-Competitive Behavior

- SO7 Total number of legal actions for anti-competitive behavior, anti-trust, and monopoly practices and their outcomes. (Additional)

Compliance

- SO8 Monetary value of significant fines and total number of non-monetary sanctions for non-compliance with laws and regulations. (Core)

Social Performance: Product Responsibility

Customer Health and Safety

- PR1 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. (Core)
- PR2 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. (Additional)

Products and Service Labeling

- PR3 Type of product and service information required by procedures, and percentage of significant products and services subject to such information requirements. (Core)
- PR4 Total number of incidents of non-compliance with regulations and voluntary codes concerning product and service information and labeling, by type of outcomes. (Additional)
- PR5 Practices related to customer satisfaction, including results of surveys measuring customer satisfaction. (Additional)

Marketing Communications

- PR6 Programs for adherence to laws, standards, and voluntary codes related to marketing communications, including advertising, promotion, and sponsorship. (Core)
- PR7 Total number of incidents of non-compliance with regulations and voluntary codes concerning marketing communications, including advertising, promotion, and sponsorship by type of outcomes. (Additional)

Customer Privacy

- PR8 Total number of substantiated complaints regarding breaches of customer privacy and losses of customer data. (Additional)

Compliance

- PR9 Monetary value of significant fines for non-compliance with laws and regulations concerning the provision and use of products and services. (Core).

Planet

Materials

- EN1 Materials used by weight or volume. (Core)
- EN2 Percentage of materials used that are recycled input materials. (Core)

Energy

- EN3 Direct energy consumption by primary energy source. (Core)
- EN4 Indirect energy consumption by primary source. (Core)
- EN5 Energy saved due to conservation and efficiency improvements. (Additional)
- EN6 Initiatives to provide energy-efficient or renewable energy based products and services, and reductions in energy requirements as a result of these initiatives. (Additional)
- EN7 Initiatives to reduce indirect energy consumption and reductions achieved. (Additional)

Water

- EN8 Total water withdrawal by source. (Core)
- EN9 Water sources significantly affected by withdrawal of water. (Additional)

EN10 Percentage and total volume of water recycled and reused. (Additional)

Biodiversity

- EN11 Location and size of land owned, leased, managed in, or adjacent to, protected areas and areas of high biodiversity value outside protected areas. (Core)
- EN12 Description of significant impacts of activities, products, and services on biodiversity in protected areas and areas of high biodiversity value outside protected areas. (Core)
- EN13 Habitats protected or restored. (Additional)
- EN14 Strategies, current actions, and future plans for managing impacts on biodiversity. (Additional)
- EN15 Number of IUCN Red List species and national conservation list species with habitats in areas affected by operations, by level of extinction risk. (Additional)

Emissions, Effluents, and Waste

- EN16 Total direct and indirect greenhouse gas emissions by weight. (Core)
- EN17 Other relevant indirect greenhouse gas emissions by weight. (Core)
- EN18 Initiatives to reduce greenhouse gas emissions and reductions achieved. (Additional)
- EN19 Emissions of ozone-depleting substances by weight. (Core)
- EN20 NO_x, SO_x, and other significant air emissions by type and weight. (Core)
- EN21 Total water discharge by quality and destination. (Core)
- EN22 Total weight of waste by type and disposal method. (Core)
- EN23 Total number and volume of significant spills. (Core)
- EN24 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. (Additional)
- EN25 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. (Additional)

Products and Services

- EN26 Initiatives to mitigate environmental impacts of products and services, and extent of impact mitigation. (Core)
- EN27 Percentage of products sold and their packaging materials that are reclaimed by category. (Core)

Compliance

- EN28 Monetary value of significant fines and total number of non-monetary sanctions for non-compliance with environmental laws and regulations. (Core)

Transport

- EN29 Significant environmental impacts of transporting products and other goods and materials used for the organization's operations, and transporting members of the workforce. (Additional)

Overall

- EN30 Total environmental protection expenditures and investments by type. (Additional)

Profit

Economic Performance

- EC1 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. (Core)
- EC2 Financial implications and other risks and opportunities for the organization's activities due to climate change. (Core)
- EC3 Coverage of the organization's defined benefit plan obligations. (Core)
- EC4 Significant financial assistance received from government. (Core)

Market Presence

- EC5 Range of ratios of standard entry level wage compared to local minimum wage at significant locations of operation. (Additional)
- EC6 Policy, practices, and proportion of spending on locally-based suppliers at significant locations of operation. (Core)
- EC7 Procedures for local hiring and proportion of senior management hired from the local community at significant locations of operation. (Core)

Indirect Economic Impacts

- EC8 Development and impact of infrastructure investments and services provided primarily for public benefit through commercial, in-kind, or pro bono engagement. (Core)
- EC9 Understanding and describing significant indirect economic impacts, including the extent of impacts. (Additional)

Appendix 4: United Nations CSD Indicators of Sustainable Development – 3rd edition

Theme	Sub-theme	Core Indicator	Other Indicator
Poverty	Income poverty	Proportion of population living below national poverty line	Proportion of population below 1 dollar a day
	Income inequality	Ratio of share in national income of highest to lowest quintile	
	Sanitation	Proportion of population using an improved sanitation facility	
	Drinking water	Proportion of population using an improves water source	
	Access to energy	Share of households without electricity or other modern energy services	Percentage of population using solid fuels for cooking
	Living conditions	Proportion of urban population living in slums	
Governance	Corruption	Percentage of population having paid bribes	
	Crime	Number of intentional homicides per 100.000 population	
Health	Mortality	Under-five mortality rate	
		Life expectancy at birth	Health life expectancy at birth
	Health care delivery	Percent of population with access to primary health care facilities	Contraceptive prevalence rate
		Immunization against infectious childhood diseases	
	Nutritional status	Nutritional status of children	
	Health status and risks	Morbidity of major diseases such as HIV/ AIDS, malaria, tuberculosis	Prevalence of tobacco use
			Suicide rate
Education	Education level	Gross intake to last grade of primary education	Life long learning
		Net enrolment rate in primary education	
		Adult secondary (tertiary) schooling attainment level	
	Literacy	Adult literacy rate	
Demographics	Population	Population growth rate	Total fertility rate
		Dependency ratio	
	Tourism		Ratio of local residents to tourist in major tourist regions and destinations
Natural hazards	Vulnerability to natural hazards	Percentage of population living in hazard prone areas	
	Disaster preparedness and response		Human and economic loss due to natural disasters
Atmosphere	Climate change	Carbon dioxide emissions	Emissions of greenhouse gases
	Ozone layer depletion	Consumption of ozone depleting substances	
	Air quality	Ambient concentration of air pollutants in urban areas	
Land	Land use and status		Land use change
			Land degradation
	Desertification		Land affected by desertification
	Agriculture	Arable and permanent cropland area	Fertilizer use efficiency
			Use of agricultural pesticides
			Area under organic farming
	Forest	Proportion of land area covered by forests	Percent of forest trees damaged by defoliation
Area of forest under sustainable forest management			
Oceans, seas and coasts	Coastal zone	Percentage of population living in coastal areas	Bathing water quality
	Fisheries	Proportion of fish stocks within safe biological limits	
	Marine environment	Proportion of marine area protected	Marine tropic index

			Area of coral reef ecosystem and percentage live cover
Freshwater	Water quantity	Proportion of total water resources used	
		Water use intensity by economic activity	
	Water quality	Presence of faecal coliforms in freshwater	Biochemical oxygen demand in water bodies Wastewater treatment
Biodiversity	Ecosystem	Proportion of terrestrial are protected, total and by ecological region	Management effectiveness of protected areas
			Area of selected key ecosystem
			Fragmentation of habitats
	Species	Change in threat status species	Abundance of selected key species
			Abundance of invasive alien species
Economic Development	Macroeconomic performance	Gross domestic product (GDP) per capita	Gross saving
		Investment share in GDP	Adjusted net savings as percentage of gross national income (GNI)
			Inflation rate
	Sustainable public finance	Debt to GNI ratio	
	Employment	Employment-population ratio	Vulnerable employment
		Labor productivity and unit labor costs	
		Share of women in wage employment in the non-agricultural sector	
	Information and communication technologies	Internet users per 100 population	Fixed telephone lines 100 population
			Mobile cellular telephone subscribes per 100 population
	Research and Development		Gross domestic expenditure on R&D as a percentage of GDP
	Tourism	Tourism contribution to GDP	
Global economic partnership	Trade	Current account deficit as percentage of GDP	Share of imports from developing countries from LDCs
			Average tariff barriers imposed on exports from developing countries and LDCs
	External financing	Net Official Development Assistance (ODA) given or received as a percentage of GNI	Foreign direct investment (FDI) net inflows and net outflows as a percentage of GDP
			Remittance as percentage of GNI
Consumption and production patterns	Material consumption	Material intensity of the economy	Domestic material consumption
	Energy use	Annual energy consumption, total and by main user category	Share of renewable energy sources in total energy use
		Intensity of energy use, total and by economic activity	
	Waste generation and management	Generation of hazardous waste	Generation of waste
		Waste treatment and disposal	Management of radioactive waste
	Transportation	Modal split of passenger transportation	Modal split of freight transport
			Energy intensity of transport

Appendix 5: Sweden's National Indicators on Environmental Performance

Indicator	Objectives monitored
Allergenic chemical products	A Non-Toxic Environment
People with allergy or asthma who report nuisance due to air pollutants	Clean Air
Ammonia emissions	Zero Eutrophication
The proportion of damaged ancient monuments	Sustainable Forests
Artificial wetlands	Thriving Wetlands
Number of wolverines in mountain areas	A Magnificent Mountain Landscape
Number of reindeer in mountain areas	A Magnificent Mountain Landscape
Number of protected wetlands included in the Mire Protection Plan	Thriving Wetlands
Limited nutrient leaching – catch crops	Zero Eutrophication, Flourishing Lakes and Streams
	A Balanced Marine Environment, Flourishing Coastal Areas and Archipelagos
	Zero Eutrophication, Flourishing Lakes and Streams
	A Balanced Marine Environment, Flourishing Coastal Areas and Archipelagos
Limited nutrient leaching – protection zones	A Good Built Environment
	Clean Air
Benzene in air	A Good Built Environment
Clean Air	A Good Built Environment
Nuisance from vehicle exhaust gases	Clean Air
Symptoms attributed to indoor environments	A Safe Radiation Environment
Nuisance from transport noise	A Varied Agricultural Landscape
Nuisance from wood smoke	A Good Built Environment
Behaviour and UV exposure	A Magnificent Mountain Landscape
Semi-natural grazing land	A Good Built Environment
Homes with damp and mould	Good-Quality Groundwater
Noise pollution in mountain areas	A Safe Radiation Environment
Historic buildings	A Non-Toxic Environment
Certified well driller	A Non-Toxic Environment, A Varied Agricultural Landscape
Caesium-137 in milk	A Non-Toxic Environment
CMR substances in products	A Non-Toxic Environment, A Varied Agricultural Landscape
Organic livestock production	A Non-Toxic Environment
	A Non-Toxic Environment, A Varied Agricultural Landscape
Organic milk	Reduced Climate Impact, Clean Air, Natural Acidification Only, A Safe Radiation Environment, Flourishing Lakes and Streams, Thriving Wetlands, A Good Built Environment
Land under organic cultivation	A Magnificent Mountain Landscape
	A Good Built Environment
Energy use	A Balanced Marine Environment, Flourishing Coastal Areas and Archipelagos
	Reduced Climate Impact, A Magnificent Mountain Landscape
Development in mountain areas	Zero Eutrophication, A Balanced Marine Environment, Flourishing Coastal Areas and Archipelagos
Exposure to environmental tobacco smoke	A Non-Toxic Environment
Fishery vessels	Natural Acidification Only, Sustainable Forests
	Natural Acidification Only
Arctic fox litters	Flourishing Lakes and Streams, A Rich Diversity of Plant and Animal Life
	Sustainable Forests
Phosphorus in the sea	A Good Built Environment
	Good-Quality Groundwater, A Good Built Environment
Contaminated sites	A Safe Radiation Environment, A Protective Ozone Layer
Acidified forest soils	A Safe Radiation Environment, A Protective Ozone Layer
Acidified lakes	A Good Built Environment
Reproduction of freshwater pearl mussel	Sustainable Forests
	A Magnificent Mountain Landscape, A Rich Diversity of Plant and Animal Life
Old forests	A Varied Agricultural Landscape, A Rich Diversity of Plant and Animal Life
Gravel use	
Gravel extraction in important groundwater areas	
Skin cancer – malignant melanoma	
Non-melanoma skin cancer	
Household waste	
Hard dead wood	
Breeding birds of the mountains	
Breeding birds in farmlands	

Breeding birds of the forest	Sustainable Forests, A Rich Diversity of Plant and Animal Life
Breeding birds of the wetlands	Thriving Wetlands, A Rich Diversity of Plant and Animal Life
Breeding birds in lake and river areas	Flourishing Lakes and Streams, A Rich Diversity of Plant and Animal Life
Chemical products hazardous to health	A Non-Toxic Environment
Greenhouse gas emissions	Reduced Climate Impact
Chloride in groundwater	Good-Quality Groundwater
Chemical products available to consumers	A Non-Toxic Environment
Culturally significant features on arable land	A Varied Agricultural Landscape
Nitrogen in the sea	Zero Eutrophication, A Balanced Marine Environment, Flourishing Coastal Areas and Archipelagos
Nitrogen dioxide in air	Clean Air
NO _x emissions	Natural Acidification Only, Clean Air, Zero Eutrophication
Driving distance by car	Reduced Climate Impact, Clean Air, Natural Acidification Only, Zero Eutrophication, A Good Built Environment
Groundlevel ozone in air	Clean Air
Pollutants in breast milk	A Non-Toxic Environment
Environmental management systems	A Non-Toxic Environment
National emissions of CFC	A Non-Toxic Environment
Degradation of archaeological material in soil	Natural Acidification Only
Nitrogen deposition	Natural Acidification Only, Flourishing Lakes and Streams, Good-Quality Groundwater, Sustainable Forests, A Magnificent Mountain Landscape
Sulphur deposition	Natural Acidification Only, Flourishing Lakes and Streams, Good-Quality Groundwater, Sustainable Forests, A Magnificent Mountain Landscape
Nickel allergy	A Non-Toxic Environment
Oil discharges in marine areas	A Balanced Marine Environment, Flourishing Coastal Areas and Archipelagos
PM10 particles in air	Clean Air
Spatial planning for Energy	A Good Built Environment
Spatial planning for Green areas and Aquatic areas	A Good Built Environment
Spatial planning for Cultural heritage	A Good Built Environment
Spatial planning for Transports	A Good Built Environment
Radon in drinking water	A Good Built Environment, A Safe Radiation Environment, Good-Quality Groundwater
Radon in apartment buildings	A Good Built Environment, A Safe Radiation Environment
Radon in schools	A Good Built Environment, A Safe Radiation Environment
Radon in houses	A Good Built Environment, A Safe Radiation Environment
Prohibitions on demolition of buildings	A Good Built Environment
Wetland protection	Thriving Wetlands
Protected forest land – habitat protection	Sustainable Forests
Protected forest land – nature reserve	Sustainable Forests
Protected forest land – nature conservation agreements	Sustainable Forests
Protected mountain environments	A Magnificent Mountain Landscape
Protected lakes and watercourses	Flourishing Lakes and Streams
Mown meadows	A Varied Agricultural Landscape
New buildings near the sea shore	A Balanced Marine Environment, Flourishing Coastal Areas and Archipelagos
New buildings near lake shores and river banks	Flourishing Lakes and Streams
Ambient radiation level	A Safe Radiation Environment
Sulphur dioxide in air	Clean Air
Sulphur dioxide emissions	Natural Acidification Only, Clean Air
Sleep disturbance from transport noise	A Good Built Environment
Ligh all-terrain vehicles meeting noise standards	A Magnificent Mountain Landscape
Phosphorus entering coastal areas	Zero Eutrophication, A Balanced Marine Environment, Flourishing Coastal Areas and Archipelagos
Nitrogen entering coastal areas	Zero Eutrophication, A Balanced Marine Environment, Flourishing Coastal Areas and Archipelagos
Emissions of volatile organic compounds	Clean Air
UV radiation	A Protective Ozone Layer

Groundwater protection areas
Wind power electricity
Use of de-icing salt
Plant protection products

Plant protection products in surface water
Fisheries

Arable land
Recycling of glass
Recycling of metal
Recycling of paper containers
Recycling of plastic
Old forest, rich in broad-leaved trees

Good-Quality Groundwater
Reduced Climate Impact, A Good Built Environment
Good-Quality Groundwater
A Non-Toxic Environment, A Varied Agricultural
Landscape, Flourishing Lakes and Streams, Good-
Quality Groundwater
A Non-Toxic Environment
A Balanced Marine Environment, Flourishing Coastal
Areas and Archipelagos
A Varied Agricultural Landscape
A Good Built Environment
A Good Built Environment
A Good Built Environment
A Good Built Environment
Sustainable Forests

Appendix 6: Indicators of the Sustainable Footprint Methodology

Overview of the Framework

The Triple Bottom Line			
	1. People	2. Planet	3. Profit
Level 1 Project Pre-Phase	1.1.1 Stakeholders	1.2.1 Design Options	1.3.1 Expected Economic Performance
	1.1.2 Customers	1.2.2 Land & Biodiversity	1.3.2 Expected Financial Health & Stability
	1.1.3 Politics and Legislation	1.2.3 Environmental Plan	1.3.3 Expected Shareholder Involvement
	1.1.4 Team Participants	1.2.4 Product	
	1.1.5 Health & Safety Plan		
Level 2 Project Execution	2.1.1 Stakeholders	2.2.1 Transport	2.3.1 Market Presence
	2.1.2 Society	2.2.2 Emissions & Waste	2.3.2 Macro Economic Effect
	2.1.3 Suppliers	2.2.3 Materials	2.3.3 Commercial Performance
	2.1.4 Communication	2.2.4 Water	2.3.4 Capability Management
	2.1.5 Human Resources	2.2.5 Energy	2.3.5 Environmental Expenditures
	2.1.6 Health & Safety	2.2.6 Noise & Vibrations	
Level 3 Operation of the Asset	3.1.1 Stakeholders	3.2.1 Transport	3.3.1 Market Presence
	3.1.2 Society	3.2.2 Emissions & Waste	3.3.2 Macro Economic Effect
	3.1.3 Suppliers	3.2.3 Materials	3.3.3 Efficiency of the Asset
	3.1.4 Community Capital	3.2.4 Water	3.3.4 Environmental Expenditures
	3.1.5 Human Resources	3.2.5 Energy	3.3.5 Long-Term Planning
	3.1.6 Occupational Health & Safety	3.2.6 Maintenance of the Asset	3.3.6 Realized Economic Performance
		3.2.7 Decomposing of the Asset	

Indicators on People

Level 1: Project Pre-Phase

1.1.1 Stakeholders (George 1999; Labuschagne and Brent 2005) (External Social Performance).

'Stakeholders' involves stakeholder analysis, information provisioning to the stakeholders and stakeholder influence.

- Stakeholder analysis
 - Are all groups or individuals affected by the project been identified and have the impacts on them been assessed?
- Information provisioning
 - Are stakeholder meetings organized?
 - Are there community forums, information brochures and/or information websites?
- Stakeholder influence
 - Do stakeholders have an effect during the project pre-phase?

1.1.2 Customers

'Customers' entails the impact on the quality of life by using the product, for the customer and for the whole community.

- By using the product, is the quality of life of the customer improved or nor hampered?
- By the existence of the product, is the quality of life of the whole community improved?

1.1.3 Politics and Legislation

'Politics and Legislation' deals with the rules, regulations and tenders that have to be satisfied before construction can start, and the interest and influence of politics and non-corruption.

- Rules, regulations and tenders that have an effect on the project
- Different levels of political governance and their interest and influence on the project
- Non-Corruption
 - Percentage and total number of business units analyzed for risks related to corruption
 - Percentage of employees trained in organization's anti-corruption policies and procedures
 - Actions taken in response to incidents of corruption.

1.1.4 Team Participants (Taylor 2008) (Internal Social Performance)

'Team Participants' entails securing that in the team, someone is responsible for sustainability, and that sustainability criteria are applied when team members, contractors, suppliers and specialist are selected.

- In the team, is it approved who is responsible for sustainability?
- Are sustainability criteria applied when selecting team members, contractors, suppliers and specialist? (The relevant sustainability aspects can be derived from this framework)
- Are obligations and appointments regarding sustainability written down in contracts?
- Do local contractors have a priority to contractors from abroad?

1.1.5 'Health and Safety Plan'

'Health and Safety Plan' involves the availability of a health and safety plan to ensure a safe execution phase.

- Is there a health and safety plan to ensure a safe execution phase?
- Is there a health and safety manager for the project pre-phase?

Level 2: Project Execution

2.1.1 Stakeholders (Labuschagne and Brent 2005) (External Social Performance)

'Stakeholders' involves stakeholder analysis, information provisioning to the stakeholders and stakeholder influence.

- Information provisioning
 - o Are stakeholder meetings organized?
 - o Are there community forums, information brochures and/or information websites?
- Stakeholder influence
 - o Do stakeholders have an effect during the project execution?

2.1.2 Society (GRI 2010) (External Social Performance)

'Society' entails non-corruption, competitive behavior and compliance with laws and regulations.

- Non-Corruption
 - o Percentage and total number of business units analyzed for risks related to corruption.
 - o Percentage of employees trained in organization's anti-corruption policies and procedures.
 - o Actions taken in response to incidents of corruption.
- Competitive Behavior
 - o Total number of legal actions for anti-competitive behavior, anti-trust, and monopoly practices and their outcomes.
- Compliance
 - o Monetary value of significant fines and total number of non-monetary sanctions for non-compliance with laws and regulations.

2.1.3 Suppliers (External Social Performance)

'Suppliers' entails that sustainability criteria are applied when suppliers are selected.

- Do supplier evaluations include sustainability criteria?

2.1.4 Communication (Taylor 2008) (External and Internal Social Performance)

'Communication' entails that the project manager makes sure that the stakeholders, including its employees, partners and end-users, are informed about the sustainability aspects of the project.

- Does the project manager inform the stakeholders including its employees, partners and end-users about the sustainability aspects throughout the duration of the project? (The relevant sustainability aspects can be derived from this framework)

2.1.5 Human Resources (Labuschagne and Brent 2005; GRI 2010) (Internal Social Performance)

'Human Resources' entails the number of jobs created, the wages of the employees compared to the project budget, employment practices, capacity development, non-discrimination and prevention of child-labor.

- Employees
 - o Net number of permanent jobs created by the project.
 - o Wages as a percent of project budget.
- Employment Practices
 - o Average working hours.
 - o Ratio female to male workers.
 - o Ratio of basic salary of men to women by employee category.
 - o Percentages of project budget and project time spend on health and safety practices.

- Capacity Development
 - Percentage of project budget allocated to training.
 - Percentage of workers that receive training.
- Non-discrimination
 - Total number of incidents of discrimination and actions taken.
- Preventing Child Labor
 - Operations identified as having significant risk for incidents of child labor, and measures taken to contribute to the elimination of child labor.

2.1.6 Health and Safety (GRI 2010) (Internal Social Performance)

'Health and Safety' involves the workforce that is active in monitoring and advising health and safety programs, decreasing the amount of work-related injuries and the programs in place for prevention of illness.

- Percentage of total workforce represented in formal joint management-worker health and safety committees that help monitor and advice on occupational health and safety programs.
- Rates of injury, occupational diseases, lost days, and absenteeism, and number of work-related fatalities.
- Education, training, counseling, prevention, and risk-control programs in place to assist workforce members, their families, or community members regarding serious diseases.
- Health and safety topics covered in formal agreements with trade unions.

Level 3: Operation of the Asset

3.1.1 Stakeholders (Labuschagne and Brent 2005) (External Social Performance)

'Stakeholders' involves stakeholder analysis, information provisioning to the stakeholders and stakeholder influence.

- Information provisioning
 - Are stakeholder meetings organized?
 - Are there community forums, information brochures and/or information websites?
- Stakeholder influence
 - Do stakeholders have an effect during the use of the asset?

3.1.2 Society (GRI 2010) (External Social Performance)

'Society' entails non-corruption, competitive behavior and compliance with laws and regulations.

- Non-Corruption
 - Percentage and total number of business units analyzed for risks related to corruption.
 - Percentage of employees trained in organization's anti-corruption policies and procedures.
 - Actions taken in response to incidents of corruption.
- Competitive Behavior
 - Total number of legal actions for anti-competitive behavior, anti-trust, and monopoly practices and their outcomes.
- Compliance
 - Monetary value of significant fines and total number of non-monetary sanctions for non-compliance with laws and regulations.

3.1.3 Suppliers (External Social Performance)

'Suppliers' entails that sustainability criteria are applied when suppliers are selected.

- Do supplier evaluations include sustainability criteria?

3.1.4 Community Capital (Labuschagne and Brent 2005) (External Social Performance)

'Community Capital' is the net migration rate and the number of indirect jobs created by the project.

- Net migration rate.
- Number of indirect job opportunities created.

3.1.5 Human Resources (Labuschagne and Brent 2005; GRI 2010) (Internal Social Performance)

'Human Resources' entails the number of jobs created, the wages of the employees compared to the project budget, employment practices, capacity development, non-discrimination and prevention of child-labor.

- Employees
 - Net number of permanent jobs created by the project.
 - Wages as a percent of project budget.
- Employment Practices
 - Average working hours.

- Ratio female to male workers.
 - Ratio of basic salary of men to women by employee category.
 - Percentages of project budget and project time spend on health and safety practices.
- Capacity Development
 - Percentage of project budget allocated to training.
 - Percentage of workers that receive training.
- Non-discrimination
 - Total number of incidents of discrimination and actions taken.
- Preventing Child Labor
 - Operations identified as having significant risk for incidents of child labor, and measures taken to contribute to the elimination of child labor.

3.1.6 Occupational Health and Safety (GRI 1010) (Internal Social Performance)

'Occupational Health and Safety' involves decreasing the amount of work-related injuries and the programs in place for prevention of illness.

- Percentage of total workforce represented in formal joint management-worker health and safety committees that help monitor and advice on occupational health and safety programs.
- Rates of injury, occupational diseases, lost days, and absenteeism, and number of work-related fatalities by region.
- Education, training, counseling, prevention, and risk-control programs in place to assist workforce members, their families, or community members regarding serious diseases.
- Health and safety topics covered in formal agreements with trade unions.

Indicators on Planet

Level 1: Project Pre-Phase

1.2.1 Design Options (Taylor 2008)

'Design Options' entails if designs of the asset are stimulated that respond to good practices regarding the environment and if the different designs are checked on environmental impacts.

- Are designs stimulated which creatively respond to good practices regarding the environment?
- Are the different designs checked on environmental impacts?

1.2.2 Land and Biodiversity (GRI 2010)

'Land and Biodiversity' involves the land that is needed for building the asset, the impacts on biodiversity, the habitats that are protected and the compensation activities.

- Location and size of land owned, leased, managed in, or adjacent to, protected areas and areas of high biodiversity value outside protected areas.
- 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.
- Current compensation activities and future plans for managing impacts on biodiversity. For example: Is extra land bought to be organized as nature reserve as a compensation for the negative environmental impact of the project?

1.2.3 Environmental Plan (de Vries 2010)

'Environmental Plan' includes the plan for separating waste and treating dangerous chemicals.

- How is waste going to be separated?
- How are dangerous chemicals going to be treated?

1.2.4 Product

'Product' involves looking at the alternatives of the product that are more environmentally desirable, alternatives for the process of producing the product and the possibilities of environmentally friendly decomposing of the product.

- Are there more environmentally desirable alternatives of the product available?
- Are there more environmentally desirable alternatives for the process of producing the product?
- Possibilities of environmental friendly decomposing of the product.
- Effect on the environment after the product is decomposed.

- Future expectations: After the asset is build, is the product that that can be produced desired?

Level 2: Project Execution

2.2.1 Transport (Gareis, Heumann et al. 2009; GRI 2010)

'Transport' entails the travelling by the members of the team and all transport of products, goods and materials needed for the project execution.

- Amount of travel hours by members of workforce by type (plain, car, and train etc)
- Amount of significant environmental and social impacts of transporting products and other goods and materials used for the project execution.

2.2.2 Emissions and Waste (GRI 2010)

'Emissions and Waste' measures emissions, initiatives to reduce those emissions, waste by type and disposal method and spills.

- Total direct and indirect greenhouse gas emissions.
- Initiatives to reduce greenhouse gas emissions and reductions achieved.
- NOx and SOx, air emissions.
- Total weight of waste by type and disposal method.
- Total number and volume of significant spills.

2.2.3 Materials (GRI 2010)

'Materials' involves all input materials, the percentage of those materials that are recycled and the percentage of those input materials that can be recycled in the future.

- Input materials used by weight or volume.
- Percentage of materials used that are recycled input materials.
- Percentage of materials used that can be recycled in the future.

2.2.4 Water (GRI 2010)

'Water' incorporates the water withdrawal, the effect on the water sources and the percentage of water that is recycled and reused.

- Total water withdrawal by source (sea, potable, rain, process and contaminated water).
- Water sources significantly affected by withdrawal of water.
- Percentage and total volume of water recycled and reused.

2.2.5 Energy (GRI 2010)

'Energy' entails energy consumption, energy saved due to efficiency improvements, and initiatives to increase energy-efficiency or use of renewable energy.

- Direct energy consumption by primary energy consumer.
- Indirect energy consumption by primary consumer.
- 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.

2.2.6 Noise and Vibrations

'Noise and Vibrations' entails the noise and vibrations that are produced during the construction of the asset.

- Noise in decibel produced in the construction period during the day, evening and night.
- Exposure to vibration measured in meters per second squared (m/s²).

Level 3: Operation of the Asset

3.2.1 Transport (Gareis, Heumann et al. 2009; GRI 2010)

'Transport' entails the travelling by the members of the team and all transport of products, goods and materials needed for the project execution.

- Amount of travel hours by members of workforce by type (plain, car, and train etc)
- Amount of significant environmental and social impacts of transporting products and other goods and materials used for the project execution.

3.2.2 Emissions and Waste (GRI 2010)

'Emissions and Waste' measures emissions, initiatives to reduce those emissions, waste by type and disposal method and spills.

- Total direct and indirect greenhouse gas emissions.
- Initiatives to reduce greenhouse gas emissions and reductions achieved.
- NOx and SOx, air emissions.
- Total weight of waste by type and disposal method.
- Total number and volume of significant spills.

3.2.3 Materials (GRI 2010)

'Materials' involves all input materials, the percentage of those materials that are recycled and the percentage of those input materials that can be recycled in the future.

- Input materials used by weight or volume.
- Percentage of materials used that are recycled input materials.
- Percentage of materials used that can be recycled in the future.

3.2.4 Water (GRI 2010)

'Water' incorporates the water withdrawal, the effect on the water sources and the percentage of water that is recycled and reused.

- Total water withdrawal by source (sea, potable, rain, process and contaminated water).
- Water sources significantly affected by withdrawal of water.
- Percentage and total volume of water recycled and reused.

3.2.5 Energy (GRI 2010)

'Energy' entails energy consumption, energy saved due to efficiency improvements, and initiatives to increase energy-efficiency or use of renewable energy.

- Direct energy consumption by primary energy consumer.
- Indirect energy consumption by primary consumer.
- 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.

3.2.6 Maintenance of the Asset

'Maintenance of the Asset' tests if there is a plan for preventive and re-active maintenance and if it is possible to run the asset during maintenance.

- Is there a preventive maintenance plan to minimize break-downs of the asset?
- Is there a re-active maintenance plan when repairs are necessary?
- Is it possible to run the asset during maintenance?

3.3.5 Decommissioning of the Asset

'Decommissioning of the Asset' involves the possibilities of environmental friendly decomposing of the asset and the effect on the environment after the asset is decomposed.

- Possibilities of environmental friendly decommissioning of the asset.
- Effect on the environment after the asset is decommissioned.

Indicators on Profit

Level 1: Project Pre-Phase

1.3.1 Expected Economic Performance (GRI 2010)

'Expected Economic Performance' involves expected profits, CAPEX, OPEX, donations, and financial implications and risks due to climate change.

- Expected financial benefits: profits.
- Expected CAPEX (Capital Expenditures).
- Expected OPEX (Operating Expenditures).
- Expected donations and other community investments, retained earnings, and payments to capital providers and governments.
- Financial implications and other risks and opportunities for the organization's activities due to climate change.

1.3.2 Expected Financial Health and Stability (Dijkhuizen 2010)

'Expected Financial Health and Stability' measures if there is a system for financial risk management and if financial reservations are made in time.

- Is there a system for financial risk management which includes an analysis of financial risks and cash flow management (debtors and creditors)?
- Does the liquidity equals at least 1 and the solvency at least 0.4?
- Are financial reservations made in time, but only when necessary?

1.3.3 Expected Shareholder Involvement (Dijkhuizen 2010)

'Expected Shareholder Involvement' measures if shareholders and management decisions have a long-term focus and if long-term changes require shareholder approval.

- Do shareholders, members and/ or (financial) participants have a long-term focus and expectations?
- Are management decisions and remunerations in line with this perspective?
- Do decisions that imply significant long-term changes require shareholder or member approval?

Level 2: Project Execution

2.3.1 Market Presence (GRI 2010)

'Market Presence' measures the wage level compared to the local minimum wage and the proportion of locally-based employees, senior management and suppliers.

- Range of ratios of standard entry level wage compared to local minimum wage at significant locations of operation.
- Policy, practices, and proportion of spending on locally-based suppliers at significant locations of operation.
- Procedures for local hiring and proportion of senior management hired from the local community at significant locations of operation.

2.3.2 Macro Economic Effect (Labuschagne, Brent et al. 2005; GRI 2010)

'Macro Economic Effect' involves the increase in economic activity due to the project, the contribution to GDP and the market share performance.

- Increase in regional and national economic activity due to project.
- Contribution to gross domestic product (GDP).
- Market share performance.

2.3.3 Commercial Performance (Labuschagne, Brent et al. 2005; Dijkhuizen 2010)

'Commercial Performance' tests if the project is not dependent on a limited number of stakeholders, if there is an innovation strategy, if long-term business is ensured and if is invested in new business.

- Is it ensured that the project is not dependent on a limited number of stakeholders, including clients and suppliers? (this criterion assesses the vulnerability of the company's trade network)
- Is there an innovation strategy?
- Are investments done to ensure long-term business?
- Does the budget reflect investments in new business? And is the generation of new business actually demonstrated?

2.3.4 Capability Management (Dijkhuizen 2010)

'Capability Management' investigates if there is a plan for technological development, competence management, information management, quality management and business continuity and disaster recovery.

- Is there a structured approach to capability management in terms of technological development, competence management, information management, quality management and business continuity and disaster recovery planning?

2.3.5 Environmental expenditures (GRI 2010)

'Environmental Expenditures' measures the environmental expenditures and investments by type.

- Total environmental expenditures and investments by type compared to total project budget.

Level 3: Operation of the Asset

3.3.1 Market Presence (GRI 2010)

'Market Presence' measures the wage level compared to the local minimum wage and the proportion of locally-based employees, senior management and suppliers.

- Range of ratios of standard entry level wage compared to local minimum wage at significant locations of operation.
- Policy, practices, and proportion of spending on locally-based suppliers at significant locations of operation.
- Procedures for local hiring and proportion of senior management hired from the local community at significant locations of operation.

3.3.2 Macro Economic Effect (GRI 2010)

'Macro Economic Effect' involves the increase in economic activity due to the project, the contribution to GDP and the market share performance.

- Increase in regional and national economic activity due to project.
- Contribution to gross domestic product (GDP).
- Market share performance.

3.3.3 Efficiency of Asset

'Efficiency of Asset' measures how long the asset is in use compared to the hours needed for reparations and maintenance, the costs of maintenance and the fines when the product is not delivered on time.

- How long is the asset in use compared to the hours needed for reparations and maintenance? Annual ratio: hours of non-production due to maintenance and reparations/ maximum possible hours of production.
- Costs of maintenance.
- Costs of fines in case of inability to deliver the ordered amount of the product.

3.3.4 Environmental expenditures (GRI 2010)

'Environmental Expenditures' measures the environmental expenditures and investments by type.

- Total environmental expenditures and investments by type compared to total project budget.

3.3.5 Long-Term Planning (Dijkhuizen 2010)

'Long-Term Planning' tests if there is a long-term financial planning and if possible future scenarios for the business environment are analyzed.

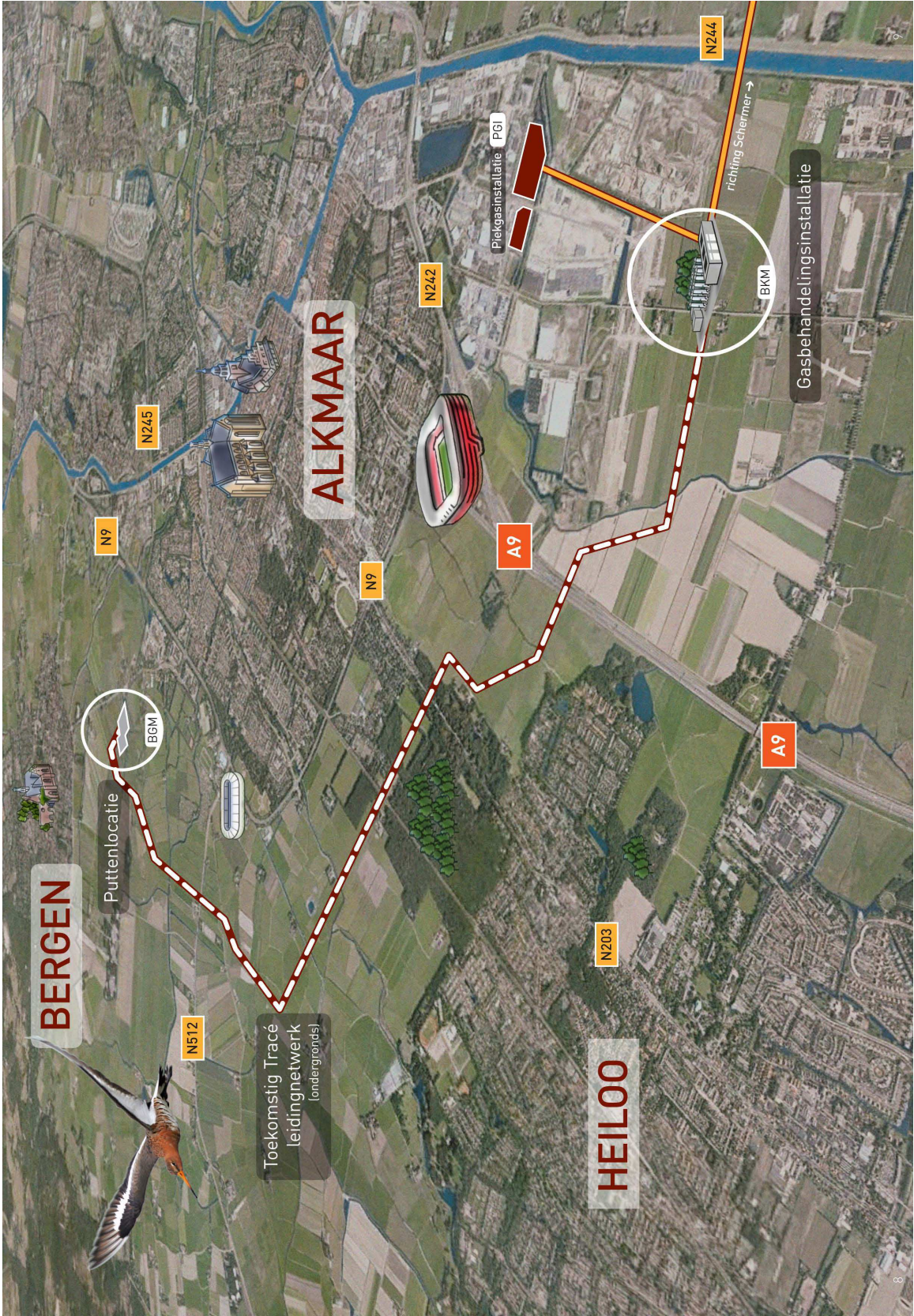
- Is there a structured approach to long-term financial planning, including at least business succession by current or new key personnel and/or stakeholders?
- Are possible future scenarios for the business environment analyzed and planned?

3.3.6 Realized Economic Performance (GRI 2010)

'Realized Economic Performance' involves realized profits, CAPEX, OPEX, donations, and financial implications and risks due to climate change.

- Realized financial benefits: profits.
- Realized CAPEX (Capital Expenditures).
- Realized OPEX (Operating Expenditures).
- Realized donations and other community investments, retained earnings, and payments to capital providers and governments.
- Financial implications and other risks and opportunities for the organization's activities due to climate change.

Appendix 7: Locations of the BGS project



Appendix 8: List of Personal Communication

These interviews, meetings and lectures served as an input for this research; (1) for developing and evaluating the framework, and (2) for determining the 'Sustainable Footprint' of the BGS project.

For reasons of confidentiality, names are removed.

1. Personal Communication for Developing and Evaluating the Framework

When	What	Location	Who
18-2-2010	Interview Energy Transition	TPM, The Hague	
17-3-2010	General Team Meeting BGS	TAQA, The Hague	
26-3-2010	Guest lecture Sustainability, WB4402	3ME, Delft	
16-4-2010	Feedback Meeting	TPM, The Hague	
16-4-2010	Sustainability Literature review	TPM, Delft	
19-4-2010	Feedback Meeting	TAQA, The Hague	
19-4-2010	Interview on Enironmental Impact Assessment BGS	TAQA, The Hague	
20-4-2010	Symposium MV, Future Technologies in Petroleum and Mining	Aula, Delft	
29-4-2010	Lecture Complexity of Sustainability	Cultureel Centrum, TU Delft	
20-5-2010	GDR Half-way Meeting, Expert Panel 1	TPM, The Hague	
31-5-2010	Presentation of Framework to TAQA Management	TAQA, The Hague	
1-6-2010	Debate on Sustainable Energy	AZ Stadion, Alkmaar	
2-6-2010	GDR Meeting, Expert Panel 2	TAQA, The Hague	
6-8-2010	Meeting on Benchmarking Projects	IPA, The Hague	
~every 1 to 2 weeks	Feedback meeting with external supervisors	TAQA, The Hague	
~every 1 to 2 weeks	Feedback meeting with first supervisor	TPM, The Hague	

2. Personal Communication for Determining the Sustainable Footprint of the BGS Project

When	What	Location	Who
9-4-2010	Site visit	PGL, Bergermeer, BDF	
14-4-2010	General Team Meeting BGS	TAQA, The Hague	
14-4-2010	Commercial Lunch and Learn BGS	TAQA, The Hague	
28-4-2010	General Team Meeting BGS	TAQA, The Hague	
25-5-2010	Interviews at Fluor on Planet Aspects	Fluor, Haarlem	
9-6-2010	General Team Meeting BGS	TAQA, The Hague	
11-6-2010	Site visit for Fluor employees	PGL, Bergermeer	
14-6-2010	Interview on Communication and Stakeholders	TAQA, The Hague	
16-6-2010	Drilling and Well Engineering Lunch and Learn BGS	TAQA, The Hague	
16-6-2010	Interview on Health and Safety	TAQA, The Hague	
16-6-210	Interview on TAQA's Long-term Strategy and Procedures	TAQA, The Hague	
16-6-210	Interview on CAPEX Ranking of Projects	TAQA, The Hague	
17-6-2010	Conversation about pipelines and contracts	TAQA, The Hague	
21-6-2010	Meeting on Health and Safety statistics Fluor	TAQA, The Hague	
21-6-2010	Enterprise Content Management Training	TAQA, The Hague	
22-6-2010	Interview on Human Resources	TAQA, The Hague	
23-6-2010	Calculating total FTE's for BGS Project	TAQA, The Hague	
30-6-2010	General Team Meeting BGS	TAQA, The Hague	
12-7-2910	Interview on Profits	TAQA, The Hague	
14-7-2010	Interview on Energy and Emissions & Waste	TAQA, The Hague	
16-7-2010	Interview Emissions and Waste PGL	TAQA, The Hague	
23-7-2010	General Team Meeting BGS	TAQA, The Hague	
23-7-2010	Telephone Interview Health and Safety at Fluor	Fluor, Haarlem	
23-7-2010	Telephone Interview Energy	Fluor, Haarlem	
28-7-2010	Interview on Permits, Stakeholders and Environmental effects	TAQA, The Hague	
4-8-2010	Subsurface Lunch and Learn BGS	TAQA, The Hague	
11-8-2010	General Ream Meeting BGS	TAQA, The Hague	
16-8-2010	Court Case from Gasalarm2 against the decision of the ministry of Economic Affairs (EZ)	Hoge Raad der Nederlanden, The Hague	

