MASTER THESIS

IMPROVING SUSTAINABILITY OF ROAD INFRASTRUCTURE PROJECTS BY PROCUREMENT

ARCADIS

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Improving sustainability of road infrastructure projects by procurement

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Master of Science

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Preface

This thesis report is the result of the graduation project, carried out at ARCADIS, to fulfil the Master of Science System Engineering, Policy Analysis, and Management (SEPAM) at Delft University of Technology.

The graduation commission consisted of four people (see table below), whom I would like to thank sincerely for their valuable comments, their assistance throughout the project, and their believe in a good outcome of the ambition process.

Chair:	Prof. Dr. G.P. van Wee
First supervisor:	Dr. Ir. J.H. Baggen
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Next to this, I thank all interviewees who were willing to share their knowledge and experience with me, both during the orientation phase and during the case study. This has helped me to structure the problem and to raise the reliability and practical usability of the result.

Especially, I want to mention Paula Kuijpers, who did not only provide me with information, but also invite me as a participant to two LEF sessions. You gave me access to the small network of policy makers of sustainable procurement, thank you.

Summary

The thesis report, to which this summary belongs, is the result of the graduation project, carried out at ARCADIS, to fulfil the Master of Science program Systems Engineering, Policy Analysis, and Management (SEPAM) at Delft University of Technology.

INTRODUCTION

While the idea sustainable development dates back a long time, the acknowledgement of its importance seems to grow each year. After encouragement of a European communication on Integrated Product Policy, the Netherlands declared the ambition to use its market power to stimulate sustainable development (EC, 2003) (van Geel, 2006). In 2010, the central government intends to procure 100% sustainably, while provinces aim at 50% sustainable procurement and municipalities at 75%.

SenterNovem, a governmental agency, made sustainable procurement operational, by developing environmental criteria. If a governmental party applies the relevant criteria to a contract, the product is considered procured sustainably. A monitor, carried out in 2008, however, shows a serious gap between ambition and reality (PwC, 2009).

Based on a pre-analysis, with several interviews, we observed that the 'instrument' sustainable procurement is not used to its full potential. Especially not during procurement of road infrastructure projects, where both organizational and environmental challenges leave much room for improvement. With a yearly investment of 4.5 to 8 billion euros, these projects are one of the designated spearheads of sustainable procurement (SenterNovem, 2009; Cramer, 2009).

We state our objective as follows: *The design of a framework that improves the support of sustainable development of road infrastructure via sustainable procurement by the government.*

METHOD

Before starting the research, we used a pre-analysis to sharpen the broad research description as provided by ARCADIS. Hereby, we used literature to gain insight in the problem at hand. Furthermore, we interviewed two procurement coordinators, the ambassador of sustainable procurement of municipalities, the head of the market group infrastructure, and an advisor of a sustainability consultancy firm.

Based on the pre-analysis we were able to state the objective as given in the introduction and to start the actual research. The first step, hereby, was to gain insight in the current system of sustainable procurement of road infrastructure projects. We used a variety of literature to analyse in-depth the background of sustainable procurement, the goal of the policy makers, and the position of the SenterNovem criteria in the system.

The second step of the research has been to analyse the pitfalls of the current system. The pre-analysis already had given us an idea what would be probable pitfalls. However, we used literature to analyse the correctness and completeness of pitfalls brought forward by the interviewees. Furthermore, we thoroughly investigated three cases to gain input from practical experience. By comparing the information from literature and practice, we were able to identify the challenges that should be overcome to reach our objective.

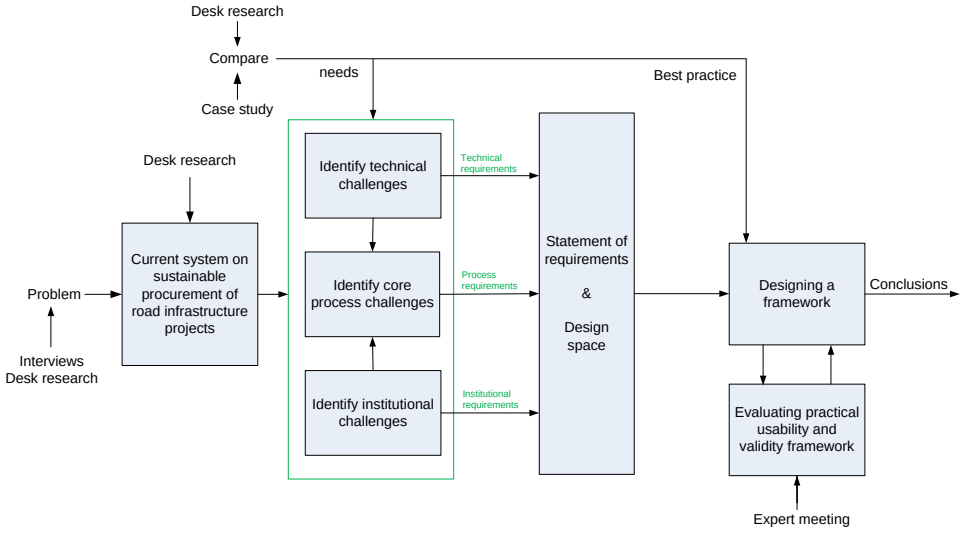
Based on the identified challenges, we set up a statement of requirements towards a framework that improves the support of sustainable development via procurement. Furthermore, we defined design choices to give direction to the design.

The fourth step was the actual designing of the framework. Next to using our own creativity, we used best-practices found by comparing case studies and literature. This design process has been an iterative process, during which several experts both from ARCADIS and procuring governmental parties have been consulted for their opinion.

Apart from the 'of the record' remarks, we organised an official expert meeting during which the practical usability and validity of the framework has been tested. Hereby, eight sustainable experts of engineering consultancy ARCADIS, and experts of the Directorate-General for Public Works and Water Management (Rijkswaterstaat), of SenterNovem, of building contractor KWS, and of the municipality of Amersfoort were present.

Figure 1.1 shows the research strategy as described above and used during the study.

Figure 1.1
Research strategy



RESULTS

As a result of the study, we gained insight in the current system of sustainable procurement of road infrastructure, as well as the pitfalls. We were able to state requirements to improve the current system, to design a framework that meets these requirements, and to evaluate the practical usability and validity of the framework.

Result 1: Insight in the current system of sustainable procurement

The goal of the current system of sustainable procurement is to set an example and, moreover, to stimulate sustainable development. To this end, sustainable criteria, set up by Senter Novem, should be adopted during the specification phase of the procurement project. The type of SenterNovem criteria are given in table 1.1

Table 1.1
Type of SenterNovem criteria

	Demand	Wish
Qualification supplier	- Suitability demands	- Selection criteria
Qualification product	- Minimum criteria - Contract performance clause	- Sub award criteria

The demands should exclude suppliers or products that do not reach at least a definite minimum respect for environment. The applying of these criteria determines the percentage "procured sustainably", and thus the achievement of the ambition

The wishes should stimulate suppliers to rise above the minimum environmental requirements. Although the wishes provide a great opportunity for sustainable improvements, the use of these criteria is facultative and do not influence the score on sustainable procurement.

Result 2: Identified pitfalls of the current system

While the instrument sustainable procurement could significantly contribute to stimulate sustainable development, several pitfalls hamper the potential influence. The main pitfalls are:

1. Procuring governmental parties do not always apply the SenterNovem criteria since employees do not feel a sense of urgency, the use of criteria is seen as a great administrative burden, and the current system and monitor leaves much room for strategic behaviour.

2. If the procuring party decide to apply the SenterNovem criteria, the influence on actual sustainable development is limited since the criteria are not ambitious, only focused on energy and materials, and sustainability is not considered a core value during the early phases of a project.

Result 3: Requirements to improve the current system

The improvements to the system should ensure a policy that is implemented and positively influences sustainable development.

To ensure that the sustainable procurement policy is actually implemented, the execution of the policy should be easy and controllable. To this end, the following requirements are set up:

- Sustainable criteria should be easily adoptable
- The actual use of criteria should be easily measurable

To ensure sustainable procurement of road infrastructure projects seriously stimulate sustainable development, the criteria itself should improve, while procurers should also consider sustainability a core value. To this end, the following requirements are set up:

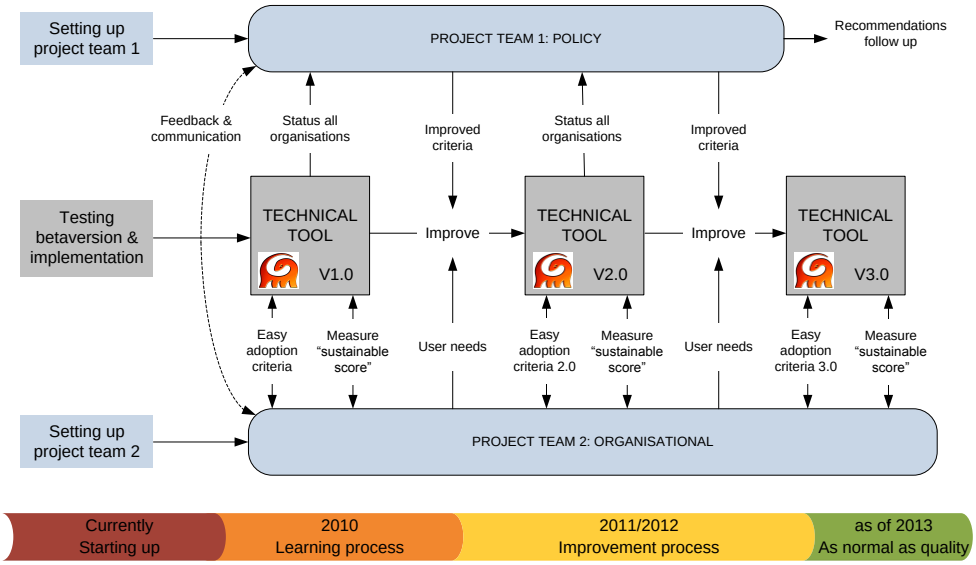
- Within the concept of sustainable development, the focus should be clarified
- Sustainable criteria should be more ambitious
- Sustainability should be considered a core value

Result 4: A designed framework to improve the current system

To fulfil the requirements to improve the current system, we designed a framework. This framework includes several improvements to ensure the implementation of the sustainable procurement policy of road infrastructure, as well as improvement of the policy itself. The designed framework is visualised in figure 1.2

Figure 1.2

Framework to improve the current system of sustainable procurement of road infrastructure projects



The technical tool stimulates procuring governmental parties to apply prescribed sustainable criteria. To this end, the tool provides a quick overview of relevant criteria per project. Hereby, the requirement of easy adoption of the criteria is met. Furthermore, the tool enables easy measuring of the use of criteria.

A policy project team is set up to improve the current criteria. Hereby, the focus is clarified by the responsible ministry of sustainable procurement (VROM). Furthermore, policy makers with technical knowledge of both procurement and road infrastructure projects are part of the redevelopment (e.g. Rijkswaterstaat). This enables the project team to significantly improve the current ambition of the criteria.

An organisation project team should carry out the sustainable policy. Hereby, procuring governmental parties should consider sustainable development a core value. Consequently, it should be taken in account during the early phases of a project. Ideally, technicians and procurers should cooperate already in an early phase, while discussing the strategy to reach the most sustainable product.

The improvements to the current system are implemented in phases. Hereby, the project team communicates to be able to make the new policy a success. Furthermore, the information, provided by the technical tool, provides input for improvement. At all levels, sustainability is becoming more and more a core value, which is as normal as taken into account quality, or even price.

Because the framework is integrating all these elements, it meets the requirements to improve the current system. The technical tool fills the gap between policy and procuring governmental parties. It ensures that focussed, ambitious criteria, brought forward by the policy project team, are adopted on the level of the organisation. Combined with good communication, this minimises the resistance among employees and starts up the situation where sustainability is considered a core value.

Result 5: A validated framework

Based on the expert meeting, we conclude the framework to be both practically usable and valid. While the experts differ in opinion on many aspects, in general, they shared this believe. Especially, they were enthusiastic about the, short term, potential of the technical

tool. This is seen as a tool that can make criteria made at policy level easily adaptable and measurable at organisational level. Hereby, it seriously helps to overcome the threshold fear of using the criteria.

CONCLUSION

The objective of this study has been to bring forward a framework that improves the support of sustainable development of road infrastructure via sustainable procurement by the government.

Such a framework will be a success if it ensures that the sustainable procurement policy of road infrastructure projects is implemented, while this policy seriously stimulates sustainable development.

- To ensure implementation of the sustainable procurement policy, the execution of the policy should be easy and controllable. To this end, the criteria should be easily adoptable and measurable.
- To ensure sustainable procurement of road infrastructure projects seriously stimulate sustainable development, the sustainable criteria should improve by defining focus, and subsequently raise the ambition level of the criteria. Furthermore, procuring governmental parties should consider sustainability a core value.

The framework, brought forward in this master thesis (fig1.2) will ensure both the implementation and improvement of the current sustainable procurement policy of road infrastructure projects. It encompass an ongoing improvement process, during which both policy makers and executers, facilitated by a technical tool, cooperate towards the situation where sustainable development is considered a core value.

REFLECTION AND FURTHER RESEARCH

During this study, we focussed on road infrastructure projects and took for granted the SenterNovem criteria. While the technical tool can easily be adjusted to be applicable during every procurement, both the policy team and organisational team cannot. However, the overall idea to set up these teams can be generalized. If the outcome of a policy plan influences technicians in their daily work, technical knowledge should be available in the project team. Additional research, however, is necessary to develop a framework applicable towards complete stimulation of sustainable development. Hereby, also alternative measures to stimulate sustainable development should be investigated

Given the great attention for this master thesis, the relevance is undisputable. Both policy makers and governmental procuring parties are searching to get some grip on the current process. Currently, several procuring coordinators of municipalities and provinces are already in negotiation about the costs of the tool. Furthermore, policy makers are very interested in the clear overview provided by the framework. Consequently, we believe the thesis can be defined very relevant. When using the framework, however, the potential improvements should continuously be researched.

Content

CHAPTER 1

Research design

This is the moment when we must come together to save this planet. Let us resolve that we will not leave our children a world where the oceans rise and famine spreads and terrible storms devastate our lands" (Barack Obama)

1.1 INTRODUCTION

"Sustainable" is becoming the key catchall term[1] of the 21st century. This, somewhat precipitous, conclusion can be drawn based on both national and international policy, and on advertisement for sustainable products (from energy to banking). Indicative, the term "sustainable" gets over 60 million hits at Google.

While the great attention for sustainability is new, the idea is not. Already in 1972, the Club of Rome published "the limits to growth". In this study, the expected problems of an unchanged growth trend in world population, industrialization, pollution, food production, and resource depletion are disseminated. The world's people are summoned to strive for ecological and economic stability that is sustainable far into the future (Meadows, *et al*, 1972).

Presumably, the World Commission on Environment and Development formulates the best-known definition of sustainable development. This "Brundland Commission" is set up by the General Assembly of the United Nations" in an urgent call for sustainable development. The commission defines sustainable development as follows (WCED, 1987):

"Development that meets the needs of the present without compromising the ability of future generations to meet their own needs"

This definition is, up until now, the most quoted definition. The definition did bring to light a difficult trade off. Negative environmental impacts often accompany economic growth, while this growth is necessary to alleviate poverty.

In 1997, Sustainable Development (SD) is enshrined in the preamble and in the objectives of the EU Treaty (Amsterdam). Furthermore, it features in Article 2 of the EC Treaty, which lays down the tasks of the Community (EC, 1997). Subsequently, in 2001, the "EU sustainable development strategy" and, in 2002, the "sixth environment action programme" were carried out (EC, 2001) (EC, 2002). The implementation of these strategies implies the integration of SD at all levels of public governance.

The government can seriously influence the market through public procurement. After all, "he who pays the piper calls the tune". Therefore, a European communication on Integrated

[1] In Dutch: containerbegrip

Product Policy encouraged European member states to adopt national action plans to ensure SD through (green) public procurement by the end of 2006 (EC, 2003).

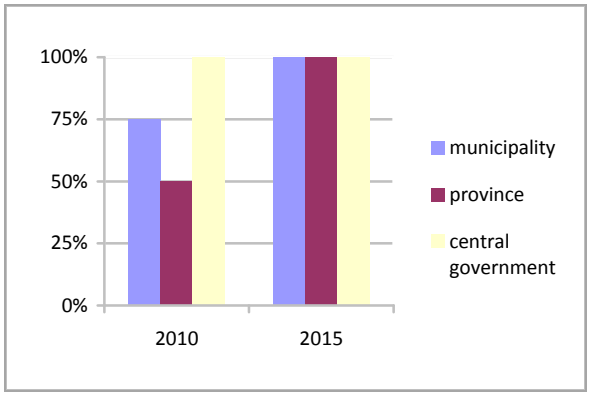
The Netherlands brought about the encouragement of the European Commission. In 2004, the Dutch government set up the strategy "Duurzame Bedrijfvoering Overheid" (Sustainable governmental management) (DBO). This strategy focuses on the sustainability of the governmental operations. The emphasis, hereby, is on sustainable procurement.

Former State Secretary van Geel declared, in 2004, the ambition to sustainable procurement for 50 percent in 2010 (van Geel, 2006). In a consultation with provinces, municipalities, and water boards, this ambition was agreed upon. The House of Chambers, however, demanded a higher ambition. They seconded the motion to sustainable procurement, by central government, for 100 percent in 2010 (Koopmans & de Krom, 2005).

To fulfil the idea of integration of SD at all levels of governance, the central government came to agreements with both the provinces and municipalities on sustainable procurement. In 2007, the municipalities agreed to procure 75 percent in 2010 and subsequent 100 percent in 2015 (VNG, 2007). Furthermore, the provinces agreed to sustainable procurement of 50 percent in 2010 followed by 100 percent in 2015 (IPO, 2007) (fig 1.3).

Figure 1.3

Sustainable procurement ambition governmental parties



By introducing sustainable procurement, Dutch governmental parties aim to provide a good example and stimulate the market to sustainable development. To make operational sustainable procurement, the Dutch government chooses to apply social and environmental criteria before awarding a contract (MFA, 2007). SenterNovem, a government agency, has developed environmental criteria for over 80 products. In April 2009, these criteria are ratified by the DBO.

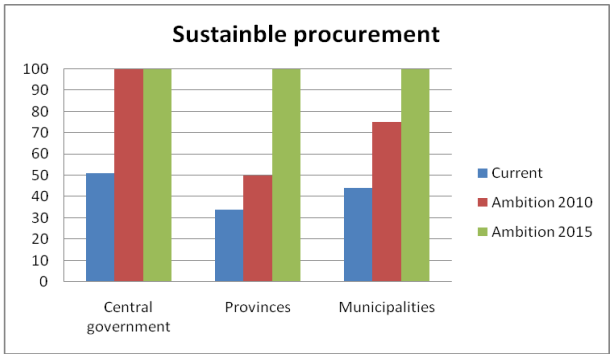
The criteria, as mentioned above, determine completely whether a project is to be concluded sustainable. As such, it also determines the percentage of sustainable procurement by the governmental parties. Although there might be alternative methods to ensure sustainable development, this method is the only one laid down, by the Dutch government, in the compositions with both the provinces and municipalities. In our research, therefore, we will take the SenterNovem criteria as starting-point, rather than alternatives.

1.2 RESEARCH PROBLEM

In 2008, a monitor is carried out by PriceWaterhouseCooper to gain insight in the status of sustainable procurement among procuring governmental parties. The results of this "Monitor Duurzaam Inkopen 2008", visualised in figure 1.4, shows a serious gap between the current results and the ambition of governmental parties (PWC, 2009).

Figure 1.4

Gap results and ambition sustainable procurement



Because the monitor bases these percentages only on the available criteria of 14 product groups, it will be very hard for the governmental parties to reach their ambitions of subsequent 100, 50, and 75 percent SP based on all product groups in 2010. Furthermore, a study among 52 Dutch municipalities, carried out by BECO in April 2008, shows 67 percent of the Dutch municipalities is still searching how to integrate sustainability in the procurement process, while 94 percent does not use the criteria at all (BECO, 2008).

Based on this information, ARCADIS, where this master thesis has been executed, asked to explore "how sustainable procurement by the Dutch government should be set up to reach a better world" (Raessen & Creemer, 2009). To sharpen this very broad research description, a typical "Technology, Policy, and Management" approach has been taken. That is, determining the actual problem by interviewing several key players[2].

We interviewed two procurement coordinators, the ambassador of sustainable procurement of municipalities, the head of the market group infrastructure, and an advisor of a sustainability consultancy firm. Despite their variety, the interviewees have a forthwith, common view on sustainable procurement. They believe the current instrument sustainable procurement is not used to its full potential.

The interviewees used various arguments why the current system of sustainable procurement is not seriously stimulating sustainable development. The interviewees (annex 2), however, broadly supported four problems:

- Lack of knowledge among employees

  "We do not work with the SenterNovem criteria, as a matter of fact, this is the first time I hear about them" (head of market group infrastructure, stadsregio Amsterdam)

- Resistance among employees

  "We are observing resistance towards sustainable procurement, especially among the conservative employees of the infrastructure sector (GWW)" (advisor of a sustainability consultancy firm, BECO)

- Low ambition of criteria

  "Especially considering the enormous amount of money and time spent on the SenterNovem criteria, the result is somewhat disappointing. The ambition of the criteria is low and will not change the market significantly" (procurement coordinator, municipality of Amersfoort)

[2] In annex 2, a complete elaboration of the interviews can be found

- Distorted monitoring

  "The main problem with this binary monitor is, that it is not based on the actual results, but only on the estimates of respondents about the use of the finished SenterNovem criteria" (advisor market & procurement, Rijkswaterstaat)

The first two problems could explain the gap between the current governmental results and ambition. The third problem, however, increases the complications. It implies governmental procurement considered a 100% sustainable given the current method, does not add to the actual goal: "stimulating sustainable development". The forth problem adds to this, because the actual status of governmental parties is unclear, and therefore, an assessment of the influence on sustainable development is impossible.

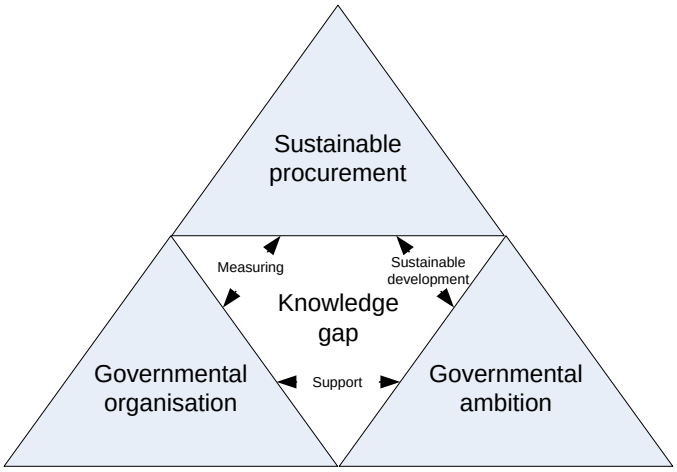
Based on the problem exploration we identify the knowledge gap, that it is unclear why exactly the current system of sustainable procurement is not yet a great success. The interviewees did provide, however, direction where to search for answers. Based on the problems provided, we identify three sub-knowledge gaps:

- It is unknown how the governmental organisation should raise acknowledgement and support for sustainable procurement among employees.
- It is unknown how sustainable procurement should be integrated in public procurement to stimulate sustainable development.
- It is unknown how sustainable procurement by procuring governmental parties should be measured reliably and continuously.

In figure 1.5, a visualisation of the knowledge gaps is given.

Figure 1.5

Visualization knowledge gaps



1.3 PROBLEM DEMARCATION

In "the world of sustainability", everything coheres. However, to reach a practical product of university standard, within the given timeframe of graduating, demarcation is necessary. To determine the scope, the potential (socially) added value is taken into account. This demarcation is partly based on the interviews mentioned.

Based on the pre-analysis, we identify three elements of the problem. Firstly, the criteria prescribed and method to assess the progress are a technical element. Secondly, raising

support for sustainable procurement, and for the use of criteria is an institutional element. Finally, the policy process and integration of sustainable procurement is a process element.

Due to the interdependencies, all these elements have to be taken into account. Consequently, not all products procured by the government can be investigated. The focus, therefore, is on the product to which the most value can be added from sustainable point of view. For three reasons, this product is "road infrastructure projects" (annex 2):

1. The resistance against sustainable procurement is, often, concluded to be the highest among the rather conservative employees responsible for procurement of road infrastructure. Raising support in this market group can, therefore, be considered the greatest organisational challenge.
2. During the construction of road infrastructure projects, a great amount of materials (roads) and energy (engineering structures) is used. Improving these projects will have an enormous impact on sustainability as a whole. Consequently, a great potential for sustainable development is present.
3. Road infrastructure projects tend to high investments and thus procurement of governmental parties. For municipalities, these projects even cover an average of 25 to 50 percent of total expenditures (BECO, 2008). Accordingly, measuring these projects covers a great part of the monitor.

Summarizing, the research of sustainable procurement of road infrastructure projects will contribute greatly to fill the present knowledge gaps.

Based on the problem exploration and demarcation, we can state the problem as follows:

PROBLEM STATEMENT

> The current system of sustainable procurement of road infrastructure projects is not stimulating sustainable development to its full potential.

1.4 RESEARCH GOAL

The goal of this research is to help responsible coordinators[3] of sustainable procurement to overcome the problem as stated before. To that end, this research project analyses how we can facilitate and improve sustainable procurement of road infrastructure projects.

The interviews described before already provide direction on the necessary adjustments. Based on this information we know the research should provide knowledge on how to raise acknowledgement and support among employees, on how sustainable procurement should be implemented in public procurement, and on how to measure it.

Executing this project should result in a framework, which provides this knowledge. Consequently, it will help Dutch authorities to reach, within the scope, their goal of sustainable procurement. The research goal is stated below.

RESEARCH GOAL

> The design of a practical framework that improves the support of sustainable development of road infrastructure via sustainable procurement by the government.

[3] Usually the procurement or environmental coordinator

1.5 RESEARCH ISSUE

Given the knowledge gaps noticed, the problem stated, and the research goal, we formulate research questions. The positions of these questions in the research strategy are given in figure 1.6. The main research question is stated as follows:

RESEARCH QUESTION

> How should the current system of sustainable procurement of road infrastructure projects be adjusted to improve the stimulation of sustainable development?

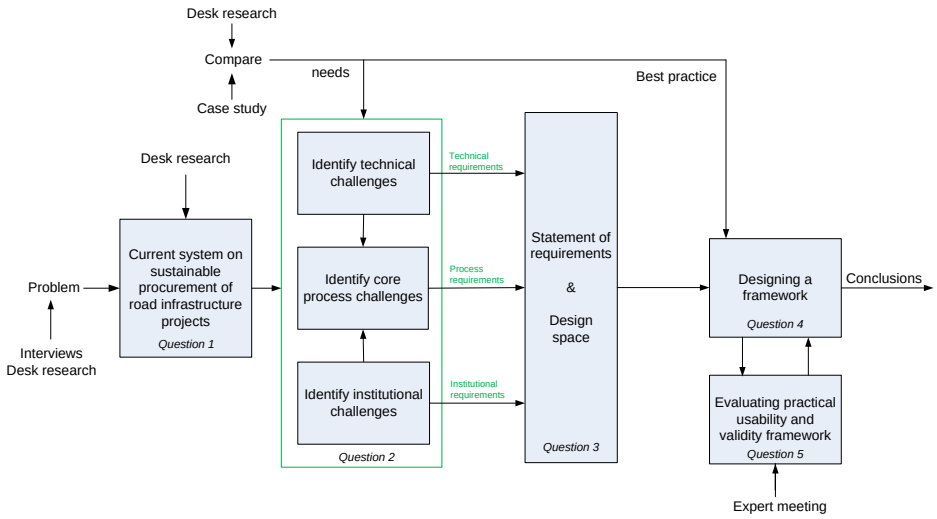
The answer to this question should put into practice the theoretical solutions from literature and provide a practical framework for government parties. To answer the main question, five sub-questions are formulated:

1. What is the current system of sustainable procurement of road infrastructure projects?
2. Why does this system not significantly stimulate sustainable development?
3. What are the requirements to overcome the current pitfalls?
4. How should the requirements to improve the use of sustainable procurement be met?
5. What is the practical usability and validity of the framework?

By answering the first sub-question we provide the theoretical context, goal, and form of the current system of sustainable procurement. Following the second sub-question, we determine pitfalls of the current system that should be eliminated. In the first instance, we will subdivide technical, institutional, and process challenges. By integrating the challenges, we provide the requirements meant in sub-question three. To answer the fourth sub-question, we bring forward a framework to improve the current system. Finally, we test the practical usability and validity of this framework, based on the last sub-question.

In figure 1.6, the connection between the research questions is visualized. Furthermore, the approach to answer the sub-questions is given. This approach is elaborated in §1.6.

Figure 1.6
Research strategy



1.6 RESEARCH STRATEGY

The goal of the research is to design a practical framework that improves the support of sustainable development of road infrastructure projects via sustainable procurement. The use of this framework should overcome the pitfalls of the current system. To this end, the framework should at least:

- Result in sustainable, measurable criteria that are stimulating the market to sustainable development (technical).
- Raise support among key players for sustainable procurement (institutional).
- Answer how to integrate sustainability in public procurement (process).

To reach this goal, three research methods are combined: desk research, case study, and expert meeting. In the research framework, the role of these methods is visualized (fig 1.6). This encompasses the questions it answers. In table 1.2, we provide an overview of the used method per sub-question.

Table 1.2
Overview methods per sub-question

Sub-question	Research method: Desk research	Case study	Expert meeting
1. What is the current system of sustainable procurement of RI projects?	X		
2. Why does this system not significantly stimulate sustainable development?	X	X	
3. What are the requirements to overcome the current pitfalls?			x
4. How should the requirements to improve the use of SP be met?	X	X	x
5. What is the practical usability and validity of the framework?			X

The methods are combined to provide a wide scope of information and opinions within the research. The advantages and disadvantages of the methods described are largely based on Verschuren (2005).

Desk research (Question 1, 2, and 4)

Desk research is a literature searching approach and forms the theoretical basis of the thesis. In literature, both procurement and sustainable development are well represented. Furthermore, the SenterNovem criteria are freely accessible as well as parliamentary papers on the subject. By combining this information, we are able to discover the context of the current system, its pitfalls, and potential measures.

Q1: We explore the current system of sustainable procurement of road infrastructure projects. Hereby we use general literature about sustainable development and (green) public procurement. Furthermore, we use parliamentary papers and implementation manuals to determine the goal and form of the current system.

Q2: To determine the pitfalls of the current system, we subdivide technical, institutional, and process elements. During all, we use literature to provide the theoretical context of the challenges.

Technical:

- We explore the SenterNovem criteria relevant for road infrastructure projects. Hereby, we analyse the number, type, and theme of criteria to gain insight in the administrative burden and ambition level of the current system.
- We explore 'state of the art' tools, described in literature, to gain insight in current possibilities to measure sustainable procurement. Of course, the current monitor forms the basis. However, we also analyse potential improvements provided by alternative measuring methods.

Institutional:

- To gain insight in the institutional context, we identify the actors and network characteristics based on, among others, management reports of the actors and literature about networks.
- We apply institutional theories to determine institutional challenges of the current system. These theories are well founded in literature.

Process:

- We use a literature survey to analyse the processes behind policy, procurement, and projects. Based on this information, the core design challenges are elaborated.

Q4: The source literature is used again during the design of the framework. Ways to meet the requirements to the design will be partly based on best practices from literature. For instance, the exploration of 'state of the art' tools mentioned before might result in adopting one of these methods.

By performing the desk research, it is possible to gather, quickly, a large number of reliable information. However, a pitfall of this method is there is no direct contact with the research unit and that solutions provided are rather theoretical. To deal with this potential problem, case studies are carried out, providing in-depth information.

Case study (Question 2 and 4,)

"In general, case studies are the preferred strategy when "how" or "why" questions are being posed, when the investigator has little control over events, and when the focus is on a contemporary phenomenon within some real-life context" (Yin, 2002). Clearly, this definition is directly applicable for question 2, and 4. In annex 7, we set up a complete case study protocol.

The goal of using case studies is to compare the theory as found in literature with real life cases. Hereby, we gain insight in the decisions made during a project towards sustainable procurement. We can investigate if, why, and how sustainability has been taken into account during the procurement process. Furthermore, in case of completed projects, we are able to observe the result.

By comparing the theory from literature with the practical information from case studies, we are able to assess the challenges from literature with reality (question 2). Furthermore, we can learn which (practical) measures are taken, if any, to overcome these challenges (question 4).

To enable cross case conclusions, which improves the validity of the results, at least 2 cases should be investigated. Given the demarcation, the cases should encompass the procurement of a road infrastructure project. To gain much information about both the challenges and potential measures, the idea sustainability should at least be considered

during the project. Preferably, sustainable criteria, as set up by SenterNovem criteria, should be adopted during the project.

The fact that the case studies might provide biased information is neutralized by combining the information with the theory found in literature (desk research). By combining these two methods, practical methods and tools with scientific value can be considered feasible.

A problem of a case study is the fact that the external validity of the results is not certain. Neither single nor multiple case studies allow for statistical generalization (Numagami, 1998). Users of the framework therefore, should be enabled to discuss or even change the "final" framework when necessary.

Expert meeting (Question 3, 4, and 5)

Setting up the statement of requirements and actually designing the framework is an iterative process. Hereby, we will consult, regularly, experts at ARCADIS to improve our work. Because we carry out our project in the market group contract management, feedback on the formulation of the requirements (question 3) derived from the challenges should be easy to find. Furthermore, we search actively for feedback on initial designs (question 4) by presenting the thesis work at meetings.

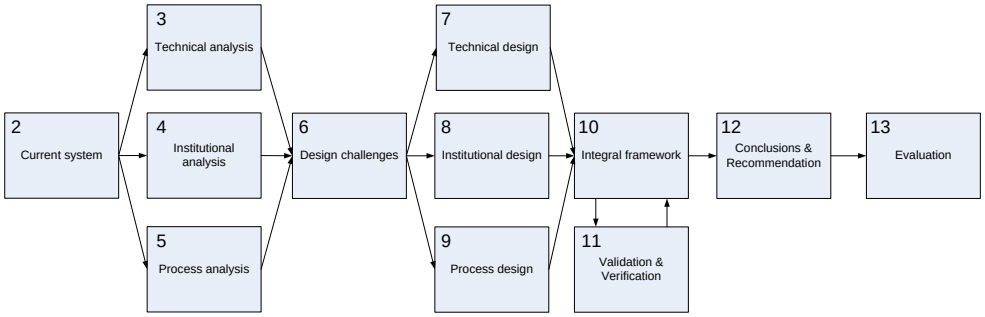
We verify and validate the preliminary design of the framework during an extensive expert meeting. Hereby, we answer question 5. During this session, not only sustainable experts from ARCADIS will be invited, but also experts who should actually use the framework. We assume we will meet these experts during the case studies.

1.7 STRUCTURE

In figure 1.7, the structure of the report is given.

Figure 1.7

Research structure



The figure above provides the overview of this thesis report. In chapter 2, we elaborate on the current system of sustainable procurement of road infrastructure projects. Following this, we analyse the pitfalls of the current system. Hereby, we investigate the technical, institutional, and process challenges in subsequent chapter 3, 4, and 5. From these analyses, the design challenges become apparent in chapter 6. In chapter 7, 8, and 9 the technical, institutional, and process design is given. These designs form the basis of an integral framework, provided in chapter 10. The framework is validated and verified in chapter 11, after which conclusions and recommendations are given in chapter 12. Finally, the complete thesis process is reflected in chapter 13.

The social value of this master thesis is threefold:

- For the first time, an integral approach (TIP) is taken to provide governmental parties with a method to reach the goal of sustainable procurement.
- The thesis product combines theory with practical considerations.
- While the thesis product is demarcated to road infrastructure, it sets a good example for other products.

CHAPTER 2 Current system of sustainable procurement

"In theory, there is no difference between theory and practice; in practice, there is" (Chuck Reid)

In this chapter, we explore the current system on sustainable procurement of road infrastructure projects. We provide the background and goal of sustainable procurement. Furthermore, the operationalisation of sustainable procurement is analysed. Hereby, we elaborate on the procurement process, the use of sustainable criteria, which enables us to determine the position of the SenterNovem criteria.

2.1 THE IDEA SUSTAINABLE PROCUREMENT

To place sustainable procurement in perspective, we first explore the emerging and evolvement of the theory of sustainable development. Following this, we elaborate the political acknowledgement of the potential of sustainable procurement. Finally, we define the goal of sustainable procurement.

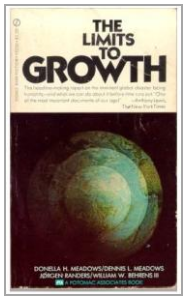
2.1.1 SUSTAINABLE DEVELOPMENT

Triggered by the book "Silent Spring", already in 1969, sustainable development gained political acknowledgement, resulting in a nationally policy for the environment (Carson, 1962) (NEPA, 1969). In essence, the idea of sustainability at that moment was "minimising environmental damage". Measures to do so were the main topic of United Nations Conferences in Stockholm (1972), Nairobi (1977) and the first global meeting to link environment and human settlement

In 1972, the global think tank "Club of Rome" gained worldwide attention with the report "the limits to growth". The report sold more than 12 million copies in some 30 languages worldwide (Club of Rome, 2009). The conclusions of the report are (Meadows, *et al*, 1972):

Illustration 2.1

The limits to growth



1. If the present growth trends in world population, industrialization, pollution, food production, and resource depletion continue unchanged, the limits to growth on this planet will be reached sometime within the next one hundred years.

2. It is possible to alter these growth trends and to establish a condition of ecological and economic stability that is sustainable far into the future. The state of global equilibrium could be designed so that the basic material needs of each person on earth are satisfied and each person has

an equal opportunity to realize his individual human potential.

Obviously, "The Club of Rome" summoned the world's people to strive for the second outcome rather than the first. Furthermore, they requested the world's people to start as soon as possible, to increase the chance of success (Meadows, *et al*, 1972). While the report does not provide solutions, it raised political acknowledgement of the environment.

During the 90s, the concept of sustainable development has expanded with the acknowledgement of the necessity of global social well-being. In an urgent call for sustainable development, the General Assembly of the United Nations set up the World Commission on Environment and Development. This "Brundtland Commission" defines sustainable development as follows (WCED, 1987):

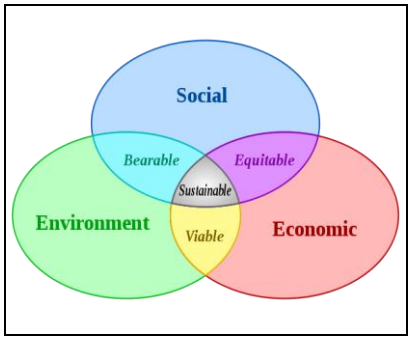
"Development that meets the needs of the present without compromising the ability of future generations to meet their own needs"

The definition did bring to light a difficult trade off. Negative environmental impacts often accompany economic growth, while this growth is necessary to alleviate poverty.

At the end of the twentieth century, it was recognised, sustainability covers three aspects, namely, People (social), Planet (environment), and Profit (economic) (Elkington, 1998) (IISD, 1997). The interlocking circles model in figure 2.8 gives a clear representation of the trade off between these objectives (IUCN, 2006).

Figure 2.8

Interlocking circles model



The concept "sustainable development" is dynamic and multi interpretable. Nonetheless, we can recognize two important aspects:

- Our behaviour will influence the possibilities of future generations
- A trade off has to be made between social, environmental, and economic issues.

2.1.2 POLITICAL ACKNOWLEDGEMENT OF SUSTAINABLE PROCUREMENT

At the start of this century, the politics acknowledged the potential power to stimulate sustainable development via procurement. "Public authorities are major consumers in Europe, spending some 16% of the EU's gross domestic product" (EC, 2004). The original idea of sustainable procurement is using this procurement power to opt for goods and services that respect the environment (UN, 2002). Later, respect for social issues is added to this (EC, 2005).

After encouragement of an European communication on Integrated Product Policy, the Netherlands set up the strategy "Duurzame Bedrijfvoering Overheid" (Sustainable governmental management) (DBO). This strategy intend to ensure sustainable development

through public procurement (van Geel, 2006). Hereby, the Dutch government, thus, acknowledged the great potential of sustainable procurement.

Former State Secretary Van Geel declared, in 2004, the ambition to sustainable procure 50 percent in 2010. In a consultation with provinces, municipalities, and water boards, this ambition was agreed upon. The House of Chambers, however, demanded a higher ambition. They seconded the motion "" to sustainable procure, by central government, 100 percent in 2010 (Koopmans & de Krom, 2005).

In 2007, the "Vereniging van Nederlandse Gemeenten" (association of Dutch municipalities) (VNG) signed the "Klimaatakkoord Gemeenten en Rijk 2007-2011" (Climate composition municipalities and central government 2007-2011) agreeing to sustainable procure 75 percent in 2010 and subsequent 100 percent in 2015.

In 2009, the "Inter Provinciaal Overleg" (Inter Provincial Consultation) (IPO) signed the "Klimaat- Energieakkoord tussen Rijk en Provincies" (Climate-Energy composition among central government and provinces) agreeing to procure sustainably 50 percent in 2010 and subsequent 100 percent in 2015.

Illustration 2.2

Left: signing climate composition VNG

Right: Signing climate composition IPO

2.1.3 GOAL OF SUSTAINABLE PROCUREMENT

The goal of sustainable procurement at all levels of the Dutch governmental parties is twofold (van Geel, 2006):

- Setting an example
- Stimulating sustainable development

The Dutch government feels the responsibility to set an example to both the market and private purchasers. Hereby, raised awareness and a behavioural change is intended (van Geel, 2006). A more direct goal, however, is to stimulate the market to sustainable develop. Hereby, the governmental organization uses their collective investment of €40 billion yearly, as persuasiveness (SenterNovem, 2009; VROM, 2008).

Stimulating sustainable development by procurement consists of two elements:

1. The exclusion of suppliers who are not able to provide a product with at least a definite minimum respect for environment and human rights.
2. Giving preference to suppliers who rise above the minimum environmental and social requirements.

The first method stimulates suppliers to reach the required minimum level. After all, if they fall to reach this level, they will lose the government as customer.

The second method stimulates suppliers to improve their products towards environmental and social sustainability. Consequently, the chance of sustainable innovations grows, because an innovative supplier will be in advantage.

2.2 THE OPERATIONALISATION OF SUSTAINABLE PROCUREMENT

In the previous section, we have elaborated on the background and goal of sustainable procurement. We have seen the Dutch government declared the ambition to procure sustainably in 2010. To reach this ambition and enable measuring of the fulfilment, sustainable procurement has to be made operational. Here, we analyse how this is put into practice in the current system.

The current system uses the adoption of sustainable criteria, put forward by SenterNovem, to make sustainable procurement operational. To be able to understand this method of making sustainable procurement operational, we first clarify the public procurement process and the use and form of sustainable criteria. Following this, we determine the current position of the SenterNovem criteria within the process.

2.2.1 THE PUBLIC PROCUREMENT PROCESS

Weele (2005) defines procurement as "acquisition of goods, works, and/or services at the best possible total cost of ownership, in the right quantity and quality, at the right time, in the right place and from the right source". The current system on sustainable procurement intend to make environmental and social issues part during the determination of the "right quantity, quality and source".

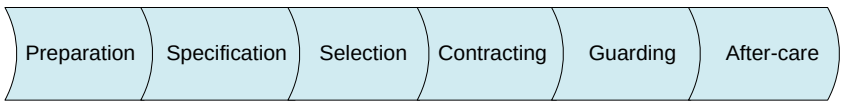
Public procurement is the term applied to when the purchaser is a body of the public sector (O'Hara, 2004). In case of road infrastructure projects, this is forthwith always the case. Because public procurement is funded by taxpayers money, public purchasers have, compared to private purchasers, a stricter obligation to get the "best value for money" and to be fair in procurement (EC, 2004). Here, being fair means providing equal treatment and transparency (EC, 2004).

This strict obligation makes demands to the design of "sustainable procurement". Whereas private purchasers are able to choose to buy from a preferred supplier, a public purchaser is not. Therefore, just believing a supplier provides the "most sustainable product", is not enough. A transparent procurement process in which potential suppliers are treated equally should clear this. Hereby, the "most sustainable product" should be seen as "best value for money"

Various authors subdivide the public procurement process into phases. Although the naming differs, authors roughly describe the following phasing (Weele, 2008; Lennartz & Veeke, 2007; Wijnberg *et al*, 1997; Ehlermann-Cache, 2007; Gelderman & Albronda, 2005):

Figure 2.9

Phases public procurement process



For road infrastructure projects, the first four phases mainly encapsulate the tender process. During an attended lecture of Frits Creemer (2009), we learned in depth the potential tender methods. In annex 3, we provide a summary of this lecture. Here, it is enough to realise two types of tender methods exist:

- A tradition tender method, where the procurer exactly prescribes how the road infrastructure project should be executed. The contractor who will execute the process for the lowest price, gains the contract.
- An innovative tender method, where the procurer tries to use the expertise of the building contractor to gain the best value for money. The contractor who provides overall (quality, money) the best solution, gains the contract.

Preparation

In the preparation phase, the procuring party determines its purchasing needs. First, he affirms the necessity to purchase a product. If so, he defines what, exactly, he needs. After determining the need, the procurement process to gain the product is set up. Hereby, thus, answering how to procure. Furthermore, he prepares a tender strategy.

Specification

During the specification phase, the procurer specifies the demands and wishes on both the supplier and the product. Based on the type of tender, he can either completely prescribe, or functionally prescribe the product he wants. Furthermore, he specifies the award method (award-criteria) and calculation.

Selection

In the selection phase, building contractors provide a proposal to execute the road infrastructure project. If an innovative tender method is used, this proposal contains a preliminary design, an execution plan, and a quotation. In case of a traditional tender, the building contractor only provides a quotation. A judging committee awards the contract based on the earlier specified award criteria (CROW, 2005; Regieraad Bouw, 2009).

Contracting

When the building contractor is selected, a contract between the procuring party and building contractor is signed. In this phase, only operational adjustments are made. By signing the contract, both the procurer and supplier record their bilateral agreement.

Guarding

When the contract is awarded, the execution by the building contractor should be guarded. Hereby, the procuring party has to verify whether the building contractor acts according to the contract. This includes sustainable measures agreed upon in the contract.

After-care

The final stage of the procurement process is after-care. This, mainly, encapsulate the learning process for the procuring parties. Both own and outside employees, as well as building contractors can learn from the experiences

2.2.2 THE USE OF SUSTAINABLE CRITERIA

To make sustainable procurement operational, SenterNovem, a governmental agency, set up sustainable criteria for over 80 product groups. Cramer (2009), the responsible minister for the policy on sustainable procurement even stated the definition for sustainable procurement as follows:

"Taking into account environmental and social aspects during procurement"

Taking into account should be assured by the use of the criteria brought forward by SenterNovem. Given the goal of sustainable procurement, Cramer apparently, assumes using environmental and social criteria will both set an example and stimulate sustainable procurement.

In a manual on the implementation of sustainable procurement, SenterNovem claims it uses the following type of criteria:

- Exclusion clause

- Suitability demands
- Selection criteria
- Minimum requirements
- Sub-award criteria
- Contract performance clause

To clarify the different specifications, as used by SenterNovem, we provide a examples after each description. To that end, we use real life criteria, found in statement of requirements and selection guides of four, road related projects. The documents are published on the Dutch digital public procurement journal "aanbestedingskalender". The four projects are given in table 2.3.

Table 2.3

Sources of criteria examples

Project	Description
Construction N50	Construction of the "N50 Ramspol-Ens"
Reconstruction Utrechtseweg	Reconstruction of the "Utrechtseweg Hoog" and illumination
Extension A50	Realisation of higher road capacity "A50 Ewijk-Valburg"
Reconstruction Hoessenboslaan	Reconstruction of Hoessenboslaan, Heistraat, and intersection

"Exclusion clauses" prescribe, in general terms, causes for exclusion of suppliers. In tender legislation, a finite list of binding and facultative exclusion clauses is given. Suppliers who are convicted, by a decree absolute, for a severe economic crime must be excluded. Suppliers who lack creditworthiness or professional integrity may be excluded (BAO, 2005). The awarding authority must point, for transparency reasons, the facultative exclusion clauses he will use.

Example:

Use of (all) facultative exclusion clauses Hoessenboslaan

"The subscriber may not be situated as meant in article 2.7 of ARW 2005[4]"

"Suitability demands" are qualitative requirements that the supplier, at least, has to meet to be considered for further participation of the tender process. The demands relate to the financial capacity and expertise of the supplier (Regieraad Bouw, 2009).

Example:

Suitability demand N50

"In the previous financial year, the candidate had a turnover of at least €40.000.000, within civil engineering (GWW) or fitting sector"

"Selection criteria" are criteria, describing wishes, set by the procurer to limit the number of participating tenders. The criteria have to be transparent, non-discrimination, and proportional. The criteria can only be used in a non-public tender (Regieraad Bouw, 2009).

[4] ARW: Aanbestedingsreglement Werken (Tender regulation Works)

Example:

Selection criteria A50

"The following points are awarded if the candidate designed, in the previous 10 year, a concrete and/or steal bridge with a free span of:

>100 m = 10 points

>150 m = 20 points

>200 m = 30 points"

While the term "minimum criteria" are often referred to by procurers when they mean the exclusions clauses or suitability demands, SenterNovem does not. The "minimum criteria" brought forward by SenterNovem are the specifications to the product (SenterNovem, 2009). Therefore, two types of minimum criteria are possible (Pianoo, 2009):

1. Technical specification; "Explicit description of the technical requirements of the product"
2. Functional specification; "Description of the desired performance of a system, based on the function of the system"

Technical specification is the conventional method to procure works. Hereby, the awarding authority provides the suppliers with an exact description of all activities necessary to realize the design. While this detailed specification is time consuming, it simplifies the assessment of proposals (Pianoo, 2009).

Example:

Technical minimum criteria Hoessenboslaan

"Transfer disposed materials to a, by appropriate authority, approved, revision- and processing establishment"

Functional specification is a relatively new, alternative method to procure complex products like road infrastructure. Hereby, the procurer saves time by only describing the desired performance of a system. Moreover, suppliers are stimulated to use their technical knowledge and innovate. The assessment of proposals, however, is hard and takes a lot of time (Regieraad Bouw, 2009).

Example:

Functional minimum criteria N50

"The technical working life of the pavement surface is, at normal maintenance, subject to calamities, at least 10 years"

A public procurer can award an order based either on the "lowest price" or on "best value for money"[5]. In the first case, the procurer only specifies minimum criteria and awards the order to the supplier who provides the lowest bid. In the second case, the procurer specifies, next to price, qualitative sub award criteria. The procurer should use this method if he wants to stimulate the market to exceed the minimum criteria (SenterNovem, 2009).

[5] In Dutch: EMVI (Economisch Meest Voordelige Inschrijving)

Example:

Use of sub award criteria Utrechtseweg

"The award criterion is 'best value for money' with the sub award criteria price (35 points) and quality (65 points). Quality is determined by:

- Planning = 5 points
- Temporary diversions = 25 points
- Compaction = 5 points
- Use of equipment = 5 points
- Storage area = 5 points
- Guarantee accessibility shop buildings = 15 points
- Sustainability = 5 points"

In the manual on sustainable procurement, SenterNovem defines a contract performance clause as condition under which the building contractor should execute the project. These conditions can influence price-setting, responsibility, compensation of risks, and also sustainability (SenterNovem, 2009).

These clauses are, thus, part of operational adjustments rather than negotiation. However, the contract performance clauses should be adopted in the tender guide, to enable contractors to prepare and adjust their proposal. Because we could not find criteria that fit the describtion of SenterNovem in the real life cases, we use the sustainable contract performance clause prescribed by SenterNovem for engineering structures.

Example:

Contract performance clause maintenance plan (product group Engineering Structures)

"During the execution of the engineering structure, a maintenance plan should be provided, in which the measures are given necessary to maintain the engineering structure. The plan describes the method of maintenance, necessary to ensure the reservation of the sustainable aspects of the engineering structure. The plan, at least, consist of :

A description of the measures and interval of inspection for a period of XX year, with corresponding instructions

A description of the interval of maintenance for a period of XX year, with corresponding instructions"

2.3 THE POSITION OF SENTERNOVEM CRITERIA

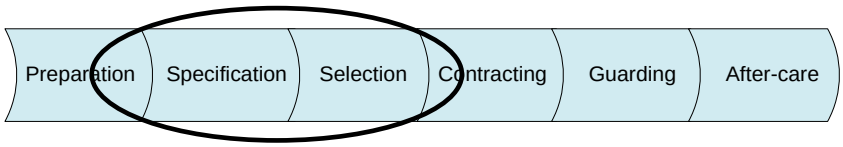
In recent years, governments tend to use their procurement powers as an environmental and social protection tool (Bolton, 2008). In the Netherlands, where public procurement amounted for 20.3 percent of its Gross Domestic Product, the government can seriously influence the market (CIA, 2008).

As mentioned before, SenterNovem set up criteria to make sustainable procurement operational. The idea behind the SenterNovem criteria is providing awarding authorities

with easily adaptable criteria. This enables awarding authorities, to add predefined criteria, during the specification phase, to the statement of requirements and selection guide.

Based on the form and type of criteria, we can position the criteria in the procurement process. The criteria form the input to assess both suppliers and proposals during the selection phase on sustainability, while they should be adopted during the specification. The position of the criteria is visualised in figure 2.10

Figure 2.10
Position of SenterNovem criteria in the procurement process



Already in the description of the use of sustainable criteria (§2.22), we explored the type of SenterNovem criteria. We can chart these criteria by distinguish qualification of suppliers and products, as well as demands, and wishes. The criteria, set up by SenterNovem are charted in table 2.4 as demand or wish, and qualification of supplier or product.

Table 2.4
Type of SenterNovem criteria

	Demand	Wish
Qualification supplier	- Suitability demands	- Selection criteria
Qualification product	- Minimum criteria - Contract performance clause	- Sub award criteria

The supplier demands should exclude suppliers, who do not act according, at least a certain, minimum level of sustainability. The product demands excludes proposed products that do not reach a given, minimum level of sustainability. At this moment, only environmental demands are present. However, social demands, in form of contract performance clauses, are expected early 2010 (SenterNovem, 2009).

An awarding authority, who wants to follow the idea of sustainable procurement, should at least incorporate all available demands of the relevant product group. The incorporation of these criteria determines the percentage "sustainable procured".

The selection criteria should stimulate suppliers to extend a minimum level of sustainability. Hereby, good scoring on these criteria will enlarge the change of being pre-selected. The sub-award criteria should stimulate sustainable innovation. Sustainable improvements enlarge the chance of receiving the contract. Hereby, sustainable innovation is rewarded.

SenterNovem recognizes the wishes provide a great opportunity for sustainable improvements (SenterNovem, 2009). However, the awarding authority can only apply these criteria if he uses a non-public innovative tender process (annex 3). Therefore, these wishes are facultative and do not influence the score of sustainable procurement (PWC, 2009).

CHAPTER 3 Technical analysis

"Men are only as good as their technical development allows them to be" (George Orwell)

In this chapter, we analyse the technical aspects of sustainable procurement. This encapsulates the analysis of sustainable criteria, and methods and tools to assess sustainable procurement. The criteria will be researched based on two quick scans of the SenterNovem criteria, and comparison with two cases. Based on these analyses, we gain insight in the technical pitfalls of the current system that hamper significant stimulation of sustainable development.

3.1 ANALYSIS SENTERNOVEM CRITERIA

To make sustainable procurement operational, SenterNovem, has developed environmental criteria for over 80 products. In April 2009, these criteria are ratified by the DBO. These criteria, however, raised criticism among both the business sector, and members of the House of Representatives. Therefore, Cramer decided to focus on criteria with the most environmental benefit.

In July 2009, Cramer announced the revised criteria. She reduced the number of product groups to 45, subdivided in six categories (table 3.5). In table 3.6, all product groups[6], per category, are given (SenterNovem, 2009; Cramer, 2009). These categories leave, according to Cramer, the most room for environmental benefit:

Table 3.5
Number of product groups per category

Category	# Product groups
Building	5
GWW[7]	10
Maintenance public space	4
Transport	11
Equipment	6
Facilities	9
Total	45

3.1.1 RELEVANT PRODUCT GROUPS FOR ROAD INFRASTRUCTURE PROJECTS

Because the research of this thesis is demarcated to construction of road infrastructure projects, not all product groups are relevant. Obviously, our area of attention is the category

[6] Valid on August 15, 2009

[7] GWW = Grond Weg en Waterbouw (Foundation, Road, and Water construction)

GWW. On the other hand, our scope exceeds the existing product group "road". We determined the relevant product groups based on a rough web-analysis of call for tenders of road projects (aanbestedingskalender) and in consultation with experts at ARCADIS.

During the construction of a *road* infrastructure project, first the *earthworks* have to be (re)developed. Often, under the ground, *cables & pipes*, and *sewer*, has to be replaced or reconstructed. Furthermore, a new road situation, often, requests for a new *VRI*[8] system, and *illumination*. Finally, especially at large projects, *engineering structures* often accompany a road infrastructure project. These structures have to be *conserved*.

Table 3.6

Product groups per category

Category	Building	GWW	Maintenance public space	Transport	Equipment	Facilities
Product group	Office building construction	Pumping stations	De-icing	Maintenance conveyance	Audio visual equipment	Office carpeting
	Office building rental & sales	Engineering structure	Cleansing public space	Mobil equipment	Drink vending machine	Printed paper
	Office building renovation	Conservation works	Street furniture	Heavy vehicles	Reproduction equipment	Office merchandise
	Office building demolition	Water purification installations	Parks and other planted or beatified areas	External council chamber and committee rooms	Network and telephone facilities	Office furniture
	Office building maintenance	Cables & pipes		Public transport	Mass catering equipment	Electricity
		Road		Vessels	Hardware	Catering
		VRI		Transport service		Cleaning
		Sewer		Mail		Dungarees
		Earthworks		Official car		Paper
		Illumination		Abroad mission		
				Adapted transport		

3.1.2 QUICK-SCAN ADMINISTRATIVE BURDEN CRITERIA

We make a quick-scan of the criteria, given the relevant product groups. Hereby, we distinct demands and wishes. As we concluded in chapter 2, only the incorporation of the demands determines the percentage "sustainable procured".

The first step is to determine the number of predefined criteria per product group. This enables us to get insight in the significance of the type of criteria. Furthermore, by counting

[8] VRI = Verkeer Regel Installatie (Traffic and travel information)

all demands, we determine the number of criteria, per product group, taken into account in the "monitor sustainable procurement".

The demands consist of suitability demands of the supplier, minimum criteria (specifications) of the product, and contract performance clauses (provision) of the method of execution. Furthermore, predefined wishes are present per product group. The wishes consist of selection criteria on the suppliers, and sub award criteria on the product.

In table 3.7, we chart the type of criteria per product group. We see, here, only demands on the product are given. Neither suitability demands, nor selection criteria are predefined. Furthermore, 20 minimum criteria are present, 5 provisions, and 13 sub award criteria. The number of criteria taken into account in the monitor is, thus, 25.

Table 3.7

Type of criteria per product group

	Demands				Wishes	
	Supplier	Product		Total	Supplier	Product
Product group	Suitability	Minimum	Provision		Selection	Sub award
Conservation works	-	3	1	4	-	-
Earthworks	-	-	-	-	-	1
Engineering structure	-	2	1	3	-	1
Illumination	-	3	1	4	-	2
Cables and pipes	-	3	-	3	-	2
Sewer	-	5	1	6	-	2
VRI	-	3	-	3	-	2
Road	-	1	1	2	-	3
Total	-	20	5	25	-	13

The criteria documents are published on the internet. These documents encompass much explanation on the product group and criteria. Every document has, forthwith the same design. The (sub) chapters of the criteria documents are provided in table 3.8.

Table 3.8 (left)

Content criteria document

Content
1. Introduction
1.1 Demarcation
1.2 Status
2. Market and sustainable aspects
2.1 Market development
2.2 Sustainable aspects
3. Sustainable procurement
3.1 Preparation phase
3.2 Specification phase
3.3 Use
4. Further information

Table 3.9 (right)

Pages per criteria document

Product group	Pages
Conservation works	24
Earthworks	15
Cables and pipes	32
Engineering structure	27
Illumination	34
Sewer	34
VRI	20
Road	25
Total	211

Although the documents provide much information, the actual criteria can be found in "3.2 specification phase". A procurement manager, thus, has to read many pages before finding the actual criteria. This is, especially, a problem if a project covers several product groups.

In table 3.8, the total number of pages per criteria documents is given (211). Because we already know the total number of demands taken into account in the criteria (25), we can calculate the number of written pages with regard to the number of monitored criteria. This is 211/25 = 8.4 page per criterion.

Based on the quick scan of the criteria, we identified a technical pitfall:

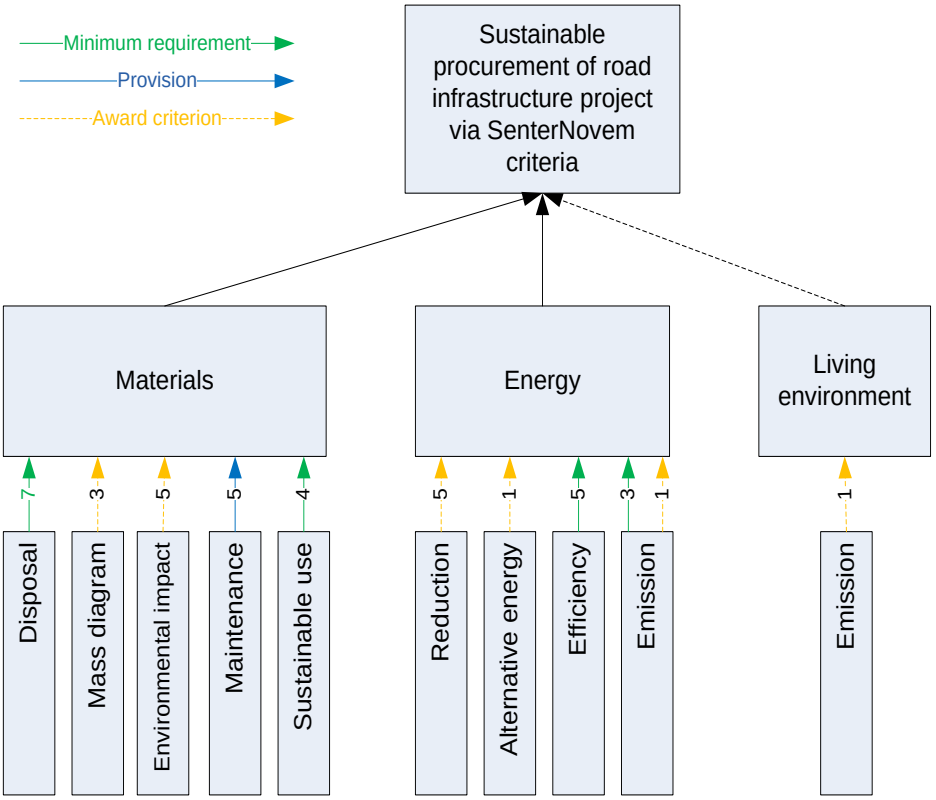
- The adoption of criteria lays a heavy administrative burden on the procuring parties, because per criterion, more than 8 pages text have been written.

3.1.3 QUICK-SCAN OF CRITERIA THEMES

Based on the relevant product groups, we analyse the sustainable themes covered by the SenterNovem criteria. In annex 5, the complete quick-scan is given. In figure 3.11, the influence of the criteria per theme is visualised. Hereby, we distinct the "monitored" minimum requirements and provisions, and "facultative" award criteria.

Figure 3.11

Quick-scan of themes



We conclude sustainable procurement of road infrastructure projects via SenterNovem criteria completely focus on use of materials and energy. Only one criterion influences living environment via light pollution. Furthermore, this criterion also influences both material and energy use, and is facultative.

Material use

The monitored sub-themes of materials are disposal, maintenance, and sustainable use. Except for maintenance, all criteria are technical minimum criteria. The disposal criteria, specifically, describe how the contractor must remove and process the disposal. For

"sustainable use", the sustainable measures on the design and exclusion of toxic materials are prescribed. The sub-theme maintenance is covered by the provision to deliver a maintenance plan.

While the monitored criteria do influence the project, the criteria do not leave any design space to the contractor because it are technical requirements. Furthermore, though on different product groups, all criteria on maintenance and disposal are, forthwith, equal.

The criteria regarding mass diagram and environmental impact do stimulate contractors to use their technical knowledge. These sub-themes both stimulate the contractors to improve their design to, respectively, optimize the mass diagram, and minimize environmental impact of the complete design. However, these criteria are facultative and do not influence the percentage "sustainable procured".

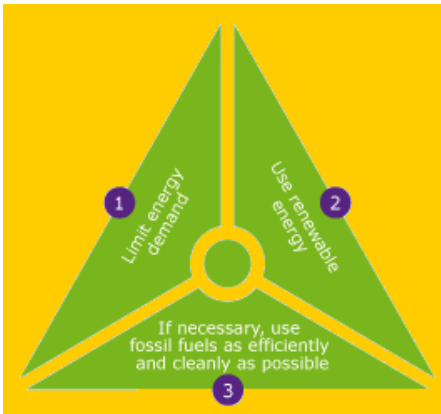
Energy

It strikes, the sub-themes of energy closely correlate to the steps of Duijvestein's (1998) "Trias Energetica". Hereby, the sub-themes fit the steps in the following way:

- Step 1 => "Reduction"
- Step 2 => "Alternative energy"
- Step 3 => "Efficiency", and "emission" (clean)

Illustration 3.3

Trias Energetica (Nuon, 2006)



TRIAS ENERGETICA

Lysen (1996) laid the foundation for the strategy "Trias Energetica". This three-step strategy, drawn by Duijvestein, provides a hierarchical approach of energy use. Hereby, the first step is, relatively, the most sustainable step, while the third step is the least sustainable. The steps are (Brouwers & Entrop, 2004):

1. Reduce energy demand by reconsidering the consumption
2. Use renewable energy as widely as possible
3. When there still remains an energy demand, then use fossil energy as efficient and clean as possible.

A great difference between the principles of "Trias Energetica" and the criteria, however, is the order of use. Duijvestein (1998) stated step 1 must be taken first and is the most important step. However, SenterNovem only provides demands for efficiency and emission (step 3). The criteria regarding step 1 and 2 are facultative.

Based on the analyses of the themes, we identified two technical pitfalls:

- The criteria only influence material use and energy
- The most ambitious criteria are not monitored

3.2 CRITERIA FROM CASE STUDY

To be able to compare the challenges found in literature with practical experience, we carried out case studies. Here, we describe the investigated cases, as well as their position in this study. Following this, for two cases, we compare the sustainable criteria taken into account during the project with the SenterNovem criteria.

3.2.1 THE ANALYSED CASES

Initially, we intended to find several cases that encompass the procurement of a road infrastructure project. Hereby, the idea sustainable should at least be considered during the project. Furthermore, we preferred projects where SenterNovem criteria were used or considered during the procurement project.

Despite all time and effort we put in finding these cases, it became clear such cases do not yet exist. Continuously, the reaction of procuring governmental parties was they did not take into account any form of sustainable criteria during the procurement of road infrastructure projects. This, clearly, underline the necessity of improvements to the current system of sustainable procurement.

The replies of governmental procuring parties on the case study requests underlines the technical pitfall of administrative burden and ambition:

- If governmental parties were aware of the SenterNovem criteria, they claimed they did not believe in all this clerical work

While we did not find a case completely in line with our expectations, we were able to analyse three cases that, nonetheless, provides us with much information. These cases are the reconstruction of the provincial road N221, the fictive procurement of the A3, and two LEF session during which actors had a brainstorm on improvements to the current criteria. In appendix 9, we describe the complete case study.

In the first case, the reconstruction project of the provincial road N221 is analysed. We choose this project, because it, probably, is the only finished road infrastructure project, executed with the idea to sustainable build it. Consequently, we are able to compare the project, executed in 2004, with the current ambition of sustainable procurement. Furthermore, we can see the decisions made and the actual results of the project.

In the second case, the fictive pilot project of the A3 is analysed. During this project, the usefulness of DuboCalc, a program that RWS considers the basis to sustainable procure (road) infrastructure projects, is tested. We choose this project, because, although fictive, contractors are requested to provide a sustainable road. Because contractors provide a fictive proposal and provided feedback, we are able to compare the pilot with the current ambition, as well as gaining insight in the decisions made both by Rijkswaterstaat and the building contractors.

In the third case, the LEF sessions "further development sustainable procurement GWW" are analysed. During two workshops, relevant actors had a brainstorm about improvements of current SenterNovem criteria. We choose this case, because during these cases several actors were present who seriously influence the policy regarding sustainable procurement. The direct contact both on and off-records with these actors enabled us to have a good insight in the background, current and future policy process. Furthermore, we were able to get a good view on the positions of the present actors.

Because the first two cases both involve the procurement of road infrastructure projects, we can compare the criteria taken into account during the project with the SenterNovem criteria. Based on this, we can underline, object or expand the current technical challenges.

3.2.2 COMPARISON OF CRITERIA WITH CASE 1: RECONSTRUCTION N221

The N221 at Baarn is reconstructed in 2004. The preparation, already, started in 1996, when the idea of sustainable procurement was unknown. The project, however, is set-up as a pilot for "sustainable building".

The project used an innovative tender method. Instead of complete description, the province of Utrecht commanded a part of the project. For the rest, the province established a ceiling price for sustainable measures. Given this price, the building contractors were encouraged to optimize the sustainable aspect of the project. Hereby, the initiators of these measures are distinguished by:

Prescribed in statement of requirements (method chosen by province)

Function prescribed (method chosen by contractor)

Extra (proposed by contractor)

Table 3.10
Sustainable measures per theme N221 (adjusted from annex 7.1)

Sustainable use of materials	Energy	Living environment	Sustainable safe
Concrete centre conductor	Dynamic traffic distribution (VRI) with led	Speed regime 80-50-80 km/hr	Separation of carriageway and bicycle path
Use of granulated concrete	Dynamic illumination system (dipped at night) with high pressure sodium vapour lamp	Sound attenuation asphalt	Shutting down sideways to lower points of conflict
Reuse of materials		Rain is received in a separate drain system and infiltrated in soil	Safer traverse via centre conductors
Separation of tarred asphalt		Reserving and replanting of trees	Sustainable safe intersection
Apply secondary- and recycled materials		Water-permeable bicycle paths "Gasfalt"	Cat's eyes on centre conductors for visibility
Strive for a closed mass-haul diagram		Contractors communication advisor	Spettermarkering (Spatter marking) to raise visibility
			Reflexing White compound in concrete

In table 3.10, the sustainable measures are charted per theme. Furthermore, via the color of the highlight, the initiators of the measures are given.

Sustainable use of materials

The first conclusion we can draw from the comparison is the contractor, already in 2004, extensive covered the aspect "sustainable use of materials". While the SenterNovem criteria

did not exist, and the province only requested a concrete centre conductor, the contractor brought forward many of the current existing SenterNovem criteria.

Two measures can directly be retrieved in the current criteria: "separation of tarred asphalt" is part of the demands for disposal (e.g. annex 4.1 M1) and the wish to strive for a closed mass haul diagram covers the homonymous wish (e.g. annex 4.1 G2). The other proposed measures; reuse of materials, use of granulated concrete, and applying recycled materials, are subdivided over the demands for sustainable use, and wishes for minimum environmental impact (e.g. annex 4.3 G3). The only material demand, actually, not taken into account is the aspect "maintenance".

Energy

Regarding energy, only prescribed measures are present. Both requirements can directly be found in the current criteria; "dynamic traffic distribution (VRI) with led" covers both demands about VRI (annex 4.3), while "Dynamic illumination system (dipped at night) with high pressure sodium vapour lamp" covers the requirement of OVL about dimming (annex 4.5 M1) and energy reduction (annex 4.5 M2). All these measures are part of step 3 of Trias Energetica, efficient use of energy.

The use of alternative energy (step 2) or reduction of energy need via design (step 1) is not, really, applicable in this case. Nonetheless, all proposals of the contractor, under the sub-theme 'sustainable save", can also be seen as measures that reduce the need for illumination.

Living environment & Sustainable safe

Both "living environment" and "sustainable safe" are themes we do not see in the current SenterNovem criteria. However, as can be seen in table 3.10, several measures are used in this case. This encompass, among others, sound attenuation asphalt, and separation of carriageway and cycle path. Consequently, both the sound hindrance and the number of accidents have been reduced (annex 9.1).

The question rises, whether we should consider these aspects sustainable measures. While it would, probably, raise support among neighbors, it might also greenwash the current standard measures. Two risks of greenwashing are (1) it will lead to cynicism and doubt about all environmental claims and (2) the sustainability movement will lose the power of the market to accelerate progress towards sustainability (TerraChoice, 2009).

Illustration 3.4
Greenwashing (TerraChoice, 2009)

GREENWASHING

Greenwashing is "the act of misleading consumers regarding the environmental benefits of a product or service" (TerraChoice, 2009) Hereby, the seven sins of greenwashing are:

1. Sin of a Hidden trade off
2. Sin of No Proof
3. Sin of Vagueness
4. Sin of Irrelevance
5. Sin of Lesser of Two Evils
6. Sin of Fibbing
7. Sin of Worshiping False labels

As an example, we use the idea of sound attenuation asphalt. While this asphalt will reduce the noise hindrance, the lifespan of this type of asphalt is shorter than regular asphalt (sin 1). Furthermore, law limits the acceptable noise hindrance. Therefore, a noise reduction is only relevant if law does not already prescribe this (sin 4).

Based on the comparison of the criteria with case 1, we add two pitfalls:

- Demonstrated by the fact that almost all relevant criteria were addressed in case 1, executed in 2004, the current criteria are not very ambitious.
- Next to materials and energy, case 1 took into account living environment and safety as sustainable measures. It is unclear if this should be considered part of sustainable procurement, because no focus is present.

3.2.3 COMPARISON OF CRITERIA WITH CASE 2: FICTIVE TENDER A3

During the fictive pilot project of the A3, the usefulness of DuboCalc, a program to quantify sustainability is tested. RWS considers DuboCalc the basis to sustainable procure (road) infrastructure projects. During the project, contractors are asked to provide a fictive proposal and evaluated the project, process, and DuboCalc (annex 9.2).

Illustration 3.5
DuboCalc (RWS, 2009)

DuboCalc

DuboCalc is a software program that enables users to calculate the environmental costs of a design by analyzing the complete life cycle of used materials and energy. The methodology is based on the standardized framework for Life Cycle Analysis (ISO 14.040 series).

DuboCalc converts the environmental impact of a design into tangible equivalents such as CO2 and SO2. Following this, the presence of these equivalents is translated into shadow prices. The "MilieuKostenIndicator" (environmental costs indicator) (MKI) represents the complete shadow price for the design (RWS, 2009)

The environmental impacts taken into account in DuboCalc are:

- Greenhouse effect (kg CO2)
- Acidification (kg SO2)
- Lesion ozone layer (kg CFK 11)
- Abiotic exhaustion (kg Sb)
- Philanthropic toxicity (kg DB)
- Terrestrial ecotoxicity (kg DB)
- Aquatic ecotoxicity (kg DB)
- Smog formation (kg Ethylene)
- Eutrophication (kg PO4)
- Energy (MJ)
- Hazardous waste (kg)
- Non hazardous waste (kg)

The above mentioned environmental impacts are calculated by analyzing the complete life cycle of used materials and energy. The building contractors, therefore, can only optimize the amount and type of materials and energy.

Given all the environmental impacts, we conclude DuboCalc exceeds the ambition of the SenterNovem criteria. During interviews of this case study, project member pointed out, they do not believe the current criteria will seriously influence the market, while DuboCalc might. However, the MKI-score is used as an award-criterion. Consequently, the procuring party is dependent on the design of the building contractors. Subsequently, the two greatest risks, identified by the building contractors, are manipulation and changes after reward (annex 9.2).

During the pilot, the relevant SenterNovem demands were not adapted in the contract. The use of DuboCalc, however, does bring forward many of the SenterNovem wishes. Because the wishes, however, are not part of the monitor, this sustainable pilot would be monitored as procured unsustainably.

Based on the comparison of the criteria with case 2, we underline three pitfalls:

- The current SenterNovem criteria are not ambitious
- While a focus lacks, all measures seems to aim at energy and material use
- While the sustainable criteria applied during the pilot exceed the ambition level of the current demands, they are not monitored

3.3 TOOLS AND METHODS TO ASSESS SUSTAINABLE PROCUREMENT

Because the Dutch government (100%) agreed in climate compositions with both VNG (75%) and IPO (50%) to reach a percentage sustainable procurement in 2010, this percentage has to be measured. We analyse the most used tools and methods to measure the percentage sustainable procured. These tools and methods are:

- Monitor Duurzaam Inkopen (monitor sustainable procurement)
- Zelfscan Duurzaam Inkopen (Selfscan sustainable procurement)
- DUIK scan BECO
- Sustainability Scorecard 2.0 DHV

Illustration 3.6
Monitor Duurzaam Inkopen 2008 (PWC, 2008)

Monitor Duurzaam Inkopen

The "Monitor Duurzaam Inkopen (monitor sustainable procurement)" measures the governmental progress regarding sustainable procurement. From 2006 on, every two year, a measurement of the percentage sustainable procurement takes place.

The measurement is based on a digital questionnaire, which should be answered by governmental parties. Only the sustainable demands (minimum criteria, provisions) determine the percentage sustainable procured.

The percentage sustainable procured is determined by the following formula:

Score (%) = Sustainable procured volume / Total volume

Probably, the most important methods to measure the percentage sustainable procurement is the "Monitor Duurzaam Inkopen". In 2006, Significant carried out the monitor, while in

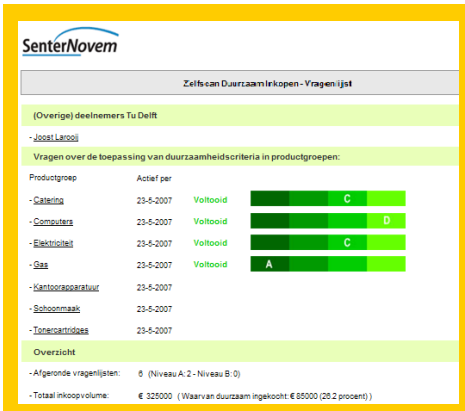
2008 Price Waterhouse Cooper did. This percentages found in this monitor are authoritative. Whether a governmental party reaches its ambition is based on this monitor.

There is, however, much criticism towards the method of measuring. The monitor only takes into account the sustainable demands, which does not stimulate procurers to use sustainable selection or award criterion. Furthermore, the monitor is binary; unless all demands are incorporated, the product is considered not sustainable procured. Finally, there is no control whatsoever on the replies of governmental parties on the questionnaire.

Another problem of the current monitor is the fact the digital questionnaire requests estimates of the used criteria per product groups. Therefore, the actual score per product group might not be accurate. Furthermore, especially for road infrastructure, projects cover several product groups.

The monitor, on the other hand, provides information of the scores of all governmental parties. Therefore, the best and worst scoring parties can be attended to investigate the causes of the score. Furthermore, it raises the attention of governmental procurement parties about their status.

Illustration 3.7
Zelfscan Duurzaam Inkopen (SenterNovem, 2007)



Zelfscan Duurzaam Inkopen

The "Zelfscan Duurzaam Inkopen (self-scan sustainable procurement)" is a free web-based application for governmental parties to scan their own performance.

By means of a digital questionnaire, (yes/no) the scan analyses whether or not the sustainable criteria are used during the tender (from A to D).

If all demands are taken into account, the procurement is considered completely sustainable.

Significant develop the self-scan sustainable procurement in 2006. At that moment only the criteria for catering, computers, electricity, gas, office equipment, cleaning, and toner cartridges were finished. However, an update of the self-scan is never made. Therefore, the excluded criteria computers, gas, and cartridges are still part of the self-scan, while no new criteria are added.

The self-scan measures the criteria according to the monitor. In addition, a stepwise visualization is given of "how sustainable" the product group is procured. Testing the self-scan showed the following sustainable steps are given (table 3.11). However, the percentage sustainable procured is still completely based on the demands.

Table 3.11
Steps self-scan

All demands & > 50 % wishes	All demands & < 50% wishes	> 50% demands	< 50 % demands

If the tool would include all new criteria, it could be very helpful to the governmental parties to test their position before the monitor is carried out. The scan, however, should be made per procurement of a product, rather than per procured product in a year. After all, the used criteria might differ per procurement.

Illustration 3.8
DUIK scan BECO (BECO, 2009)

DUIK scan BECO

The "DUIK scan" in developed by sustainable consultancy firm BECO. The scan is developed for municipalities and measures the percentage sustainable procured.

BECO uses next to SenterNovem criteria, also own criteria to determine the percentage sustainable procured. After interviews, BECO determines whether a product group is 0, 50, or 100 percent sustainable procured (Beco, 2008).

While the other tools and methods are based on own answers, the DUIK scan is carried out by an independent consultancy firm. The advisors of BECO interview various procurers to determine the use of sustainable criteria per product group. This method, to some extent, minimizes the risk of strategic answers of the procuring organization. Furthermore, this method at least tries to base the score on the procurement volume.

Because of the different measuring method, however, the percentage sustainable procured might differ from the monitor. For instance, the municipality of Amersfoort scored, in 2008, 36% on the Monitor Duurzaam Inkopen, and 47% on the DUIK scan. Furthermore, the determination is still based on questionnaires instead of the actual use of criteria.

Illustration 3.9
Sustainability score card 2.0 (DHV, 2008)

Sustainable score card 2.0

The sustainability score card 2.0 is developed by engineering agency DHV. The tool is developed for organizations to gain insight in their sustainable position, changes and risks.

DHV interviews external stakeholders of the organization. Based on this information, a questionnaire for the organization is developed, after which the position is determined via interviews.

Finally, DHV advises the organization how to improve their position in the market.

The sustainable score card, as put forward by DHV, has the same advantages (independent measurement) and pitfalls (different from monitor and use of questionnaires) of the DUIK scan. However, the target groups of this instrument are private organizations rather than public organizations.

Based on the analyses of the methods and tools to assess sustainable procurement, we determine the technical pitfalls of the current available measure methods. Several methods are available for procuring governmental parties to either measure their own status or measure it for them. While the problems differ, all methods have in common they do not base their score on the actual use of criteria per procurement volume by the procuring governmental parties. Instead they request responsible coordinators to estimate their score per product groups during questionnaires or interviews.

Based on the analysis, we identify the following technical challenge regarding measurement:

- The sustainable score of a procuring party is measured based on questionnaires and best guesses of responsible procurers instead of actual use per procurement volume.

Summarizing, we found the following technical pitfalls of the current system:

- The adoption of criteria lays a heavy administrative burden on the procuring parties, because per criterion, more than 8 pages have been written.
- While the policy makers never provide a clear focus of sustainable procurement, the relevant criteria only influence the use of energy and material.
- Because the criteria are not ambitious, the influence on actual sustainable development is limited.
- The sustainable score of a procuring party is measured based on questionnaires and best guesses of responsible procurers instead of actual use per procurement volume.

CHAPTER 4 Institutional analysis

"The world is not going to be saved by legislation" (William Howard Taft)

In this chapter, we explore the institutional context of the current system of sustainable procurement. Hereby we analyse the actors involved, the network they cooperate in, and the corresponding challenges. Furthermore, we apply theories of the New Institutional Economics to the current system of sustainable procurement of road infrastructure projects. Based on this, we determine the institutional pitfalls of the current system.

4.1 ACTOR ANALYSIS

In this research, the problem owner is supposed to be the responsible coordinator of sustainable procurement. This coordinator has, however, not sufficient means to solve the complex policy problem on his own. Therefore, he has to be aware of the interest and objectives of other actors.

Actors are those parties that have a certain interest in the system and/or that have some ability to influence that system, either directly or indirectly" (Bots, 2002). These parties are in some way involved with the policy problem, will be affected by the solutions, or have means that are essential for solving the problem (van der Lei & Thissen, 2009).

This actor analysis, therefore, is necessary to provide insight into the range of actors involved as well as their networks. An actor analysis originates in stakeholder analyses. However, the main difference is the fact that in an actor analysis the "capacity to influence decision making" is an important aspect.

We take the following steps subsequently:

1. Inventory of actors involved
2. Exhibiting the formal chart
3. Determining the interests, objectives and problem perception of actors
4. Mapping out the interdependencies between actors
5. Determining the consequences of these findings

4.1.1 INVENTORY OF ACTORS INVOLVED

We invented the involved actors during the case study, elaborated in annex 9. The determined relevant actors during sustainable procurement of road infrastructure are:

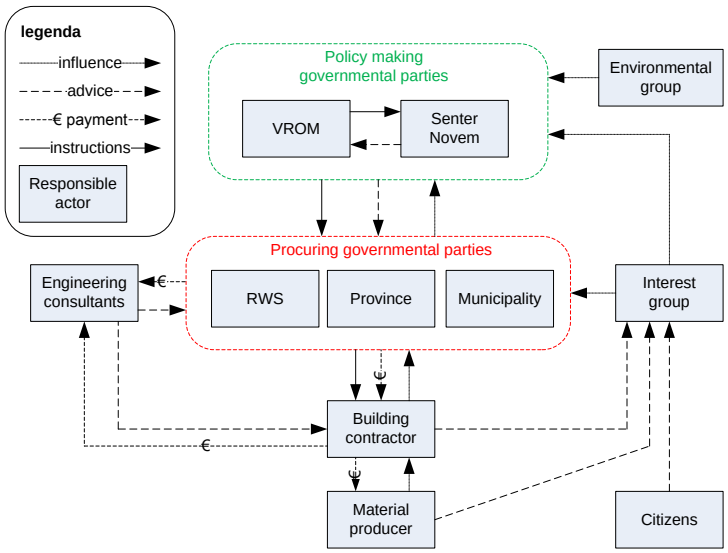
- VROM

- RWS
- SenterNovem
- Province
- Municipality
- Engineering consultancy
- Environmental parties
- Citizens
- Building contractor
- Road material producer

4.1.2 FORMAL CHART

In figure 4.10, we chart the formal interrelation between the actors. These interrelations consist of influence, advice, payment, or instruction. The set up of this chart is largely based on case 3 (annex 9.3), and parliamentary papers (Koopmans & de Krom, 2005; van Geel, 2006; Cramer, 2007; Cramer, 2008; Cramer, 2009).

Figure 4.12
Formal chart actors



VROM is designated as responsible ministry to give shape to sustainable procurement. The governmental agency SenterNovem is assigned to set up - in close collaboration with VROM, procuring governmental parties, and interest groups – environmental and social criteria. During the criteria making process, many actors try to influence the form and content of the criteria. After approval, however, the criteria should be adapted by the procuring governmental parties.

For road infrastructure, the most important procuring parties are Rijkswaterstaat, provinces, and municipalities. These parties make a contract with a building contractor about the work. If this is carried out according to plan, the procuring governmental parties pay the building contractor. In the contract, the relevant SenterNovem criteria should be taken into account.

Because the SenterNovem criteria especially influence the type of materials use, the material producer is indirectly influenced by the contract. The material producer, building contractor, and citizens will try to influence the demands of the procuring parties as well as policy that underlie this. Interest groups like BouwendNederland, VBW Asfalt, and citizens action groups, form the platform for these parties.

Finally, engineering consultants like ARCADIS give advice to procuring governmental parties on how to procure the project and how to set up the contract. Furthermore, the consultants advise building contractors how to subscribe for a work.

4.1.3 INTERESTS, OBJECTIVES, AND PROBLEM PERCEPTION

In table 4.8, on the next page, we provide an overview of the interest, objectives, problem perception, and instruments of all relevant actors. We gained this information, mostly, direct from employees of the organization during the LEF sessions (annex 9.3). Furthermore, we used analyzed annual reports, policy programs and websites of the organizations (VROM, 2007; SenterNovem, 2008; Rijkswaterstaat, 2009; CBS, 2008; VID, 2009; ARCADIS, 2009; Natuur & Milieu, 2008; BAM, 2009).

Even though the goals of the actors differ greatly, none of them, right away, objects to the idea of sustainable procurement. All actors see both risks and chances. While both policy makers and procuring parties wants to achieve sustainable procured road infrastructure, the building contractors and material producers see a chance to distinguish themselves from other parties not only on price. Furthermore, citizens and environmental groups hope the policy will improve the quality of the (living) environment. Finally, engineering consultancies see potential work in facilitating governmental parties during procurement.

Nonetheless, in table 4.12, we see objections to the current design of sustainable procurement. The policy making parties believes pre-defined environmental demands should preserve the road infrastructure market, while environmental wishes should motivate building contractors to sustainable innovate. Especially the local authorities, however, object to the increased administration and reduced influence of clerks. Furthermore, Rijkswaterstaat believe the current policy does not motivate the market enough to innovate.

Both environmental parties and citizens believe the current criteria are not ambitious enough. Furthermore, building contractors fear the criteria will only raise restrictions without rewards for innovation.

4.1.4 INTERDEPENDENCIES BETWEEN ACTORS

In the network of actors, several interdependencies become clear. To fulfill the goal of sustainable procurement of road infrastructure, several critical actors can be defined (table 4.13). These parties are all policymaking, and procuring governmental parties, and the interest groups.

The actions of the policy making governmental parties are critical. If a deficient design of sustainable procurement is set up, the system is bound to fail. The actual execution of this policy, however, lies in hands of the procuring governmental parties. They need to apply the policy, and use their expertise to improve the policy.

Another critical actor is the interest group. Specifically, the interest group of building contractors and road material producers are critical. Of course, on project level, the contractors themselves are critical. However, because building contractors need to obtain projects, they will adjust to the policy. If the building contractors and material producers, however, cooperate against the policy via an interest group, the policy will fail.

Table 4.12
Interests, objectives, and problem perception actors

Actors	Interests	Objectives	Existing or expected situation	Causes	Instruments
VROM	Protection of human and ecosystem health	- Sustainable production and consumption	- Preserved road infrastructure market - Resistance towards criteria	- Use of minimum criteria - Use of facultative criteria - Increased administration	- Expertise - Financial means - Development of criteria
SenterNovem	Implementation of government policies on environment and sustainability	- Preserving the road infrastructure market	- Preserved road infrastructure market - Resistance towards criteria	- Use of minimum criteria - Use of facultative criteria - Increased administration	- Expertise - Development of criteria
RWS	Realization of V&W objectives "dynamic and sustainable living environment"	- Becoming the leading sustainable executive agency - Reliable road network - 100% SP in 2010	- 750 traffic victims in 2008 - 15.713.022 km traffic jam in 2007 - Limited innovation	- Lack of capacity road - Insufficient challenge market	- Expertise - Financial means - Use of criteria - Functional specification
Provinces	Sustainable regional development	- Sustainable provincial road network - 50% SP in 2010	- Increased administration - Reduced influence clerks	- Prescribed use of criteria	- Expertise - Financial means - Use of criteria
Municipalities	Sustainable local development	- Sustainable local road network - 75% SP in 2010	- Increased administration - Reduced influence clerks	- Prescribed use of criteria	- Expertise - Financial means - Use of criteria
Engineering consultancy	Continued existence as engineering consultancy	- High demand for product	- Increased demand for sustainable procurement related product	- Insufficient knowledge governmental employees	- Expertise
Environmental parties	Environmental protection	- Minimal damage to environment by road infrastructure	- Insufficient influence criteria on environment	- Low ambition criteria	- Lobby
Citizens	Living environment	- 'Accessible, safe, and livable' living and working environment	- Insufficient influence criteria on living environment	- Low ambition criteria	- Lobby
Interest group	Realization of objectives group of interest	- Objectives Citizens/Building contractors/ Road material producer	- Insufficient influence criteria - Negative influence criteria	- Low ambition criteria - Restrictions of criteria	- Lobby
Building contractors	Continued existence as building contractor	- High demand for product	- Reduced demand for unsustainable product - Less competitors	- Restrictions of criteria	- Lobby - R&D
Road material producer	Continued existence as road material producer	- High demand for product	- Reduced demand for unsustainable product - Less competitors	- Restrictions of criteria	- Lobby - R&D

Table 4.13
Determination of critical actors

Actors	Resources	Degree of substitutability	Dependency	Critical actor
VROM	- Responsibility program sustainable procurement - Approving criteria	Mediocre	High	Yes
SenterNovem	- Using expertise and relations to set up criteria	Mediocre	High	Yes
RWS	- Relation with market - Procurement power - Expertise	Limited	High	Yes
Provinces	- Relation with market - Procurement power - Expertise	Limited	High	Yes
Municipalities	- Relation with market - Procurement power - Expertise	Limited	High	Yes
Engineering consultancy	- Expertise	High	Limited	No
Environmental parties	- Expertise	Limited	Limited	No
Citizens	- Blocking power	Limited	Limited	No
Interest group	- Blocking power - Expertise - Relation with governmental parties	Limited	Mediocre	Yes
Building contractors	- Expertise with building projects - Relation with governmental parties	High	High	No
Road material producer	- Expertise on materials	High	High	No

In table 4.14, the current position towards the current design of sustainable procurement of road infrastructure is visualized. Of course the policy makers support the current design, since they are responsible for it. However, although the executers of the policy; Rijkswaterstaat, provinces, and municipalities have the same objectives, they, often, do not agree with the current set-up. Furthermore, not all municipalities are dedicated, demonstrated by the fact only 170 out of 441 municipalities signed the statement to sustainable procure (SenterNovem, 2009).

Both building contractors and road material producers have conflicting interests and objectives. While most parties incorporate sustainability in their mission statement (BAM, 2009; Heijmans, 2009) their most important goal is a continued existence. The current set-up of sustainable procurement earlier adds risks than it provides opportunities. Therefore, they will encourage interest groups like BouwendNederland to lobby for changes.

Table 4.14
Overview of interdependencies of actors

	Dedicated actors		Non-dedicated actors	
	Critical actors	**Non-critical actors**	**Critical actors**	**Non-critical actors**
Similar / supportive interests and objectives	- VROM - SenterNovem - *RWS* - *Provinces* - *Municipalities*	- Engineering consultancy - Environmental parties	- *Municipalities*	- *Citizen*
Conflicting interests and objectives	- Interest group - *RWS* - *Provinces* - *Municipalities*	- Building contractors - Road material producer	- *Municipalities*	- *Citizen*

The actor analysis teaches us the actors behave in a network. Several critical actors, all with different objectives and motives, are versatile interdependent. We analyze this network into more detail in the following section.

4.2 NETWORK ANALYSIS

We consider the above-identified actors part of a network. De Bruin & ten Heuvelhof (1997) describe a network as "a whole of public, semi-public, or private actors who try to reach their goals by using their instruments to influence the other actors". Based on the actor analysis, we know the actors fit this description. During this analysis, we will characterize the network and specify the challenges based on the specific properties.

4.2.1 NETWORK CHARACTERISTICS

The four general characteristics that determine a complex network are multiform, closeness, interdependence, and dynamic (de Bruijn, *et al*, 2007). Here, we describe the presence of these characteristics in the process of sustainable procurement of road infrastructure

Multiform
During the process of setting up sustainable procurement in road infrastructure project, many different parties are involved. These parties are far from uniform. For instance, the different procuring governmental parties want to gain the best product for the lowest price, while the building contractors want to provide the product with maximum profit.

Furthermore, the size of the governmental parties differs greatly. For instance, RWS spend, in 2008, approximately €1.6 billion for road infrastructure, while the municipality of Amersfoort 'only' invested €1.4 million (RWS, 2008) (Amersfoort 2008).

Especially for large governmental parties, the own organization is also multiform. The employees try to reach different goals that might hamper each other. For instance, an environmental employee will try to minimize the environmental impact of road infrastructure, while a financial employee will try to minimize the costs.

Closeness
The actors relevant for this master thesis are relatively closed. We conclude this because the parties are especially interested in developments that correspond to their own policy and

perception. This expresses all parties believe sustainable procurement to be a good idea. However, the desired approach differs greatly. For instance, building contractors believe the government should invest more in sustainable product, while environmental parties believe SenterNovem should tighten the current environmental criteria (annex 9.3).

During the LEF session (annex 9.3), this closeness became very apparent. RWS would likes to become the venture of sustainable procurement of road infrastructure project. Hereby, they favor another approach, more consistent with their current method of tendering. VROM, however, disliked the fact that this would shift a part of the responsibility towards RWS. On the other hand, RWS, the initiator of the LEF session, did not invite municipalities and provinces, because these organization generally do not use an innovative tender method.

Interdependence

The network at hand consists of several actors. These actors are highly dependent on each other. During the process of sustainable procurement of road infrastructure, the dependency transcends a bilateral uncomplicated dependency of the procuring parties. To set up good sustainable criteria for instance, SenterNovem needs input from procuring parties, building contractors, and interest groups. These groups, however, need each other during the actual procurement process. Furthermore, the current information provided to SenterNovem will influence this process. The interdependencies, thus, are often versatile.

Dynamic

The current network is dynamic. The basis of sustainable procurement of road infrastructure dates back at 2005. Only in 2010, however, the established ambitions come into force. Furthermore, at the latest may 2011, new elections will be hold. Probably, the political climate will change with a new cabinet. Next to this, the project group to integrate sustainable procurement, currently under the responsibility of VROM, will end with the current cabinet.

Next to the process of integrating sustainable procurement, also the actual road infrastructure projects are very dynamic. The composition of actors in a project team changes every project. For the procuring party, the project leader will probably change, while other building contractors and material producers will be part of the project.

4.2.2 NETWORK CHALLENGES

Based on the presence of the characteristics, described in the previous section, we conclude the network is indeed very complex. Nonetheless, the described characteristics are relatively common for new governmental policy implementation. Therefore, we will determine the specific properties, and corresponding challenges, for this network.

Diverse tender method

Already in the previous section, we conclude the actors to be multiform. Specifically, for procuring parties, the used tender method is very different. Several interviewees assume municipalities and provinces forthwith always use a traditional tender method awarded on lowest price (annex 9.1). Rijkswaterstaat, on the other hand, wishes to, always, use an innovative tender method with awarding based on “best value for money” (RWS, 2009). The quick-scan on tender method, described in annex 6, underlines this assumption.

Because the idea of sustainable procurement is intend to be general applicable, a diverse tender method is problematic. After all, selection and awarding criteria can only be add to the contract if a non-public tender awarded based on "best value for money" is used. Therefore, if these criteria are part of "measuring sustainable procurement", the municipalities and provinces have either to change their tender method or accept a low score on the monitor.

The current set up of sustainable procurement makes allowance for the traditional tender method. This, however, results in a monitor that does not take into account the selection, and award criteria at all. The emphasis is on technical demands. Both Rijkswaterstaat and building contractors, however, do not consider these criteria in line with the optimum tender method (annex 9.3).

In an attempt to change the current set-up, Rijkswaterstaat initiated two brainstorms with the goal to "reach criteria in line with the innovative tender method" (annex 9.3). RWS did invite several actors like interest groups, policymaking governmental parties, and ProRail. However, RWS did not invite municipalities or provinces because of their contrary tender method.

This network challenge brings to light an institutional pitfall:

- The current system of sustainable procurement intend to be generic applicable while the used procurement and tender method differs per procuring party.

Lacking consensus on focus

The parties who are openly against sustainable procurement are rare. Among others, a public opinion poll, carried out by Smartagent Company amongst 1000 Dutchman, showed 92 percent of all Dutchman really acclaim sustainable procurement by the government (SC, 2009). Probably, one of reasons is the fact the concept sustainability is so broad everyone sees at least one positive aspect of sustainable procurement. However, a problem arises when we want to determine a focus.

Already in the previous description, we stated the difference in tender method between procuring governmental parties. Consistent with this, local authorities want to focus on easily adaptable technical demands, while Rijkswaterstaat encourage functional wishes (annex 9.3). Furthermore, building contractors believe the focus should be on awarding innovators, while environmental parties promote the punishment of back markers (annex 9.3).

Next to the controversy on focus on type of criteria and process, the parties also lack consensus on focus concerning content. During the LEF session, the participants struggled to determine a joint focus. However, this resulted in a list of 55 points of interest, divided over six themes (foundation, air, water, spatial environment, living environment, and energy) (annex 9.3). Hereby, the social aspect was not even part of the discussion.

This network challenge underlines the already identified technical pitfall of lack of focus:

- During the LEF session, participants did not come up with a (joint) focus

Lacking sense of urgency

The idea of sustainable procurement dates back to 2005. After the motion Koopmans- de Krom, the governmental departments set the ambition to procure 100 percent in 2010 (Koopmans & de Krom, 2005). Furthermore, in 2007 both the IPO (inter provincial consultation) and the VNG (association of Dutch municipalities) signed a climate agreement

to sustainable procure respectively 50, and 75 percent (IPO, 2007; VNG; 2007). Now, a couple of months before 2010 a high sense of urgency among both governmental parties and building contractors would be obvious.

This sense of urgency is, clearly, present at the governmental policy making parties. They intend to implement sustainable procurement as soon as possible and take measures to raise support among governmental parties and the market. Cramer took, for instance, the substantial measure to reduce the number of criteria documents from 80 to 44, only 3 months after acceptance. During the general meeting, the opposition unanimous gave compliments for this action. However, they also pointed out the risk of losing sense of urgency among governmental parties.

Because both the IPO and the VNG are delegates, the actual procuring parties are requested to individually confirm the climate agreements. While all departments and provinces did, only 170 out of 441 municipalities signed the statement (SenterNovem, 2009). From this, we can assume the other 271 municipalities do not feel a great sense of urgency concerning sustainable procurement.

One of the reasons for a lacking sense of urgency is the climate agreement only requests an "obligation of best intend" instead of a "duty to achieve a given result" (IPO, 2007; VNG; 2007). The only external motive is the monitor hold every two year. However, the scores of the parties are only provided to the party itself. The national publication of scores is anonymous (PWC, 2008).

Finally, based on a market consultation of, Beco (2008) concluded, "the building contractors do not feel a great sense of urgency to improve the sustainability of their development. The current criteria are neither threatening nor stimulating for the contractors"

This network challenge brings to light the following institutional pitfall:

- Both procuring governmental parties and building contractors do not feel a great sense of urgency towards sustainable procurement

4.3 APPLIED INSTITUTIONAL THEORIES

In this chapter, we already gave insight in the involved actors, their behavior, and the challenges regarding the specific properties of the network. To give direction to an institutional design, however, we apply, in this section, the theories of the New Institutional Economics. The three pillars of this school are Transaction Costs Economics, Agency Theory, and Property Right Theory (Groenewegen, 2009)

4.3.1 TRANSACTION COSTS ECONOMICS

The theory of Transaction Costs Economics (TCE) tries to explain the particular structure of a firm, most importantly, the extent to which it will integrate vertically (Oxford, 2009). Of course, regarding road infrastructure projects, we know the governmental parties never completely bring the execution "in-house". However, the governmental authorities can choose to completely design the road infrastructure, or instead, leave it to the market.

Already in 1937, Coase laid the foundation for the theory of Transaction Costs Economics (TCE). He suggested that, if not for transaction costs, the efficiency of the market should make contracting out always cheaper than to hire. The transaction cost consists of searching, contracting, and monitor costs (Coase, 1937).

Williamson (1975; 1981), build on the theory of Coase. He identified the three most important characteristics of transactions. The three variables that, according to the theory, determine whether transaction costs will be lowest in a market or in a hierarchy are:

1. Frequency
2. Uncertainty
3. Asset specificity

According to the theory of Williamson, if the frequency of transactions is low, vertical integration is not interesting at all, and otherwise. However, in our case, we see the party who most frequently procure a road infrastructure project, Rijkswaterstaat, is most convinced to leave all possible to the market. Apparently, the frequency is not decisive in this case.

The second characteristic of transactions is uncertainty. This can be declined by vertical integration. During the contracting of a road infrastructure project, several reasons for uncertainty are present. Especially large projects are carried out over a long time period. Furthermore, an information asymmetry is present because building contractors know more about the building process than the governmental parties.

The risk of uncertainty is that is leaves more space for strategic behavior by building contractors. Because of the information asymmetry, the building contractors, probably, will be able to design more efficiently. On the other hand, if the design is left to the market, the uncertainty about the final design grows among the governmental party, as well as the information asymmetry.

During the policy making process of sustainable criteria, no employees with technical knowledge of both procurement and road infrastructure projects were part of the responsible group to bring forward the criteria (annex 9.3). Consequently, to be able to set up good criteria, experts from procuring governmental parties and building contractors were consulted. During these meetings, there was much room for strategic behavior.

The last characteristic of transactions is asset specificity. These are "non-redeployable physical and human investments that are specialized and unique to a task" (Williamson, 1975). In our case, the fact that employees of local authorities do not want to learn the innovative tender method might be clarified by the high asset specificity. The asset specificity would of course change if an innovative tender method become normal. The current system, however, only stimulates this asset specificity by adjusting the system for 'back markers'.

Next to the procuring party, building contractors also have to deal with asset specificity. During the tender phase, building contractors are requested to make an offer, or even an initial design. Especially during open tenders, the building contractors run a risk they do not win the tender. They will have to compensate for these lost assets during another tender.

The applied TCE theory underlines the institutional pitfall of the adjustment of the system to make it generic applicable:

- The current system stimulates the asset specificity by adjusting the system for 'back markers'

The applied TCE theory also brings to light a new institutional pitfall:

- The current system leaves much space for strategic behavior and high transaction costs

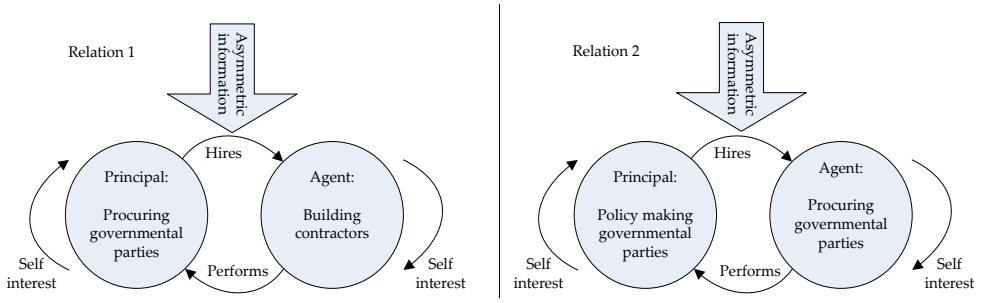
4.3.2 AGENCY THEORY

The Agency Theory describes the problems deriving from an agency relationship, in which the principal compensates an agent for acts useful to the principal and costly to the agent. The combination of different objectives and incomplete and asymmetric information between the principal and the agents results in two problems (Eisenhardt, 1989; Vries, 1992):

1. The principal cannot verify whether the agent behaves appropriately
2. Due to different preferences, the agent and principal may prefer different actions

In the network of parties relevant for sustainable procurement of road infrastructure projects, we identify two principal-agent relationships (fig 4.13). The most obvious is the relation between the procuring governmental party (principal) and the building contractors of the road infrastructure (agent). Though somewhat turbid, we also identify the relation between policymakers (principal) and policy executers (procuring parties) of sustainable procurement (agents).

Figure 4.13
Principal-agent relationships sustainable procurement



Relation 1: Procuring governmental parties vs. Building contractors
In the current situation, procuring governmental parties already struggle with setting up contracts that motivates building contractors to carry out the road infrastructure projects according to their wishes. Applying additional requests concerning sustainability will make this process even harder.

The first problem is to request the "correct" sustainable road infrastructure. After all, only building contractors really know the current state of the art regarding sustainable development of road infrastructure. If building contractors have different preferences, they might keep this information from the procuring party.

After contracting, the second problem rises. Due to monitoring costs and information asymmetry, it is hard for a procuring party to verify whether the building contractor carries out the road infrastructure project according to the contract. For instance, if agreed on a closed mass diagram, monitoring if a building contractor really did not borrow nor dispose materials seems unrealistic.

Relation 2: Policy-making governmental parties vs. Procuring governmental parties
The relation between policy making governmental parties and procuring governmental parties is not a real principal-agent relation, because the policy-making parties do not compensate the procuring parties to carry out the policy. Nonetheless, we see, currently, much similarity. The procuring parties, for one, have to perform the policy as broad forward by the policy-making parties. Hereby, only the procuring parties know whether they do so according to the policy.

The current monitor only enables the policy-making parties to get a general idea about the current behavior of the procuring parties. Because the verification is completely dependent on the honesty of the responders on the questionnaire, this verification leaves much room for opportunism of the procuring parties. Furthermore, policy makers lack instruments to adjust a procuring party, because the policy is based on "best intend".

The applied Principal Agent theory underlines the pitfall of strategic behavior:

- The current system leaves much room for strategic behavior both during the policy making process and during the implementation.

4.3.3 PROPERTY RIGHTS THEORY

Property rights theory has common antecedents with the above theories, and is yet distinct from them. It enriches the theories with the understanding that private parties have the right to own, use, and benefit from an asset (Kim & Mahoney, 2005).

The way property rights are distributed defines and shapes the behavior of actors (Demsetz, 1967). In our case, the most important property rights are sustainable road infrastructure innovations. In theory, the market should be motivated to reach this innovation because this will better their position to other suppliers.

Completely in line with the theory, building contractors claim their reserved behavior can be explained by the lack of right to own, use, and benefit from a sustainable innovation. Because building contractors will lose the rights of an innovation to the procuring party after using it in a project, investments in R&D are scant (annex 9.1). Even so much so, building contractors do not apply available innovations because this will result in losing the rights (Ramler, 2009).

While a solution to this problem seems easy, providing the building contractors with the rights, the reality is more complicated. The European tender directives, namely, request equal treatment of all parties (EC, 2004). If only one party owns a certain innovation, the procuring party may not request this product, because this would undermine market forces.

Consequently, within the current system, building contractors do not have the right to own, use and benefit from a sustainable innovation. Therefore, they feel they are not honored for being an innovator.

The applied property right theory underlines the institutional pitfall of adjusting the current system to 'back markers':

- The current system is adjusted for back markers, while precursors are not honored.

Summarizing, we found the following institutional pitfalls of the current system:

- The current system of sustainable procurement intend to be generic applicable while the used procurement and tender method differs per procuring party. The current system is adjusted for back markers, while precursors are not honoured.
- Although all procuring governmental parties should sustainable procure in 2010, both procuring parties and building contractors do not feel a great sense of urgency.
- The current system of sustainable procurement leaves much space for strategic behaviour and high transaction costs both during the policy making process and during the implementation.

CHAPTER 5 Process analysis

"I put my heart and my soul into my work, and have lost my mind in the process" (Vincent van Gogh)

In this chapter, we explore the current process context of sustainable procurement of road infrastructure projects. Hereby, we analyse the procurement, project and policy process and the interdependencies between those. Based on this, we identify the process pitfalls of the current system of sustainable procurement of road infrastructure projects.

5.1 PROCUREMENT PROCESS

Already in chapter 2: Current system, we analysed the procurement process into depth. Here, we only recapitulate the procurement phases:

- Preparation phase
- Specification phase
- Selection phase
- Contracting phase
- Guarding phase
- After care phase

Several authors emphasize, the ideal time to take into account environmental and social considerations, is during the early stages of the procurement process (Bolton, 2008; VROM, 2008; EC, 2004). The reason for this, the potential influence on the final product, is visualized in figure 5.14.

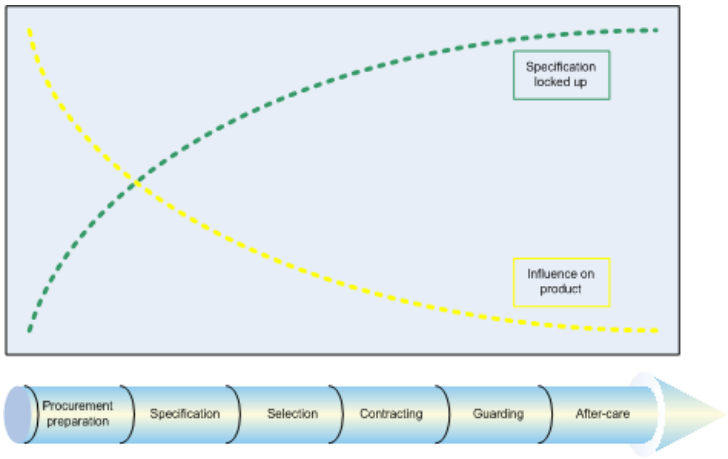


Figure 5.14
Influence on product during procurement process (adjusted from VROM, 2008)

Relevant actors broadly support the given chart (annex 9.3). During the preparation phase, many alternatives seem possible. However, already after the specifications are made, the possibility to change the definition of the need reduces. Because investments are made both

in time and costs, and agreements are made with building contractors, this barrier grows with every step.

Consequently, the decision made during the, somewhat vague, preparation phase seriously influence the outcome of the procurement process. It is, therefore, very important that an initiator is present, during the preparation phase, who persuades the responsible organisation to procure sustainable and set apart budget for sustainability (annex 9.4).

Because sustainability is, however, often not concluded a core value during the procurement process, it is often not taken into account during the preparation phase. Especially the costs of the project are considered much more important (annex 9.4). Consequently, however, the actual influence on sustainable development is limited because sustainability is becoming important, if at all, only during a phase when no significant changes can be made.

The analyzed procurement process brings to light the following process pitfall:

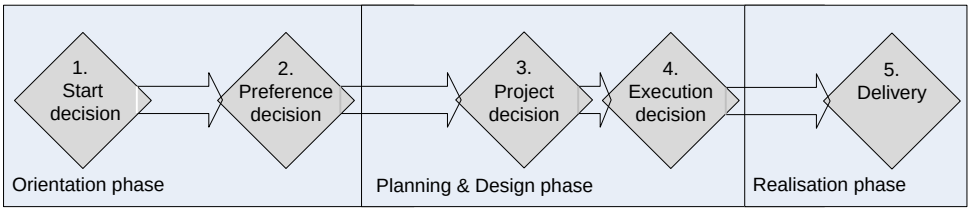
- The current core value is cost, while this should become sustainable development

5.2 PROJECT PROCESS

The project process determines the actual form of road infrastructure. Hereby, decisions are made about the alignment of the road, alternatives are studied, and decisions are made about the design of the infrastructure. In our view, the procurement process facilitates the project process. We will elaborate this in the interdependencies of the sub-processes.

Probably the best known steps towards the design of a road infrastructure projects are those as laid down in the "Meerjarenprogramma Infrastructuur, Ruimte en Transport (Long term program, Infrastructure, Spatial, and Transport)" (MIRT). This program, visualized in figure 5.12, comprehends the rules during the orientation, planning, and realization phase of the decision process (V&W, 2008).

Figure 5.15
MIRT procedure



The MIRT procedure is not necessary for all road infrastructure projects. Especially during small, uncomplicated road infrastructure projects, many of the steps are carried out only implicit. Nonetheless, the steps orientation, planning, design, and realization are applicable for all RI projects. Furthermore, if we take into account the complete life cycle of a project, we should add operation and demolition after realization (Miromoto, *et al,* 2003).

We can draw a similar figure about the influence on the design per step as given for the influence on the product in figure 5.11. While during the orientation phase, several alternatives are present, the possibility to change the project is reduced enormously after the project decision is made. Therefore, also in the project process, sustainability should be taken into account already during the orientation phase (annex 9.4).

During the project process, however, the project costs and delivery on time are considered much more important (annex 9.2). Consequently, the actual influence on sustainable development is limited because sustainability is becoming important, if at all, only during a phase when no significant changes can be made.

The analyzed project process brings underlines the pitfall of core value.

- During the project, the core value is cost, while this should become sustainable development

5.3 POLICY PROCESS

Lasswell & Lerner (1951) broke down the policy-making process into different phases. Herewith, he laid the foundation for the linear model, the most widely held view of the way in which policy is made. These phases are (Sutton, 1999):

1. Identification of policy problems
2. Agenda setting and identification of courses of action
3. Assess alternative policy proposals
4. Adopting and legitimating of best solution
5. Implementing the policy
6. Evaluating the outcome

The linear model assumes policy makers approach the issues rationally, going thorough each logical stage of the process, and carefully considering all relevant information. Critiques, however, declare, in the real world, the policy process in non-linear (Grindle and Thomas, 1991). Politicians are rather searching for a "window of opportunity" to push through their original goals (Kingdon, 1984).

In table 5.15, we provide a chronological overview of the policy process. Furthermore, we identify, per event, the corresponding phase. From this, we can analyze whether or not the process follows the linear method and at what phase the policy is (annex 9.3).

Table 5.15
Chronological overview of the policy process

Date	Event	Phase
2003	Encouragement by Integrated Product Policy to adopt national plans to ensure sustainable development through public procurement	Step 1: "Window of opportunity"
2004	Ambition "van Geel" to sustainable procure 50% in 2010	Step 4: "Adopting policy"
2005, June	Motion "Koopmans – De Krom" adopted to sustainable procure 100% in 2010	Step 4: "Adopting policy"
2006, November	Start development of SenterNovem criteria	Step 2: "Assess courses of action"
2007, March	Monitor Sustainable procurement 2006	Step 6: "Evaluating outcome"
2007, April	Under the new cabinet, sustainable procurement becomes a priority.	Step 1: "Window of opportunity"
2007, October	Start Interdepartmental director sustainable procurement	Step 2: "Assess courses of action"
2009, February	Monitor Sustainable procurement 2008	Step 6: "Evaluating outcome"
2009, April	All SenterNovem criteria completed, 83 product groups	Step 4: "Adopting policy"
2009, April 16	First LEF session Sustainable procurement	Step 2: "Assess courses of action"
2009, June	VROM decides to focus on 45 product groups, where most environmental impact can be reached. Stimulate innovation, focus on functionality and process.	Step 3: "Assess alternative policy"
2009, June 30	Second LEF sessions Sustainable procurement	Step 3: "Assess alternative policy"

2009, July 2	Progress report of Cramer in upper house	Step 2 & 6: "Evaluating outcome and propose changes"

Concerning the policy of sustainable procurement, we have to agree with the critiques. The process is not linear, nor is all relevant information carefully considered. Apparently, the decision process regarding sustainable procurement is chaotic. As a result, after four years of designing, almost 30 criteria documents have been eliminated only 3 months after finishing.

The analyzed policy process brings to light the following process pitfall:

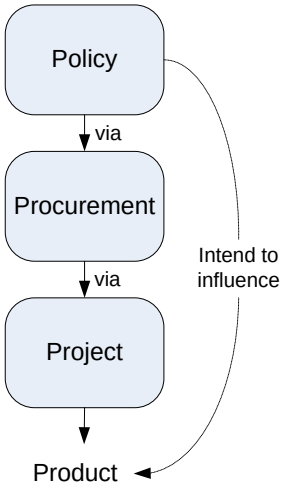
- The policy process has been very chaotic, demonstrated by the elimination of almost 30 criteria documents only 3 months after finishing

5.4 INTERDEPENDENCE OF PROCESSES

As mentioned before, the sub-processes strongly interrelate. Furthermore, each sub-process depends on the other processes. We visualize the simplified interdependence of the sub-processes in a model we call "the 4P model" (fig. 5.16)

Figure 5.16

4P model



The policy to sustainable procures aims at preservation of the (road-infrastructure) market and, thus, intends to influence the final product. This product should be sustainable developed.

Because decision makers do not make, buy, or design these products, the responsibility is cast on the procuring parties like Rijkswaterstaat, provinces, and municipalities.

The responsible procurers, however, only facilitate the projects towards new road infrastructure. Designers and building contractors carry out the actual design and execution of the product. The procurers, thus, should head the designers and building contractors.

From the figure, we learn sustainable procurement of road infrastructure projects is, in itself, not a goal. It is a method to reach actual preservation of the road infrastructure. Furthermore, we see the ambition of the policy can not be reached if either the procurement process is not influenced by the policy, or the project is not influenced by the procurement.

Already in the analysis of the separate sub-processes we have seen the most influence on the final result is made during the early phases of both the procurement and the project process. Therefore, during both processes sustainability should be taken into account already during the orientation phase. In addition, we can conclude, procurers should be part of the project already in an early stage

From our case study, we learn the relation between the processes, however, is very different per organization. We describe two opposites from the case study; the province of Utrecht (annex 7.1) and Rijkswaterstaat (annex 7.2)

The province of Utrecht virtually always designs the project itself. After writing the RAW specifications, building contractors can make an offer. Hereby, the role of procurement is minimal and only relevant late during the process. Even in the analyzed case, where, per

exception, a somewhat innovative tender is used, no procurers where part of the project. Mainly, because they are seen as "people who hinder the project with unnecessary rules". This, thus, minimizes the possibilities of the policy makers to influence the project via the procurers.

Rijkswaterstaat wants to leave all possible to the market. This includes the design process. Consequently, the procurers play a very important role in the project. This, thus, raises the possibilities of the policy makers to influence the projects via the procurers.

Case 1 brings to light the following process pitfalls:

- The current system requires the involvement of procurers during early stages of the project, while this is often not the case

Summarizing, we found the following process pitfalls of the current system:

- The current core value is cost, while this should become sustainable development.
- The policy process has been very chaotic, demonstrated by the elimination of almost 30 criteria documents only 3 months after finishing.
- The current system requires the involvement of procurers during early stages of the project, while this is often not the case.

CHAPTER 6 Design challenges

"Having a dream is what keeps you alive. Overcoming the challenges makes life worth living" (Mary Tyler Moore)

Already at the start of this master thesis we identified the problem "Sustainable procurement of road infrastructure projects is not stimulating sustainable development to its full potential". Therefore, we intend the design of "a practical framework that improves the support of sustainable development of road infrastructure via sustainable procurement by the government". Based on the pitfalls of the current system, we determine the requirements to such a framework. Finally, via design choices, we give direction to the design.

6.1 SUMMARY OF CURRENT PITFALLS

In this section, we summarize the pitfalls of the current system of sustainable procurement of road infrastructure projects. These pitfalls form the input for the requirements on the intended framework.

Technical pitfalls

Based on the technical analysis, carried out in chapter 3, we identified the technical pitfalls of the current system on sustainable procurement. Hereby, we found, underlined by both literature and practical experience:

- The adoption of criteria lays a heavy administrative burden on the procuring parties, because per criterion, more than 8 pages have been written.
- While a focus lacks, relevant criteria only influence the use of energy and material.
- The influence on sustainable development is limited, because the monitored criteria are not ambitious.
- The sustainable score of a procuring party is measured based on questionnaires and best guesses of responsible procurers instead of actual use per procurement volume.

Institutional pitfalls

Based on the institutional analysis, carried out in chapter 4, we identified the institutional pitfalls of the current system on sustainable procurement. Hereby, we found, underlined by both literature and practical experience:

- The current system of sustainable procurement intend to be generically applicable while the used procurement and tender method differs per procuring party. The system is adjusted for back markers, while precursors are not honoured.
- Although all procuring governmental parties should sustainable procure in 2010, both procuring parties and building contractors do not feel a great sense of urgency.

- The current system of sustainable procurement leaves much space for strategic behaviour and transaction costs both during the policy making process and during the implementation.

Process pitfalls

Based on the process analysis, carried out in chapter 4, we identified the process pitfalls of the current system on sustainable procurement. Hereby, we found, underlined by both literature and practical experience:

- The current core value is cost, while this should become sustainable development.
- The policy process has been very chaotic, demonstrated by the elimination of almost 30 criteria documents only 3 months after finishing.
- The current system requires the involvement of procurers during early stages of the project, while this is often not the case.

6.2 FROM PITFALLS TO REQUIREMENTS

While the technical, institutional, and process pitfalls are somewhat presented as separate in the previous chapters, the requirements to the framework are strongly based on the intersections between these aspects. Here we will determine the requirements to improve the current system of sustainable procurement after integrating the pitfalls.

6.2.1 INTEGRATION OF PITFALLS

Currently, the use of criteria lays a heavy burden on the procuring governmental party. Therefore, employees do not want to implement the current policy of sustainable procurement. Especially, because they believe the criteria will not seriously influence the market to sustainable develop. In addition, a good method to measure the actual use of criteria per procurement is lacking. This combination raises the room for strategic behavior, while it reduces the sense of urgency among both governmental parties and building contractors. As a result, the current policy on sustainable procurement of road infrastructure projects is often not implemented.

The current form of criteria is a direct result of the responsible makers. While procuring governmental parties and building contractors have the expert knowledge, the ministry of VROM and SenterNovem are responsible for the development of the criteria. Furthermore, the policy makers did not point out the focus within sustainable procurement. Therefore, the responsible parties were unable to assess the input of these experts about feasibility and efficiency of criteria. Consequently, the current ambition level of the criteria is low. As a result, even when the criteria are adopted by procuring governmental parties, the stimulation of sustainable development is limited.

While the use of criteria could raise awareness among employees for the importance of sustainable procurement, it currently does not. If criteria are adopted at all, employees often adopt them the latest phase before awarding a contract. Hereby, procurers and technicians do not cooperate. Furthermore, the chaotic policy process, the lack of good communication, and the low ambition of the criteria made several employees cynical about the current policy.

6.2.2 STATEMENT OF REQUIREMENTS

Based on the pitfalls, we now state the requirements to come to a practical framework that improves the support of sustainable development of road infrastructure via sustainable procurement by the government.

At top level, the framework should ensure two requirements:

1. The sustainable procurement policy of road infrastructure projects should be implemented

2. The sustainable procurement policy of road infrastructure projects should stimulate sustainable development

To ensure the sustainable procurement policy is actually implemented, the execution of the policy should be easy and controllable. To this end, the following requirements derive from the first top-requirements:

1.1 Sustainable criteria should be easily adoptable

1.2 The actual use of criteria per procurement volume should be easily measurable

To ensure the sustainable procurement policy of road infrastructure projects seriously stimulate sustainable development, the current policy should improve. To this end, the following requirements derive from the second top-requirement:

2.1 Within the concept of sustainable procurement, the focus should be clarified

2.2 Sustainable criteria should be more ambitious

2.3 Sustainability should be considered a core value

6.3 DESIGN CHOICES

To enable easy adoption of criteria, an overview of the relevant criteria per project should be given. While a document that only provide the criteria would already contribute to reach this goal, it would still provide 39 potential relevant criteria for road infrastructure projects alone. Ideally, the procurer should be able to define the relevant product groups after which an overview of the relevant criteria is given. Consequently, some sore of technical tool is necessary.

At this moment, several methods to measure the use of criteria are present. In chapter 3.3, we analyzed these methods. The ever-recurring problem is the measuring is not based on the actual use of criteria, but rather on questionnaires and best-guesses. Therefore, the real status of the procuring party is unknown, while employees do not have insight in their influence on the status. If the technical tool, meant to enable easy adoption of criteria would be expended with recording the use of criteria, the benefit is twofold. First, if the recording can be audited, the real status would be ensured. Second, employees would directly see the influence of using or ignoring the adaptation of criteria.

We elaborate on the technical tool that should provide a clear overview, on request, of the relevant criteria per project, and enable easy measuring of the actual "sustainable status" in chapter 7: Technical design.

While the technical design will answer the requirements towards implementation of the policy, the actual policy itself has to improve as well. To this end, the focus should be

clarified, and the criteria should be more ambitious. While we are able to determine the focus and provide new criteria, this will not meet the requirements. We lack the technical knowledge and, therefore, the current pitfalls will be present. Furthermore, the criteria should be supported by decision makers. Criteria brought forward by a student are not likely to be implemented by minister Cramer.

Instead of actually improving the current criteria ourselves, therefore, we investigate who should determine the focus, and who should make the criteria more ambitious. Given the pitfalls of the current system, employees with technical knowledge of both procurement and road infrastructure projects should at least be part of some sort of workgroup to improve the criteria.

We elaborate on the set up of the team/group that should determine the focus within the concept of sustainable procurement and the actual improvement of the current criteria in chapter 8: Institutional design. Here, we will also elaborate on the employees who should carry out the policy of sustainable procurement.

If sustainable development is considered a core value by all employees and contractors, the sustainable procurement policy is a great success. This, however, will be an enormous difficult situation to achieve. Clearly, some sort of process plan is necessary to reach this status. After all, you cannot oblige someone to consider sustainable development important.

We elaborate on the process plan towards the situation where employees consider sustainable development a core value in chapter 9: Process design.

The overall goal of this thesis is to design a practical framework that improves the support of sustainable development of road infrastructure via sustainable procurement by the government. This framework should incorporate all the measures described above. We elaborate on this framework in chapter 10: Integral design.

Of course, we have to evaluate whether the designs meet the requirements. To this end, we actively seek feedback from relevant experts during an iterative design process. Furthermore, we test the complete framework on answering the top-level requirements during an extensive expert meeting. We elaborate on this meeting in chapter 11: Validation and verification.

CHAPTER 7 Technical design

"Where there is the necessary technical skill to move mountains, there is no need for the faith that moves mountains" (Eric Hoffer)

In this chapter, the technical design will be elaborated. At the design choices we have identified we need some sort of technical tool to enable easy adoption and measurement of criteria. First we briefly describe the preliminary design of such a technical tool, as well as the comments of experts. Based on these comments, we give a final design of the tool. Finally, we give the position of the technical design in the complete framework. Here, we determine which requirements are met by this design.

7.1 PRELIMINARY DESIGN TECHNICAL TOOL

To be able to easily adopt, on request, the relevant criteria as well as measuring the sustainable status of projects, we brought forward a technical tool in excess. Hereby, the easy adoption is intended by providing users with a clear overview of the criteria. By requesting the relevant product groups, the corresponding criteria are highlighted. If users need explanation to a criteria, or even the complete criteria document, this can be consulted via hyperlinks.

To be able to easily measure whether or not criteria are actually used, the tool asks to mark the used criteria. If all relevant demands are taken into account, the tool will show the project is procured a hundred percent sustainably.

As a result, employees can much easier use the SenterNovem criteria, while the governmental party can keep up the status of a project.

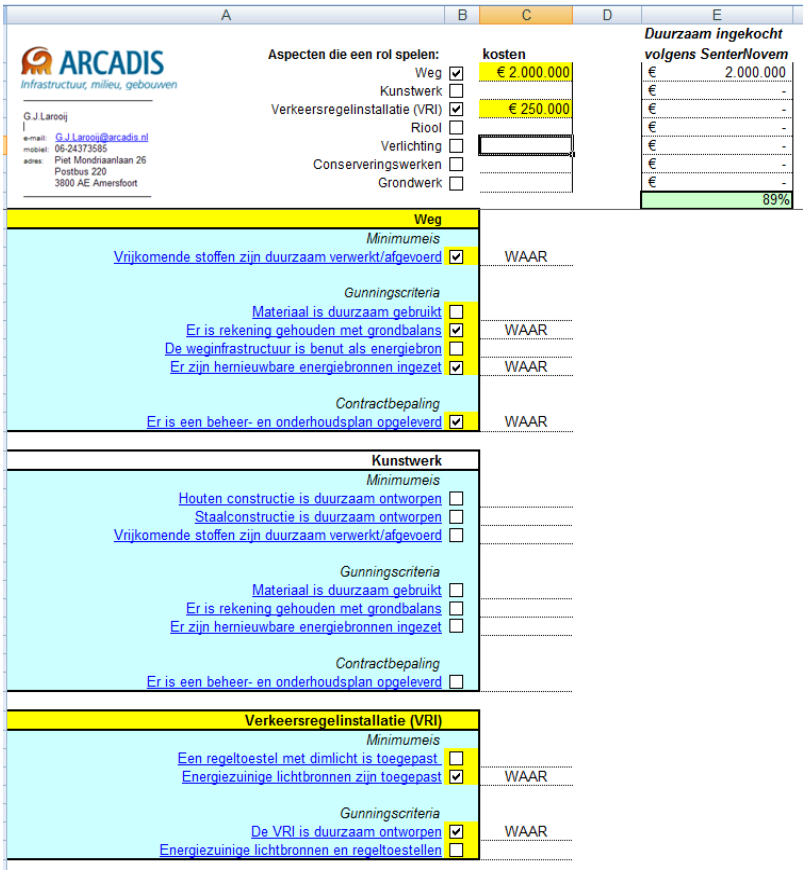
In illustration 7.9, a screenshot of the preliminary design of the technical tool is given. This tool provides governmental employees with easy access to relevant criteria as well as measuring the status. This way, the tool raises support for sustainable procurement.

During a presentation about the SenterNovem criteria, we displayed the tool to several contracting experts at ARCADIS. These experts are given in table 7.16.

Table 7.16
Contract experts ARCADIS

Expert	Expertise
Creemer, F.B.	Head advisor contract management (mobility)
Dijk van, N.J.	Head advisor design research & contracting (mobility)
Kram, J.S.	Advisor contract management
Kreetz, I.S.	Advisor contract management
Spronsen van, J.C.	Senior advisor contract management

Illustration 7.9
Screenshot preliminary technical design



During this session, the experts were very enthusiastic about the tool. They considered it both useful and helpful. Furthermore, they believe it has a serious chance to be marketable. They did see, however, three pitfalls of the current tool.

1. The tool uses terms not consistent with the jargon. For instance, the term minimum criteria cover specifications instead of requirements to the contractor.

2. The tool encapsulates all relevant criteria of road infrastructure projects. However, the list of criteria, already, is quite long. To improve the usability of the tool, all criteria should be part of the tool. However, this would result in an endless list of criteria in the excel sheet.

3. While the tool enables the measurement of a project, it does not contain a database to have a quick overview of all projects. This extra feature would add value to the tool, because it would enable a complete overview for procuring governmental parties.

While the first pitfall is problematic, the terms are directly adopted from the SenterNovem documents. Because these criteria are for general purpose, they should be adjusted at policy level. For short-term adjustments, we provided acquaintances at SenterNovem with this information. Furthermore, the complete improvement of criteria will be an important subject of institutional recommendations.

Both the second and third pitfall can be eliminated by rewriting the tool in Microsoft Access instead of Excel. Hereby, it is possible to show only the requested product group, and store the results in a database.

7.2 FINAL DESIGN TECHNICAL TOOL

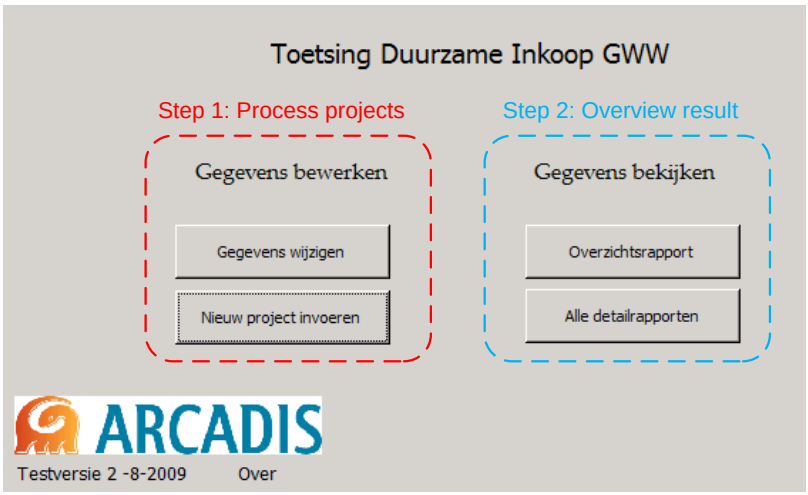
In this section, we present the final design of the technical tool. This design enables employees of governmental parties to easily adapt the SenterNovem criteria in the contract. Furthermore, it provides an overview of the "sustainable status" of both single, and all projects.

After testing the preliminary design, it became clear a database directed technical tool would significantly improve the possibilities. With the help of Joost van Spronssen, we, therefore, rewrote the tool to Microsoft Access. This improved both the ease of requesting relevant criteria as the measure possibilities of the tool.

During the verification and validation process, some extra features became clear. A software programmer at ARCADIS will make these adaptations, before launching the tool.

In illustration 7.10, the home screen of the tool is visualized. Here, we can choose to either process a project, or perceive the status of sustainable procurement per project, or organisation. We will elaborate both aspects.

Illustration 7.10
Home screen technical tool



Step 1: Process projects
When processing a (new) project, six steps have to be taken. These steps, visualized in illustration 7.11 are:

1. Provide project information
2. Select relevant product group
3. Add estimated costs
4. Control presence of relevant SenterNovem criteria in contract
5. Declare location of criteria
6. Print result

1 The user of the tool has to provide the project information. Hereby, stating the name of the project, project leader, location, and date of tender. This information is necessary to be able to provide an overview of all projects.

2 Based on the presence of elements, the relevant product groups have to be selected from a list. Currently, the product groups "road, engineering structure, traffic and travel information, sewer, illumination, preservation, earthworks, and cables and pipes" are part of the tool. After selection, automatically, the relevant criteria will attend.

3 To be able to calculate the percentage sustainable procured volume, the estimated costs per product group have to be add.

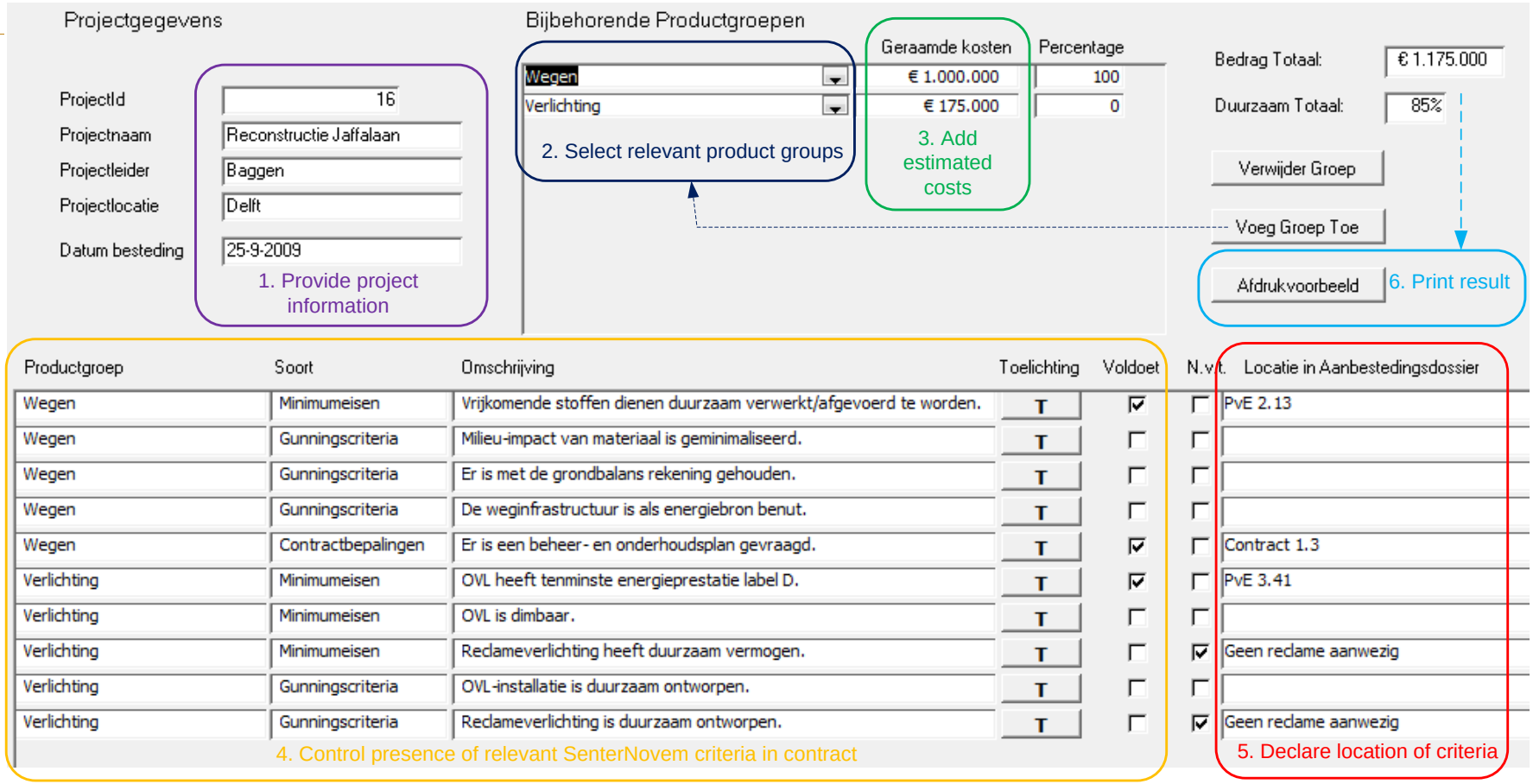
4 Based on the arisen criteria, the presence of the relevant criteria in the contract can be verified. Via "toelichting", an explanation of the complete criteria can be inspected. Furthermore, a hyperlink to the complete criteria document is given. If a criterion is adopted in the contract, it can be marked under "voldoet". If all minimum- and contract criteria are adopted, the product group will be 100 percent sustainable procured.

5 To be able to audit the correctness of the marks, the location of the criteria in the contract have to be declared. Here, also an explanation can be given why the criteria is not taken into account. This enables a complete insight in the status.

6 Finally, a complete overview of the project can be given via "afdrukvoorbeeld". This results in a summary of the project information, the relevant criteria, the costs, and the percentage "sustainable procured".

Illustration 7.11

Process projects in technical tool



Step 2: Overview result

Next to using the tool to quickly adapt the relevant criteria, the tool provides an overview of the current "sustainable procurement status" of an organisation. Hereby, the tool provides insight the sustainable score per project. The score is calculated with the following formula:

- Percentage SP[9] project = SUM (percentage SPPG[10] * costs PG[11]) / total costs

The overview is the summery as described in the last step of process projects. In illustration 7.12, a summery of a fictive project is given. The score is of this project is 85%.

Illustration 7.12
Overview result per project in technical tool

Project: Reconstructie Jaffalaan
Locatie: Delft **Bedrag: € 1.175.000**
Datum aanbesteding: 25-9-2009 **Score: 85%**

Verlichting	**€ 175.000,00**			**0 % duurzaam ingekocht**
		Voldoet	NvT	Locatie in het aanbestedingsdossier
Gunningscriteria				
Reclameverlichting is duurzaam ontworpen.		☐	☑	Geen reclame aanwezig
OVL-installatie is duurzaam ontworpen.		☐	☐	
Minimumeisen				
Reclameverlichting heeft duurzaam vermogen.		☐	☑	Geen reclame aanwezig
OVL is dimbaar.		☐	☐	
OVL heeft tenminste energieprestatie label D.		☑	☐	PvE 3.41
Wegen	**€ 1.000.000,00**			**100 % duurzaam ingekocht**
		Voldoet	NvT	Locatie in het aanbestedingsdossier
Contractbepalingen				
Er is een beheer- en onderhoudsplan gevraagd.		☑	☐	Contract 1.3
Gunningscriteria				
De weginfrastructuur is als energiebron benut.		☐	☐	
Er is met de grondbalans rekening gehouden.		☐	☐	
Milieu-impact van materiaal is geminimaliseerd.		☐	☐	
Minimumeisen				
Vrijkomende stoffen dienen duurzaam verwerkt/afgevoerd te worden.		☑	☐	PvE 2.13

Next to the summery per project, however, a database enables the complete overview of all project. Hereby, the complete score on "sustainable procurement (SP)" is given. This score is calculated with the following formula:

- Total percentage SP = SUM (percentage SP project * costs project) / total cost

In illustration 7.13, an overview of nine fictive projects is given. The total score is 59%.

Illustration 7.13
Overview all project in technical tool

Duurzaam inkopen projectenoverzicht

Project	Bedrag	Percentage	Aanbestedings-datum	Projectlocatie
N221 Baarn	€ 1.750	14%	4-4-2004	Provincie Utrecht
N207	€ 550	100%	13-8-2009	Harderwijk
Reconstructie Kleiweg	€ 1.175	85%	25-9-2009	Gouda
Reconstructie Jaffalaan	€ 1.175	85%	25-9-2009	Delft
A3 Driedam-Oostdorp	€ 15.000	67%	1-1-2010	Mamehuizen
N50	€ 600	0%	19-2-2010	Breda
A2 verbreding & duiker	€ 10.050	53%	1-7-2010	Rotterdam
Reconstructie Piet Mondri	€ 1.525	16%	10-12-2010	Amersfoort
Reconstructie N221	€ 1.250	80%	12-12-2010	Baarn
Totaal ingekocht	€ 33.075	59%		Bedragen in duizenden euro

[9] SP = Sustainable Procurement

[10] SPPG = Sustainable Procurement per Product Group

[11] PG = Product Group

7.3 POSITION TECHNICAL DESIGN

The technical design as described in this chapter helps employees of governmental parties to adapt the current SenterNovem criteria easily in the contract. Furthermore, it provides an overview of the "sustainable status" of both single, and all projects. Because the status of an organisation is much more easy to measure, the 'sense of urgency' will rise. Next to that, the possibility to audit the contracts motivates employees to provide correct information, and act accordingly to the sustainable procurement policy. The technical design, thus, meets the requirements towards implementation of the current policy on sustainable procurement of road infrastructure projects.

The criteria itself, however, are unaltered and will, therefore, not improve the stimulation of sustainable development. Nonetheless, the tool will enable good registration of the use of current criteria. Subsequently, based on this information, the criteria can be improved.

CHAPTER 8 Institutional design

"I can create institutions, but I can't rewrite the chips in people's heads" (Cal Thomas)

In this chapter, the institutional design will be elaborated. At the design choices we have identified the need of a project team to improve the current sustainable criteria. Furthermore, the roles during implementation of the sustainable procurement policy need to be clarified. Here, we clarify the arrangements between actors that regulate their relations. This is necessary, because the relevant actors for sustainable procurement of road infrastructure projects are part of a complex network in which externalities request for institutions (Koppenjan & Groenewegen, 2005).

In the following section, the design of a project team that should improve the current criteria will be elaborated. Subsequently, the formal and informal rules and arrangements at organizational level will be given to ensure implementation of the sustainable procurement policy. Finally, the position of the institutional design in the complete framework will be given. Here, we determine which requirements are met by this design.

8.1 PROJECT TEAM 1: POLICY LEVEL

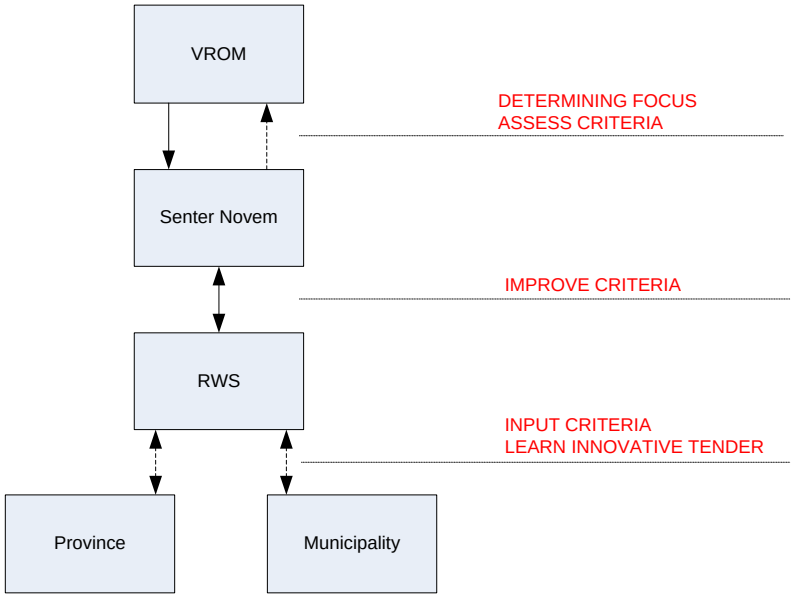
In chapter 4, we provided a formal chart of the actors (fig 4.10). The problem of this set-up is the fact the policy makers lack the technical knowledge about both procurement and road infrastructure projects. At the same time, SenterNovem is requested to prescribe profound technical criteria. SenterNovem collected the necessary information from procuring parties and building contractors. This did not only lead to high transaction costs, but also to room for strategic behavior of the informers.

Several actors conclude the criteria not to be ambitious (annex 2; annex 9). We believe this is a direct consequence of the lack of technical knowledge of the policy makers. The policy makers, namely, lack the knowledge to assess the (strategic) information of procuring parties and building contractors. Consequently, SenterNovem adjusted or removed criteria because they were 'unfeasible'. Concurrently, some terms used are not consistent with the jargon.

Already, at the technical design, we recommended improvement of the current criteria. Not only should these criteria be consistent with the jargon, but also be more ambitious. Given the lessons learned, it is important that the makers of these criteria have knowledge of both the procurement process and road infrastructure projects. While SenterNovem and VROM have gained knowledge during the past process, more experience is necessary.

We, therefore, recommend a new project team, who should further develop the criteria relevant for road infrastructure projects. This team and their responsibilities are visualized in figure 8.17.

Figure 8.17
New shape of project team at policy level



We designed a project team were the ministry VROM still has the responsibility for the complete policy of sustainable procurement. However, their role is more abstract. They should be responsible for determining the focus of the sustainable procurement of road infrastructure projects. They should dictate whether materials and energy really are the point of interest regarding sustainable road infrastructure. After determining this focus, VROM should assess the "improved criteria" on this focus.

In our project team, Rijkswaterstaat is confederate for the further development of the road infrastructure criteria. Rijkswaterstaat carries knowledge of both procurement and road infrastructure projects and has many connections with procuring experts and project managers. Furthermore, the initiative of RWS to initiate brainstorms with experts about improvements to the criteria shows the willingness of RWS. SenterNovem should facilitate the development, and control the consistency with other product groups.

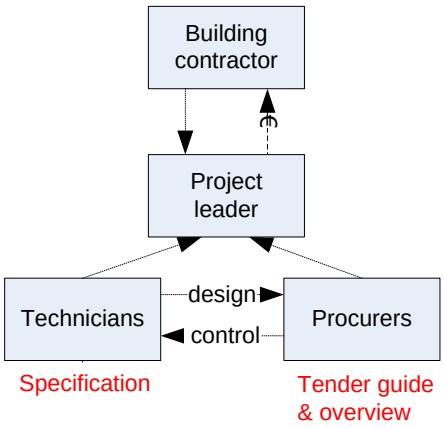
During the mentioned brainstorms, however, RWS did not invite provinces and municipalities. Nonetheless, these groups procure approximately 50 percent of the complete governmental expenditures. Therefore, delegates of both provinces and municipalities should be involved in the redevelopment. They can provide valuable input to the process, while participation will also raise support of the outcome. Furthermore, RWS can learn municipalities and provinces about innovative tendering. This is completely in line with their ambition to become the "leading sustainable executive agency" (RWS, 2008).

To raise support for the new policy, communication is vital. Therefore, the policy team should search communication and feedback from procuring governmental parties actively.

8.2 PROJECT TEAM 2: ORGANISATIONAL LEVEL

On organization level, we also define a project team. With this set-up, we try to prevent vagueness about responsibilities considering sustainable procurement, while we also try to prevent sliding away of responsibilities.

Figure 8.18
Project team at organizational level



Because the technicians are the employees that determine the actual sustainable result, we believe they should be responsible for applying the criteria. Hereby, they might either apply the criteria in a contract or use them as guidelines for the design. Procurers, however, have to control whether all criteria are taken into account and measure the progress of the percentage sustainable procured.

As a responsible manager of the project, the project leader should bring the procurers and technicians, already in an early stage of the project, together. During this phase, budget should be set apart for sustainability (annex 9.4). Furthermore, he should control whether the building contractor actually execute the project according to the criteria.

If budget is available for sustainable measures, building contractors are very willing to provide these measures. However, next to this, communication between project leader and building contractor is vital (annex 9.4).

8.3 POSITION INSTITUTIONAL DESIGN

The institutional design as described in this chapter consist of a policy and organisational project team. This project teams have a serious role in both improving and implementing the sustainable procurement policy of road infrastructure projects.

The policy project team will ensure a clarified focus within the concept of sustainable procurement, and more ambitious sustainable criteria. Hereby, two requirements to improve the current policy are met.

The organisational project team ensures the actual implementation of the sustainable procurement policy. The technical design facilitates this by making the execution of the policy easy and controllable. This project team uses this tool to implement the policy.

While the roles and responsibilities of the actors are clear now, the process is not. Therefore, the process design should clarify at what moment in time the actors should act. Otherwise, the sustainable procurement policy might be adjusted every day, and become meaningless.

CHAPTER 9 Process design

"When one has finished building one's house, one suddenly realizes that in the process one has learned something that one really needed to know in the worst way – before one began" (Friedrich Nietzsche)

In this chapter, the process design is elaborated. At the design choices we have identified the need for some sort of process plan the reach the situation where sustainable development is considered a core value. To this end, we first determine the core design challenges of such a plan, as well as measures to cope with them. Following this, we make both a policy process design, and a project process design. Then, we visualize the relationship between these processes. Finally, we elaborate the position of the process design in the framework. Here, we determine which requirements are met by this design.

9.1 CORE DESIGN CHALLENGES

The four design challenges of a process design as put forward by de Bruin, *et al* (2007), are speed, openness, protection of core values, and substance. Before making the actual process design, we describe the relevance of these design challenges here. This relevance is based on the actor, network, and process analysis. Furthermore, the process design should result in a situation where sustainability is considered a core value.

Speed

At this moment we see a clear "window of opportunity" for sustainable procurement. Despite all the pitfalls of the current policy, described above, the awareness of the policy is widespread. Both procurement parties and building contractors try to influence the process and, thus, take an interest in sustainable procurement.

Due to the somewhat chaotic policy process as well as the low ambition, the sense of urgency among critical actors is not very high. Consequently, it is not only important to improve the current set-up of sustainable procurement, but to start this process as soon as possible. Hereby, one should keep in mind that during five years; the year 2010 has been presented as "the year of truth". It is crucial; the governmental parties have intelligibility about the expectations in 2010.

Openness

The value openness is very important for this topic. Hereby we subdivide the openness of the policy making parties, procurement parties, and market.

Of course, the final decisions made by politicians must be transparent. However, the policy making parties should decide whether or not the process towards improvements should

also be open. The current process has been very open. Several actors were able to influence the process. While this did raise the support among these actors, it also reduced the ambition. This trade-off should be reconsidered for the further development of sustainable procurement.

For procurement parties, the process is not open. The score on the monitor is only perceptible for the party itself. Probably, only the front runners will agree to open up their process.

Building contractors will behave strategically during the process. They will try to influence the process in a way that enables them to make profit. Furthermore, they will not show their best (sustainable) practices for free because this might strengthen their competitors.

Protection of core values

In a way, the goal of sustainable procurement is protecting core values. These core values are summarized as the optimum between people, planet and profit (Elkington, 1998). Furthermore the overall goal of this design is to reach the situation where sustainability is considered a core value. Consequently, the idea is to harm the core values of unsustainable producers and building contractors. Even though these producers will try to influence the process, these parties will adjust if the process is carried out.

A greater risk, however, is harming the core values of building contractors that are willing to actually develop sustainable. A potential treat is asking sustainable products that are more expensive for the building contractors without giving more budgets. Another risk is prescribing how to develop while the building contractor has a more sustainable alternative.

Substance

The diversity of the concept sustainability has been very useful to gain support for sustainable procurement. However, if there is no focus on the most important themes, the policy might become useless. Therefore, the process design should enable a supported focus on the most important themes of sustainability.

Based on the SenterNovem criteria, the current focus seems to be energy and materials. However, if the critical actors agree on this, they should make this an explicit focus.

9.2 THE POLICY PROCESS DESIGN

The goal of the policy process design is to reach a sustainable procurement policy that really stimulates sustainable development. Hereby, the sub-goal is to come up with supported, measurable, ambitious, sustainable criteria that are in line with the procurement jargon. If taking into account sustainability is considered a core value, or 'as normal as taking into account quality' the process has fulfilled its task.

We establish the following phases:

1. Setting up workgroup
2. Learning from implementation
3. Implementation of new policy
4. Improve new policy
5. End the workgroup in this form

Phase 1: Setting up workgroup

At this moment, the first phase is already operative. Rijkswaterstaat initiated two brainstorms about the further development of sustainable procurement with ProRail, SenterNovem, VROM, Ministry of Defence, Bouwend Nederland, Natuur en Milieu, and ARCADIS. This initiative should be expanded to an official workgroup.

VROM, who is responsible for the complete policy process, should determine the focus of the further development. Hereby VROM can, for instance, choose to determine the current focus on materials and energy. However, because VROM lacks the technical knowledge of road infrastructure projects, they should only assess the result, not managing the workgroup.

Rijkswaterstaat, who was much technical knowledge, should be assigned as responsible organisation for the further development of sustainable procurement of road infrastructure projects. This should ensure ambitious, sustainable criteria in line with the procurement jargon. Furthermore, because RWS already took the lead in the earlier brainstorms, all parties but VROM will directly accept the position of RWS.

To convince VROM, they should be ascertained that every decision will go to them for approval. Concurrency, RWS should be obliged to invite both delegates of municipalities and provinces. These parties can provide new insights and need to have a voice in the process to ascertain support for the final result.

At the latest December 2010, the complete list of participants of the workgroup should be determined. They are obliged to participate after this date.

Dilemmas: Inviting delegates of municipalities of provinces who can keep up the process, while also being a good reflection; inviting critical interest groups who might hamper the ambition level of the result; keeping the process closed for those who want to negatively influence the process.

Phase 2: Learning from implementation

While it seems very appealing to start the further development of sustainable procurement right away, this should not result in short term changes. If already in 2010 significant changes are made to the criteria, the procuring governmental parties do not know what the expectation is. Therefore, 2010 is a transition phase.

With the use of the tool as presented in chapter 7, the status of several governmental parties can be charted easily. This information should be combined with the feedback of these parties. This experience forms the input for the further development. The new criteria should be ready before 2011.

Dilemmas: Keeping the process closed for those not involved; communication with VROM; moment of communicating renewal; Keeping the content of the workgroup confidential.

Phase 3: Implementation of new policy

After assessment of VROM, the new criteria can be adopted. At the start of 2011, the new criteria are available on a website. Furthermore, all criteria are adopted in the technical tool. If enough municipalities and provinces have learned the idea of innovative tendering, the selection, and award criteria are part of the measurement in the monitor. At the least, the number of selection and award criteria used is monitored.

Dilemmas: Design aimed at support versus design aimed at maximizing ambition; moment of communicating new criteria

Phase 4: Improve new criteria

This phase has many similarities with phase 2 and 3. The main difference is, during this phase, the new criteria are reconsidered based on feedback and status, provided by the adjusted technical tool. Again, changes to the criteria should not be made during 2011, to eliminate obscurity. At the start of 2012, the new criteria should be implemented in the technical tool, and available on a website.

Dilemmas: Design aimed at support versus design aimed at maximizing ambition; moment of communicating new criteria

Phase 5: End of workgroup in this form

The last phase covers the finalization of the workgroup. While the process of improving criteria can probably continue indefinitely, at this stage, the use and design of sustainable criteria should be 'as normal as taking into account quality'. Therefore, the workgroup, in this form, should reconsider its existence and provide recommendations about a follow up or alternative form. This form will depend on the politically environment and necessities for a continued improvement towards sustainable development.

Dilemmas: Moment of communicating end of workgroup; form of follow up; moment of communicating follow up; prevent harm of interest in sustainable procurement

9.3 THE PROJECT PROCESS DESIGN

The goal of the project process design is to reach the use of sustainable procurement as an instrument to really stimulate sustainable development. Hereby, the sub-goal is to set-up the organisation in a way that procurers and technicians use the criteria, cooperate at the start of a project, and always take into account sustainability. If taking into account sustainability is considered a core value or 'as normal as taking into account quality' the process has fulfilled its task.

We establish the following phases:

1. Setting up project team
2. Learning sustainable procurement
3. Use of criteria 2.0
4. Use of criteria 3.0
5. As normal as quality

Phase 1: Setting up project team

At this moment, all procuring governmental parties have an organisational structure of some sort. Hereby, however, the roles and responsibilities of employees regarding sustainable procurement are not always clear. Therefore, during this phase, the decision should be made to make, before 2010, technicians responsible for adopting the criteria, while procurers are responsible for the complete overview. Furthermore, the project leader should bring these parties together.

Dilemmas: Convincing technicians to use criteria without making all projects pilots; provide procurers with more responsibility without decline of relation with technicians;

Phase 2: Learning from implementation
In the year 2010, the procuring governmental parties should at least use the minimal demands as provided by SenterNovem. To this end, they can use the technical tool as presented in chapter 7. Hereby, the technicians should adopt the criteria, while the procurers control the progress. Via good communications, the technicians can learn the influence they have on the complete "sustainable status".

The lessons learned during the use of the minimal demands should be communicated to the policy project team. This will be used as input for further development. On the other hand, the policy project team will provide information about innovative tender methods. By learning this, the procuring governmental parties will be ready for 2011.

Dilemmas: Communicating ease of adopting minimal demands without losing sense of urgency; provide procurers with more responsibility without decline of relation with technicians;

Phase 3: Use of criteria 2.0
After the policy team brings forward the new criteria in 2011, the governmental team should adopt these criteria. The technicians are still able to adopt these criteria from the technical tool. However, because now the selection and award criteria are also part of the monitor, technicians and procurers have to cooperate more. The project team leader should bring these parties already at the start of the project together. Furthermore, feedback on both the improvements and pitfalls should be given to the policy team.

Dilemmas: Convincing technicians to cooperate with procurers; only use monitored criteria versus own creativity

Phase 4: Use of criteria 3.0
The new criteria brought forward in 2012, should be adopted by the governmental team. Although the technical tool is still used for quick adoption and overview, sustainability is more and more seen as a core value. Procurers and technicians cooperate in the orientation phase of projects, and determine budget and need of sustainable measures.

Building contractors demonstrate state of the art sustainable measures because they know the procuring governmental party considers this a very important aspect. Based on own experience, the procuring governmental parties apply own criteria into the technical tool in addition to the prescribed criteria.

Dilemmas: Risk of greenwashing[12] measures by procuring parties when applying own criteria; risk of greenwashing products by building contractors

Phase 5: As normal as quality
The last phase covers the ideal situation in the organisational team. The prescribed criteria are used, but this is no longer seen as exceptional. At this stage, taking into account sustainability is as normal as taking into account quality, or even price. During the early phases of a road infrastructure, procurers and technicians together determine a strategy to gain the most sustainable product. That is, the optimum trade-off between economic, environmental, and social impact.

[12] See illustration 3.5

Building contractors, on their turn, know the procuring governmental party does no longer search based on lowest price alone. Therefore, they invest money in research and development to gain the "most sustainable product". Furthermore, they inform procuring governmental parties with information about their products.

Dilemmas: Risk of losing overview of actual sustainability of products; risk of greenwashing products by building contractors

9.4 RELATION PROCESSES

While we distinguished the policy and project process, they constantly influence each other. Therefore, we provide the relation between these processes here. In figure 9.19, the interdependence between the policy and project process is given. Hereby, we conclude, the phases are simultaneous.

During the first phase (now), when both the policy and governmental team are set up, delegates of procuring governmental parties will be included in the policy team. This will be delegates of Rijkswaterstaat, provinces, and municipalities.

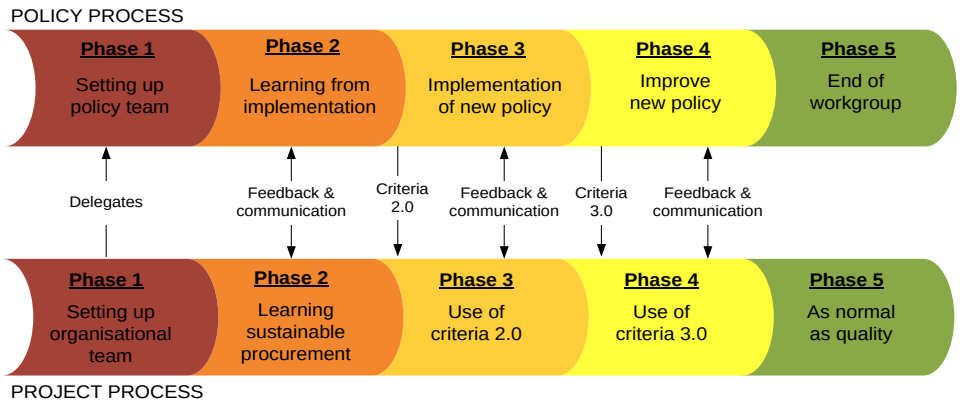
During the second phase (2010), the already existing criteria will be evaluated by the policy team, while the governmental team will use them. Both teams will use this phase especially to learn from. Hereby, the governmental team will provide feedback about the current policy to the policy team. On the other hand, the policy team will advise the procuring team, while also teach them the idea of innovative tendering.

During the third phase (2011), the policy team will provide new criteria which will be implemented by the governmental team. Again the governmental team will provide feedback to the policy team.

During the fourth phase (2012), the final criteria provided by this policy team will be put forward. The governmental team will adopt these criteria. Although there will still be feedback and communication about the criteria, the main topic, between governmental and policy team, will be the follow up of the policy team. Hereby, the governmental team can reveal their needs.

During the fifth and final phase (as of 2013), the policy team will end in its present form. On project level, taking into account is become a core value, or "as normal as quality". Therefore, the goal of both the policy and project process is fulfilled. At policy level, a follow up will be considered.

Figure 9.19
Interdependence between policy and project process



We can conclude based on figure 9.19, the success of the process design stand or fall with good communication between the policy team and project team. However, one should also keep in mind that the policy team should be able to keep strategic information confidential.

9.5 POSITION PROCESS DESIGN

The process design as described in this chapter result in a situation where sustainability has become a core value. Consequently, it answers this requirement towards improvement of the current sustainable procurement policy. As a result of the process plan, procurers and technicians cooperate already in the early phases of the project to ensure the procurement of the most sustainable product. It provides a clear policy plan for further development of sustainable procurement, starting right away, while taking into account the intelligibility of governmental parties about the expectations.

Next to that, however, the process design also enables the improvement of the current sustainable criteria via setting up the process of the policy and project teams. Hereby, the institutional design is facilitated and improved. Furthermore, the process uses the technical tool as an instrument to reach the goal of this thesis, the improvement of sustainable development of road infrastructure projects via procurement.

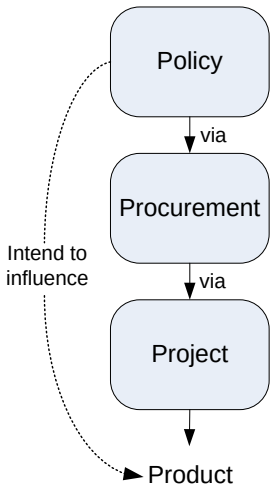
CHAPTER 10 Integral design

"The most merciful thing in the world… is the inability of the human mind to correlate all its contents" (H.P. Lovecraft)

Up until now, the distinction is made between technical, institutional, and process elements. To reach the actual design goal, however, these elements have to be integrated. In this chapter, therefore, an integral design will be put forward. This framework should answer the top requirements as defined in §6.2, the implementation and improvement of the sustainable procurement policy of road infrastructure projects. First, we will position the earlier designs, after which we provide the integral framework.

10.1 THE POSITION OF THE DESIGNS

In earlier chapters, we, already, defined the position of each design. Here, we provide an overview of the technical, institutional, and process contribution towards the actual improvement of stimulation of sustainable development of road infrastructure via sustainable procurement by the government. To this end, we use the 4P model as defined in the process analysis, and define the contribution and necessities of the designs.



Technical	Institutional	Process
Improved criteria	*Determine focus* *Improve criteria*	*Process towards improved implemented policy*
Measured criteria	*Role procurers*	*Moment of incorporating procurers*
Adapted criteria	*Role technicians*	*Moment of considering sustainability*
STIMULATION SUSTAINABLE DEVELOPMENT		

The technical tool, as presented in chapter 7, enables easy adaptation of the SenterNovem criteria. Furthermore, it enables measuring of the "sustainable status" of the project and organisation. This will contribute greatly to the stimulation of sustainable development, if the criteria are well formulated and ambitious. The tool, however, only provides easy access

to existing criteria, and, thus, depends on the institutional, and process design for the input of criteria.

The institutional design, as presented in chapter 8, consists of two project teams:
Project team 1 "policy", will improve the policy of sustainable procurement of road infrastructure projects. Hereby, Rijkswaterstaat will have a serious role because of their technical knowledge of both procurement and road infrastructure In the project team, delegates of municipalities and provinces will be involved. The more ambitious criteria will be adapted in the technical tool. The focus for this improvement and the overview of the complete policy will be guarded by the ministry VROM.

Project team 2 "organisational", executes the sustainable procurement policy. In reality, therefore, there are as many of these projects teams as procuring governmental parties. The responsibilities of all members of this team have to be clarified. The technicians will be responsible for applying the SenterNovem criteria, while procurers will control the "sustainable status" of projects. The technical tool will ease both aspects significantly. Ideally, however, procurers and technicians cooperate to apply the SenterNovem criteria and take sustainability into account.

It is vital, the two project teams communicate. While the technical tool, if used as monitor, will provide input on the current status, this does not tell the complete story. The policy team needs feedback from the organisational team to improve the policy. Moreover, the organisational team will be better prepared and willing to implement new policy if the communication is well organised.

The process design, as presented in chapter 9, consists of two processes.
Process 1 "policy", is the process towards an improved policy on sustainable procurement. This process handles the process from setting up project team 1 "policy", as described in the institutional design, to the end of this policy team. In between, the process guards the improvement of current criteria and good communication with project team 2 "project".

Process 2 "organisational", is the process from setting up an organisational team towards the situation sustainability is considered a core value and taking it into account at the start of the project is "as normal as considering quality". The technical tool is used as an instrument to start up this process by providing easy adaptation of criteria and overview of the "sustainable status".

10.2 THE INTEGRAL DESIGN

To reach the goal of this thesis, the stimulation of sustainable development of road infrastructure projects via procurement, the technical, institutional, and process design have to be integrated. After all, no single design will seriously influence the situation, while an integral design can have a major impact.

To ensure a sustainable procurement policy of road infrastructure projects that seriously stimulate sustainable development, the current policy is improved. To this end, a policy a policy project team, as described in chapter 8, has been installed. This team determines and guards the focus within the concept of sustainable procurement. Given the current criteria, a focus on materials and energy seems logical. Based on the focus, improved criteria will be brought forward, by the project team, that are in line with the jargon and more ambitious. During the improvement process, the project team gets feedback from the procuring governmental parties. In return, it provides information to these parties.

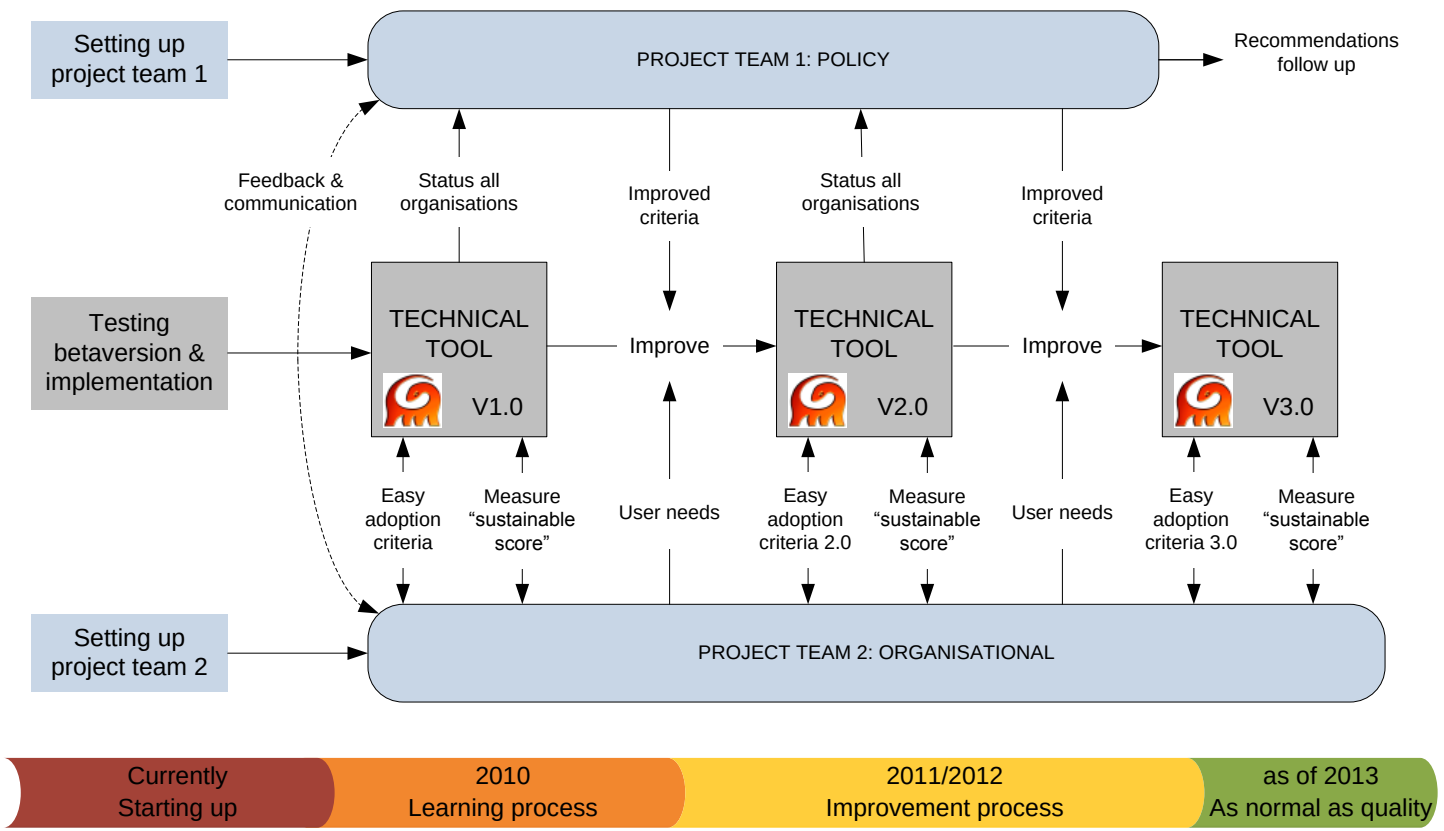
To ensure the implementation of the policy on sustainable procurement, a technical tool, as described in chapter 7, has been designed. This tool is an instrument to fill the gap between policy and procuring governmental parties. It helps the procuring governmental party to easy adopt the criteria and measure their "sustainable status. Concurrently, it provides the policy team with an overview of all organisations that use the tool.

To fulfil the improvements to the current policy, sustainability should be considered a core vale. To this end a process plan, as described in chapter 9, has been set up. This plan ensures a continuing improvement process during which all parties have to cooperate and communicate. The technical tool is an instrument to start up this process by providing easy adaptations of criteria and an overview of the sustainable status.

On the next page, we present the complete framework to improve the support of sustainable development of road infrastructure via sustainable procurement by the government (fig. 10.20) In this framework all measures described before are integrated. We clearly see the ongoing improvement process, during which all parties cooperate, facilitated by the technical tool, towards the situation where sustainable development is considered a core value, or 'as normal as quality'.

Figure 10.20

Framework to improve the current system of sustainable procurement of road infrastructure projects



CHAPTER

11 Verification & Validation

"Trust, but verify" (Ronald Reagan)

In this chapter, we describe both the verification and validation of the design. This is necessary to raise reliability of the design. While these aspects are often confused, they are not interchangeable. Verification handles the question whether we "produce the product right", while validation checks whether we "produce the right product" (Boehm, 2008).

11.1 EXPERT MEETING

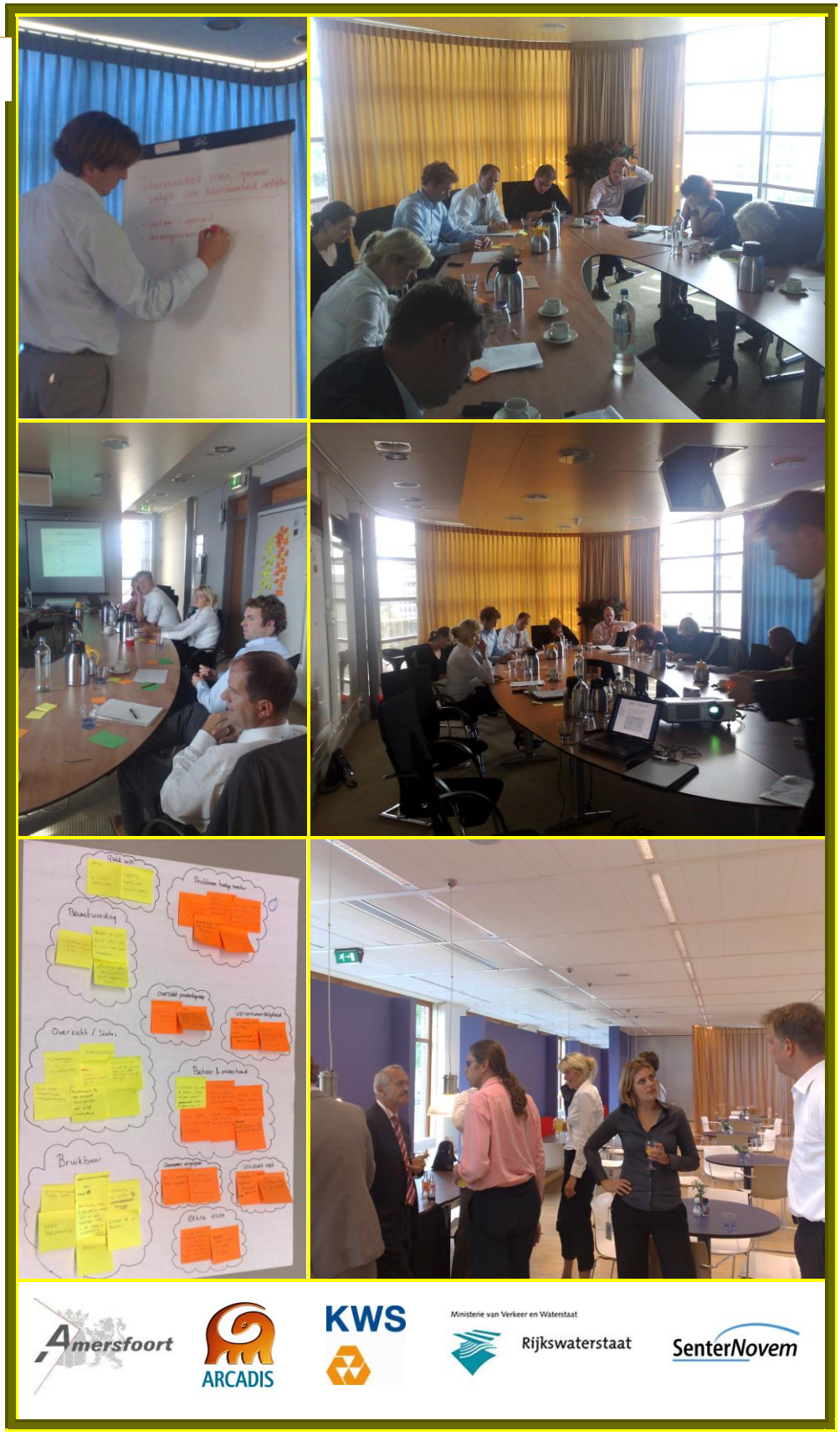
Both the verification and validation of the design took place during an expert meeting with various relevant experts. On the next page, we give an impression of this meeting. In table 11.17, we give a brief overview of the present experts. The form and output of the expert meeting is given in more depth in annex 10.

Table 11.17
Experts during meeting

Expert	Organisation	Expertise
Buining, J.D.	ARCADIS	Head advisor Rail survey (Rail)
Claassen, F.W.J.	ARCADIS	Project leader B, pioneer internal sustainability
Creemer, F.B.	ARCADIS	Head advisor contract management (mobility)
Geet van, C.	SenterNovem	Senior advisor sustainability, co-operation during criteria process, responsible for further development
Hartog den, W.	KWS	Communication manager KWS, contribution to "Nationaal Pakket Duurzaam Bouwen GWW"
Heijink, E.B.	ARCADIS	Advisor safety and sustainability
Jacobs, A.C.	ARCADIS	Trainee rail signaling, specification & system integration
Jansen, R.C.M.	ARCADIS	Advisor asset management roads
Kroese, K.F.	ARCADIS	Designer road design & installation
Kuijpers, P.	Rijkswaterstaat	Advisor staff DG/ Market and procurement, pioneer further development sustainable procurement
Raessen, M.B.A.G.	ARCADIS	Head advisor strategy & policy (mobility)
Smid-Verheul, T.	Municipality Amersfoort	Procurement coordinator municipality Amersfoort, advisor sustainable procurement
Spronsen van, J.C.	ARCADIS	Senior advisor contract management

Photo 11.1

Impression expert meeting
21-09-2009



11.2 VERIFICATION

Verification is "the process of using objective evidence to confirm that design and development outputs meet design and development input requirements" (ISO 9001, 2008)

Technical tool

The experts considered the tool very user friendly and complete. Several experts pointed out the ease of adapting and controlling the use of SenterNovem criteria. Hereby, the current method of monitoring is very distinctive and correct visualized. Nonetheless, the experts did make some suggestions, mainly to add to the completeness of the tool:

- Add the possibility "voldoet niet"
- Provide an overview per product group
- Enable users to adopt own criteria

These suggestions are very useful, and, before launching the tool, a software programmer at ARCADIS will adopt these suggestions.

Institutional arrangements

The experts did see the potential of the solution where Rijkswaterstaat takes over the responsibility for redevelopment of "sustainable procurement of road infrastructure projects". However, they also pointed out Rijkswaterstaat is an agency, and should, thus, follow and advise the policy makers.

We adjusted the initial idea to make procurers responsible for "sustainable procurement" based on the review of the experts. During a discussion, the experts broadly supported the idea that procurers should control "sustainable procurement", but they should not be responsible.

Process design

The experts agreed with the completeness, and correctness of the process recommendations. However, they did point out the complexity of making actual changes in the process.

11.3 VALIDATION

Validation is "the process of examination and provision of objective evidence to confirm that the particular requirements for a specific intended use are fulfilled" (Brazendale, 1995)

Technical tool

The experts believe the tool can add much value, especially on the short term. ARCADIS wants to use the tool as well as bringing it on the market. Furthermore, the municipality of Amersfoort is very interested in this "very usable tool".

On request, however, the experts also point out some pitfalls of the tool. Two of these stand out, because several experts brought them forward. Firstly, the tool uses the same measuring method as the current monitor, which is discrete, and might be reconsidered. Secondly, due to adaptations in the SenterNovem criteria, a lot of maintenance will be necessary to keep the tool up to date.

Joost van Spronssen, who has much experience with Microsoft Access, pointed out, both adaptations to measure method and criteria, can be carried out easily. Therefore, the main

aspect is the information from either SenterNovem or VROM about the actual status of criteria and measuring method.

Institutional

The experts believe that Rijkswaterstaat, who has much knowledge about procurement of road infrastructure projects, will be a good party to take the responsibility for redevelopment of "sustainable procurement of road infrastructure projects". A new argument, provided by the experts, is the fact the responsibility of VROM will end with this cabinet.

On the other hand, Rijkswaterstaat is currently not financed to do so, while VROM does not like the idea of loosing responsibility. Furthermore, as a result, sustainable procurement might no longer be taken into account integrant. Consequently, we adjusted the roles by making VROM overall responsible, controlling and assessing the integral project, while RWS is the pioneer for development of sustainable procurement of road infrastructure projects.

Although the experts conclude the procurers lack enough technical knowledge to be responsible for the sustainable elements of the projects, they should control the use of SenterNovem criteria. To this end, the tool is concluded particular suitable.

Process

The experts believe it is an important and good idea to consider sustainability already in the early phases of a project. However, they also concluded, all current norms, design principles, and traditions force back the design space for sustainable and innovative solutions. Therefore, courage and will power are necessary to make changes possible. Furthermore, it will take much time before taken into account sustainability during the orientation phase will be common.

CHAPTER 12 Conclusions & Recommendations

"A conclusion is the place where you got tired of thinking" (Harold Fricklestein)

In this chapter, we draw conclusions and provide recommendations based on the executed research. The research is justified by the observation that sustainable procurement of road infrastructure projects is not stimulating sustainable development to its full potential. To improve this situation, we investigated the following main research question:

How should the current system of sustainable procurement of road infrastructure be adjusted to improve the stimulation of sustainable development?

To be able to answer the research question, first we discuss the sub-questions derived from it. Based on the answers provided to the sub-questions, we are able to provide the general conclusion. Following this, we state recommendations to several actors.

12.1 CONCLUSIONS ON SUB-QUESTIONS

In order to answer the main research question, first we answer the sub-questions here.

1. What is the current system of sustainable procurement of road infrastructure projects?

The main goal of the current system of sustainable procurement is to stimulate sustainable development. To this end, the governmental organizations tend to use its collective investment of €40 billion yearly as an instrument to influence the market. The governmental parties have the following ambition towards sustainable procurement (table 12.18):

Table 12.18
Ambition in percentage per year per governmental party

	2010	2015
Central Government	100 %	100 %
Provinces	50 %	100 %
Municipalities	75 %	100 %

SenterNovem, a government agency has made operational sustainable procurement, by developing sustainable criteria documents. These documents consist of criteria that should be adopted by the procuring governmental parties. In table 12.19, all types of SenterNovem criteria are given. Hereby, the demands should exclude suppliers or products that do not reach at least a definite minimum sustainable level. The wishes should stimulate suppliers to rise above the minimum requirements.

Table 12.19
Type of criteria SenterNovem

	Demand	Wish
Qualification supplier	- Suitability demands	- Selection criteria
Qualification product	- Minimum criteria - Contract performance clause	- Sub award criteria

Currently, an awarding authority should, at least, incorporate all available demands of the relevant criteria document. The applying of these criteria determines the percentage "procured sustainably", and thus the achievement of the ambition. Although the wishes provide a great opportunity for sustainable improvements, the use of these criteria is facultative and do not influence the score on sustainable procurement.

2. Why does this system not significantly stimulate sustainable development?

We subdivide technical, institutional, and process pitfalls of the current system that explain why the current system does not significantly stimulate sustainable development. Of course, these elements correlate.

During the technical analysis, we found the following pitfalls:

- The adoption of criteria lays a heavy administrative burden on the procuring parties, because per criterion, more than 8 pages text have been written.
- While the policy makers never provide a clear focus of sustainable procurement, the relevant criteria only influence the use of energy and material.
- Because the criteria are not ambitious, the influence on actual sustainable development is limited.
- The sustainable score of a procuring party is measured based on questionnaires and best guesses of responsible procurers instead of actual use per procurement volume.

During the institutional analysis, we found the following pitfalls:

- The current system of sustainable procurement intends to be generically applicable while the used procurement and tender method differ per procuring party. The system is adjusted for back markers, while precursors are not honoured.
- Although all procuring governmental parties should procure sustainably in 2010, both procuring parties and building contractors do not feel a great sense of urgency.
- The current system of sustainable procurement leaves much space for strategic behaviour and high transaction costs both during the policy making process and during the implementation.

During the process analysis, we found the following process pitfalls:

- The current system requires the involvement of procurers during early stages of the project, while this is often not the case.
- The policy process has been very chaotic, demonstrated by the elimination of almost 30 criteria documents only 3 months after finishing.
- The current core value is costs, while this should be sustainable development.

Integrating the pitfalls of the technical, institutional, and process elements, we conclude the current system does not significantly stimulate sustainable procurement because:

a. Procuring governmental parties do not always apply the SenterNovem criteria since employees do not feel a sense of urgency, the use of criteria is seen as a great administrative burden, and the current system and monitor leave much room for strategic behaviour.

b. If a procuring party decides to apply the SenterNovem criteria, the influence on actual sustainable development is limited because the criteria are not ambitious, only focused on energy and materials, and sustainability is not considered a core value during the early phases of a project.

3. Which requirements need to be met to overcome the current pitfalls?

Based on the current pitfalls, we state requirements to improve the current system of sustainable procurement of road infrastructure projects. The design based on these requirements should help to improve the stimulation of sustainable development via procurement.

From the current pitfalls we learned the current policy is neither implemented nor ambitious. Therefore, the improvements to the system should ensure a policy that is implemented and positively influences sustainable development.

To ensure the sustainable procurement policy to be actually implemented, the execution of the policy should be easy and controllable. To this end, the following requirements are set up:

- Sustainable criteria should be easily adoptable
- The actual use of criteria should be easily measurable

To ensure that sustainable procurement of road infrastructure projects seriously stimulates sustainable development, the criteria themselves should improve, while procurers should also consider sustainability a core value. To this end, the following requirements are set up:

- Sustainable criteria should be more ambitious
- The focus on sustainable target should be clarified
- Sustainability should be considered a core value

4. How should the requirements to improve the current system be met?

We answer this question by providing a framework that includes several measures to improve the current system of sustainable procurement of road infrastructure projects. This framework is visualized below (fig12.21).

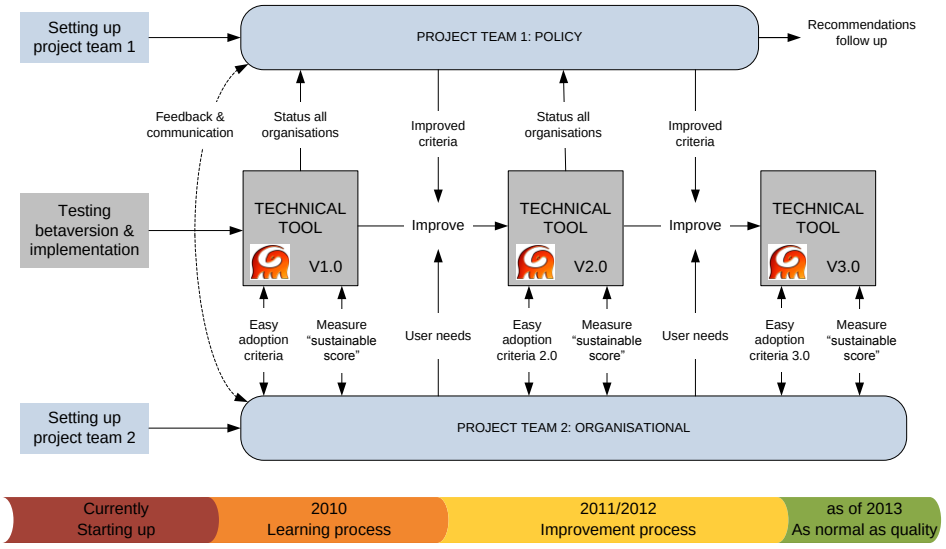


Figure 12.21
Framework to improve the current system of sustainable procurement of road infrastructure projects

The framework consists of a technical tool, a policy project team, an organisational project team and an implementation process.

The technical tool stimulates procuring governmental parties to apply prescribed sustainable criteria. To this end, the tool provides a quick overview of relevant criteria per project. Hereby, the requirement of easy adoption of the criteria is met. Furthermore, the tool enables easy measuring of the use of criteria.

A policy project team is set up to improve the current criteria. Hereby, the focus is clarified by the responsible ministry of sustainable procurement (VROM). Furthermore, policy makers with technical knowledge of both procurement and road infrastructure projects are part of the redevelopment (e.g. Rijkswaterstaat). This enables the project team to significantly improve the current ambition of the criteria.

An organisation project team should carry out the sustainable policy. Hereby, procuring governmental parties should consider sustainable development a core value. Consequently, it should be taken in account during the early phases of a project. Ideally, technicians and procurers should cooperate already in an early phase, while discussing the strategy to reach the most sustainable product.

The improvements to the current system are implemented in phases. Hereby, the project team communicates to be able to make the new policy a success. Furthermore, the information, provided by the technical tool, forms input for improvement. At all levels, sustainability is becoming more and more a core value, which is as normal as taken into account quality, or even price.

Because the framework is integrating all these elements, it meets the requirements to improve the current system. The technical tool fills the gap between policy and procuring governmental parties. It ensures that the focussed, ambitious criteria, brought forward by the policy project team, are adopted on the level of organisation. Combined with good communication, this minimises the resistance among employees and starts up the situation in which sustainability is considered a core value.

5. What is the practical usability and validity of the framework?

The practical usability and validity of the framework has been tested during an expert meeting with 8 sustainability experts of engineering consultancy ARCADIS, and experts of the Directorate-General for Public Works and Water Management (Rijkswaterstaat), of SenterNovem, of building contractor KWS, and of the municipality of Amersfoort.

While the experts differ in opinion on many aspects, in general, they shared the believe this framework is usable and valid. Especially, they were enthusiastic about the, short term, potential of the technical tool. This is seen as a tool that can make criteria made at policy level easily adaptable and measurable at organisational level. Hereby, it seriously helps to overcome the threshold fear of using the criteria.

12.2 GENERAL CONCLUSION

Now we have answered the sub-question, we can provide the general conclusion. Hereby, we answer the main research question of this thesis:

How should the current system of sustainable procurement of road infrastructure be adjusted to improve the stimulation of sustainable development?

To improve the stimulation of sustainable development via procurement, the current system should be adjusted in a way that ensures procuring governmental parties implement the sustainable procurement policy, while this policy seriously stimulates sustainable development.

- To ensure implementation of the sustainable procurement policy, the execution of the policy should be easy and controllable. To this end, the criteria should be easily adoptable and measurable.
- To ensure that sustainable procurement of road infrastructure projects seriously stimulate sustainable development, the sustainable criteria should improve by defining focus, and subsequently raise the ambition level of the criteria. Furthermore, procuring governmental parties should consider sustainability a core value.

The framework, brought forward in this master thesis (fig 12.21) will ensure both the implementation and improvement of the current sustainable procurement policy of road infrastructure projects. It encompasses an ongoing improvement process, during which both policy makers and executers, facilitated by a technical tool, cooperate towards the situation in which sustainable development is considered a core value, or 'as normal as quality'.

- The technical tool provides, on request, a quick overview of the relevant sustainable criteria. Furthermore, this tool enables the measurement of the current "sustainable status" per project or organisation
- The policy makers, among whom several have technical knowledge of both procurement and road infrastructure projects, define the focus within the concept of sustainable development, and raise the ambition level of the criteria. Information from the technical tool about the status of procuring governmental parties combined with good communication provides input for successful improvements to the policy.
- The procuring governmental parties implement the sustainable procurement policy because the technical tool facilitates easy and measurable implementation. In course of time, taking into account sustainability during procurement will become normal, which enables the implementation of a more and more ambitious policy.

12.3 RECOMMENDATIONS

Based on the research project, we provide several parties with recommendations regarding sustainable procurement of road infrastructure projects. These recommendations can be implemented by the parties right away.

- We advise procuring governmental parties to use the technical tool to enable easy adoption of sustainable criteria, and gaining insight into their status of the organisation concerning sustainability.
- We advise VROM to determine the focus within sustainable development to minimise the risk of losing overview. Furthermore, VROM should install a policy team with technical knowledge of both projects and procurement to improve the current sustainable procurement policy and sustainable criteria for road infrastructure projects.
- We advise Rijkswaterstaat to continue her process towards further development of sustainable procurement. Hereby, however, she should invite delegates of both municipalities and provinces.
- We advise ARCADIS to expand the technical tool with all SenterNovem criteria and sell it to procuring governmental parties.

CHAPTER 13 Reflection

"Experience is the name everyone gives to their mistakes" (Oscar Wilde)

In this chapter, we reflect on the executed master thesis by giving a critical judgment of the underlying research project. Hereby, we elaborate on the used methodology, the possibility of generalization, and the relevance of the outcome. Finally, we suggest directions for further research

13.1 THE USED METHODOLOGY

During the project, we applied interviews, desk research, a case study, and an expert meeting. The methods are combined to provide a wide scope of information and opinions within the research. Nonetheless, we will reflect on each method separately.

Interviews

The initial problem seemed to be infinite and immensely complex. To structure the scope of this problem, we carried out several interviews. Despite their variety, the interviewees had a forthwith, common view on sustainable procurement. Therefore, they contributed greatly to gain a quick overview of the most important elements of the problem.

The contribution of the interviewees, however, goes beyond structuring the problem. It became apparent, the network around the policy process of sustainable procurement is very small. We became part of this network after introduction of interviewees. This enabled us with direct information of, among others, policy makers. This direct contact, furthermore, enabled us to verify the usability of results as well as its validity.

Desk research

Concerning sustainable development and green public procurement, a great amount of literature is present. Furthermore, policy documents and parliamentary papers are often public. The main difficulty, therefore, was not to find information, but to use the relevant information. Because we, however, first demarcated the problem, we were able to assess the literature for relevance. Consequently, we used general information to ensure the academic level, while we used specific relevant documents to ensure usability of the outcome.

An encountered problem during the desk research was the great dynamic of the subject. While the SenterNovem criteria were not finished at the start of the research project, meanwhile, they are already significantly revised. This did bring to light the need for a good project plan, to minimize the administrative burden on governmental employees.

Case study

Initially, we intended to analyze several cases of road infrastructure project that are sustainable procured. While we put much time and effort in finding these cases, the results were disappointing. Continuously, the reaction of procuring governmental parties was they did not yet sustainable procure road infrastructure projects. Consequently, only one actual build road infrastructure project has been analyzed. This does, however, underline the resistance among employees responsible for road infrastructure projects.

In addition to the "real case", a fictional tender and LEF session have been used to enable cross case solutions. However, this is very hard, given the fact all cases are part of another abstraction space. Nonetheless, during both cases very relevant policy information have been provided. Furthermore, we met several people who actually make the policy, and influence the debates in the parliament. Consequently, we are able to make a difference with the result of the thesis.

Expert meeting

Probably, the greatest success of the thesis project was the expert meeting. During this meeting a great variety of relevant actors were present. The compliments of the persons present, and the interest in buying the product from ARCADIS, ascertain the societal relevance, as well as the usability and originality of the product.

During the meeting we were able to bring together experts of engineering consultancy ARCADIS, SenterNovem, Rijkswaterstaat, building contractor KWS, and the municipality of Amersfoort. The fact that these experts work together to improve this master thesis can be seen as a great example for the cooperation towards an improved strategy towards sustainable development. If all experts work together, serious improvement for all parties can be put into practice.

13.2 GENERALIZATION

This research project is demarcated to sustainable procurement of road infrastructure projects in the Netherlands. Hereby, relevant SenterNovem criteria are analysed and compared with practical experience. The framework put forward consist of a technical tool, a process plan and two project teams.

The technical tool contains the current criteria for road infrastructure projects, which are prescribed for all governmental procurement parties. Therefore, the tool is general applicable for all road infrastructure projects. In addition to this, ARCADIS will add the remaining SenterNovem criteria to the tool to make it applicable for all procurement.

Although the process plan is amplified on the current Dutch situation, we did find many similar obstacles to the implementation of a new policy plan in literature. Nonetheless, internationally other strategies and methods ensure sustainable development through procurement might be present. In a review of several European countries, however, PwC, Significant, and Ecofys (2009) conclude the Netherlands to be one of the pioneers of sustainable procurement. At least, the structured overview, should enable an easy comparison with international situations.

The policy project team as brought forward is very specific for this situation. The reason to set up this team, however, can be generalized. If the outcome of a policy plan influences technicians in their daily work, technical knowledge should be available in the project team.

Otherwise, the process of gaining technical information will lead to high transaction costs, and give room for strategic behavior of the informers.

The organization project team is relevant in all Dutch procuring governmental parties. Moreover, the current set up is simplified to be general applicable. However, the actual project team in organizations will be more complex. Therefore, the project team should be specified for the actual situation.

13.3 RELEVANCE

Given the great attention for this master thesis, the relevance is undisputable. Several employees of governmental procuring parties have requested an invitation for the presentation of this thesis. Furthermore, ARCADIS is already in negotiation with both a municipality and a province about the costs of the tool. Consequently, we know the result is both useful and relevant for procuring coordinators.

During the execution of this thesis, we met several people who actually make the policy, and influence the debates in the parliament. This enabled us to adjust the framework in a way to make it practical usable. Especially, given the clear searching of policy makers to get some grip on the current process, they are very interested in the clear overview provided by the framework. We do not, naively, think the policy makers will integral implement the framework. Nonetheless, we hope and believe the result will be an eye-opener and, positively, influence the further development of the sustainable procurement policy.

13.4 FURTHER RESEARCH

One of the great benefits of the provided framework is the possibility for further research. The technical tool enables future researchers a quick overview of the situation and projects as carried out by procuring governmental parties. Therefore, the struggle to identify and obtain cases is taken away. Consequently, the intended research of this master thesis can be carried out more easily and with more information. Based on the new information, both the framework itself can be improved, and alternative measures analysed.

During the research we simplified the organizational structure of procuring governmental parties. Investing this structure into more detail will greatly contribute to the proposed framework. Especially, the defined project team at organizational level will improve based on such a study.

We started this research by taking for granted the SenterNovem criteria. However, there might be other strategies to stimulate sustainable development. For instance the stimulation via pilots or improvement on the research design, immediately come to mind. While this does not make sustainable procurement unnecessary, it might seriously contribute to sustainable development as a whole.

Finally, during the research we only analyzed sustainable procurement of road infrastructure projects. While, this has a great contribution to sustainable development, this does not contain the complete public procurement. With the provided framework as example, other significant procurement should be invested.

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ANNEX 1 Scientific article

Sustainable procurement of road infrastructure projects: towards a framework to stimulate sustainable development.

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Abstract:
The Dutch government, where public procurement amounted to 20.3 percent of its Gross Domestic Product, has declared the ambition to use its market power to stimulate sustainable development. The strategy set up to reach this goal, however, lacks support of governmental employees and does not significantly influence the market. A desk research and case study are combined to gain overview of the necessities to improve this strategy as well as measures to do so. We are proposing a framework that supports sustainable development of road infrastructure via sustainable procurement by the government. This framework should be applied by the Dutch government and used as an example for other products.

Keywords: Road infrastructure projects; sustainable development; sustainable procurement; green public procurement

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Biographical notes: G. Joost Larooij BSc is a student System Engineering, Policy Analysis & Management (SEPAM) at Delft University of Technology. This scientifically paper is part of the course SPM 9510: SEPAM Master Thesis.

* Fictional publication

1 Introduction

"Sustainable" seems to become the key catchall term of the 21st century. Indicative, the term gets over 60 million hits at Google. While the great attention for sustainability is new, the idea is not. Already, in 1972, the global think tank

"Club of Rome" has called attention for the fact the world is not inexhaustible (Meadows, *et al*, 1972). Subsequently, sustainable development has been an important topic for European, and international strategies, programmes, and commissions (e.g. UN, 2002; EC, 2002; EC, 2001; WCED, 1987).
Several authors have reviewed the evolvement of sustainable development (EC 2004; Bossel; 1999; Mebratu, 1998; Lélé, 1991). We endorse the modern believe, founded by Elkington (1998), and elaborated by IUCN (2006) that a product has been developed in a sustainable way, if an optimum between social, environmental and economic aspects, both now, and in the future is reached.
In recent years, governments tend to use their procurement powers as an environmental and social protection tool (Bolton, 2008). The Netherlands, where public procurement amounted for 20.3 percent of its Gross Domestic Product, declared the ambition to use its market power to stimulate sustainable development (CIA, 2008) (DBO, 2004). Road infrastructure projects are, with a yearly investment of 4.5 to 8 billion euro, one of the designated spearheads of sustainable procurement (SenterNovem, 2009; Cramer, 2009).
While the ambition is noble, a monitor carried out in 2008 shows a serious gap between ambition and reality (PwC, 2009). Especially, at local governmental parties, and among the rather conservative employees responsible for road infrastructure projects, the support for this strategy is missing. Furthermore, we believe the method used will not significantly influence sustainable development. Therefore, research is necessary on how to raise support and ambition to really influence sustainable development via procurement. We state our objective as follows: *The design of a framework that is supporting sustainable development of road infrastructure via sustainable procurement by the government.*
To bring about this framework, we are using interviews to clarify the current problems. A desk research and case study are combined to gain overview of the necessities of the framework and best practices with both practical and scientific value. An expert meeting ensures general applicability and practical usability of the framework.
As a first step towards the framework, we analyze the current Dutch sustainable procurement strategy. Following this, we identify the pitfalls of this strategy in line with the initial ambition. Subsequently, we elaborate the possibilities to overcome these pitfalls. These measures are combined in a framework, which forms the main result. Finally, we discuss the results.

2 Current Dutch sustainable procurement strategy

After encouragement of an European communication on Integrated Product Policy, the Netherlands decided to set up a strategy to ensure sustainable development through (green) public procurement by the end of 2006 (EC, 2003).
After a rather chaotic decision process, the central government stated the ambition to a 100 percent sustainably procurement in 2010, while municipalities, and provinces strive for 50, and 75 percent respectively. Furthermore, all parties agreed to sustainable procure 100 percent in 2015. (Koopmans & de Krom, 2005; VNG, 2007; IPO, 2007).
The main goal of sustainable procurement is stimulating the market to sustainable develop. Hereby, the governmental organization uses their collective investment of €40 billion yearly, as persuasiveness (SenterNovem, 2009; VROM, 2008).

While the strategy to sustainable procurement seems straightforward, the reality is more complex. To explain this situation, we use a model we call "the 4P model" (fig. 22)

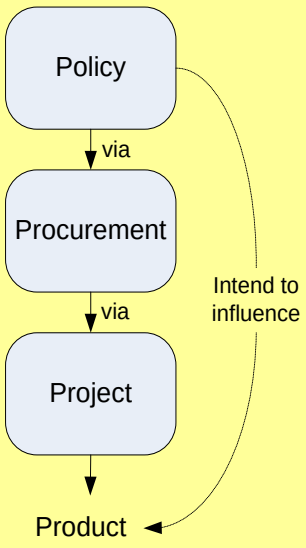

Figure 22: 4P model

The policy to sustainable procures aims at preservation of the (road-infrastructure) market and, thus, intends to influence the final product. This product should be developed sustainably.

Because decision makers do not make, buy, or design these products, the responsibility is cast on the procuring parties like Rijkswaterstaat, provinces, and municipalities.

The responsible procurers, however, only facilitate the projects towards new road infrastructure. Technicians and building contractors carry out the actual design and execution of the product.

we see the ambition of the policy can not be reached if either the procurement process is not influenced by the policy, or the project is not influenced by the procurement.

To give shape to sustainable procurement, SenterNovem, an agency of the Dutch Ministry of Economic Affairs set up sustainable criteria for over 40 product groups. To procure sustainably, the governmental parties should adopt these criteria in contracts with suppliers. The criteria consist of demands and wishes on both suppliers and products (table 20).

Table 20: Type of SenterNovem criteria

	Demand	*Wish*
Qualification supplier	➢ Suitability demand	➢ Selection criterion
Qualification product	➢ Minimum criterion ➢ Contract performance clause	➢ Sub-award criterion

The supplier demands should exclude suppliers, who do not act according, at least a certain, minimum level of sustainability. The product demands exclude proposed products that do not reach a given, minimum level of sustainability.
The selection criteria should stimulate suppliers to exceed a minimum level of sustainability. Hereby, good scoring on these criteria will enlarge the change of being pre-selected. The sub-award criteria should stimulate sustainable innovation. Sustainable improvements enlarge the chance of receiving the contract. Hereby, sustainable innovation is rewarded.
At this moment, the use of the demands determines the "sustainable score", while the wishes are facultative. A monitor carried out in 2008, based on the demands of 14 criteria documents, however, shows a serious gap between ambition and reality (fig 23) (PwC, 2008).

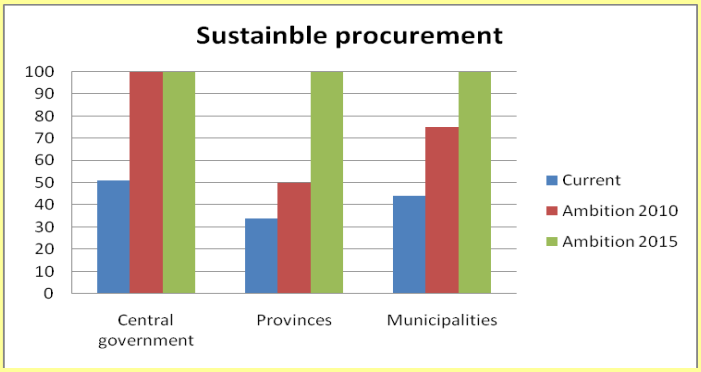

Figure 23: Gap results and ambition sustainable procurement

3 Pitfalls of current strategy

The gap between the results and ambition as visualized in figure 2, shows the strategy does not reach its desired effect. One of the reasons for this is the resistance among employees to apply the criteria. Three extra pitfalls of the current strategy, however, are the low ambition of the current criteria, the minimal cooperation between procurers and technicians, and the imperfection of the monitor.

Resistance among employees

"Especially, under the conservative employees of the road infrastructure sector, we see resistance towards sustainable procurement" (Reinhoudt, 2009). This statement, broadly supported by several interviewees, can be explained by the administrative burden.

The criteria documents, as described before, are covering many pages with explanation. The documents, relevant for road infrastructure projects, cover more than 8 pages per monitored criterion. This is especially a problem when a project covers more than one criteria document, which is common for road infrastructure projects.

If, however, these employees are not willing to carry out the policy, the strategy is bound to fail. Especially, given the great share of the total procurement, the support of these employees is indispensible.

Low ambition of criteria

"The ambition of the criteria is low and will not significantly change the market" (Smid-Verheul, 2009). This statement, broadly supported by several interviewees, is underlined by the case study.

We compared the criteria with a road infrastructure project, carried out in 2004 by the province of Utrecht. Conspicuously, almost all relevant criteria were taken into account already during this project. Therefore, we can underline the statement that the criteria are not very ambitious.

The consequence of the low ambition is the influence on the actual goal, the stimulation of sustainable development is minimal. Furthermore, both governmental procuring parties and building contractors lack a sense of urgency. Based on a market consultation, Beco (2008) concluded, "the building contractors

do not feel a great sense of urgency to improve the sustainability of their development. The current criteria are neither threatening nor stimulating for the contractors"
The low ambition of the criteria is a direct consequence of the lack of technical knowledge about both procurement and road infrastructure projects of policy makers. Without this knowledge, SenterNovem is requested to prescribe profound technical criteria. Consequently, SenterNovem collected the necessary information from procuring parties and building contractors. This did not only lead to high transaction costs, but also to giving room for strategic behavior of the informers.

Minimal cooperation procurers and technicians

Several authors are emphasizing, the ideal time to take into account sustainable considerations, is during the early stages of the procurement process (Bolton, 2008; VROM, 2008; EC, 2004). We are supporting this because, during this phase, the potential influence on the final product is high.
In the 4P model (fig 1), we visualised the importance of cooperation between procurers and technicians. Currently, however, technicians are often involving the procurers only in the latest phase of the project. The current strategy facilitates this behaviour because the criteria can be adopted into the contract at the latest phase. Given the influence of the early phase on the final product, we conclude that the cooperation between procurers and technicians is not optimal at all.

Distorted monitoring

There is much criticism towards the method of measuring the "sustainable score" or procuring governmental parties. The monitor only takes into account the sustainable demands, which does not stimulate procurers to use sustainable selection or award criterion (Kuipers, 2009). Furthermore, the monitor is binary; unless all demands are incorporated, the product is considered not sustainable procured. Reinhoudt (2009) points out, there is no control, whatsoever, on the replies of governmental parties on the questionnaire.
In addition to the described monitoring problems, the digital questionnaire requests estimates of the used criteria per product groups. Therefore, the actual score per product group might not be accurate. Furthermore, especially road infrastructure projects are covering several product groups.

The first problem could explain the gap between the current governmental results and ambition. The second problem, however, increases the complications. It implies governmental procurement considered 100% sustainable according to the monitor, does not add to the actual goal: "to stimulate sustainable development". Furthermore, the strategy facilitates a lack of early cooperation between procurers and technicians, though such cooperation would significantly improve the influence on sustainable development. The final problem adds to this, because the actual status of governmental parties is unclear, and therefore, an assessment of the influence on sustainable development is impossible.

4 Possibilities to improve the strategy

To improve the strategy, we present a framework that supports sustainable development of road infrastructure projects via sustainable procurement by the government. We propose a quick overview of relevant criteria, improved cooperation in procuring parties, improved ambition of criteria, and an improved monitor method. We are integrating all these measures into a framework.

Quick overview of relevant criteria

Employees should be provided with a quick overview of relevant criteria per project to reduce the resistance towards sustainable procurement. Hereby, additional information will be available on request. This method will ensure the adoption of the prescribed criteria. A technical tool will provide this overview.

Improved cooperation in procuring party

At the level of organisation, the cooperation between procurers and technicians should improve to reach real sustainable procurement. Already during the orientation phase of both procurement and project, the cooperation should start. Hereby, sustainable development should be seen as a core value. On the long run, taking into account sustainable development should be as normal as taking into account quality, or even price.

Before this is the case, however, first the prescribed criteria should be used and learned from. Hereby, the technical tool should ease this use. Furthermore, the ambition of criteria should improve to raise a sense of urgency among governmental employees to cooperate. Also, the procuring party needs to gain insight in its current sustainable status.

Improved ambition of criteria

Though the quick overview of criteria will ensure the use of criteria, this is not enough, given the current ambition level. To gain real influence on sustainable development of road infrastructure projects, the criteria and policy itself have to improve. Therefore, the criteria should be improved by a team with technical information of both road infrastructure projects and procurement. First, however, the policy makers should set a focus within sustainable development.

The project team should use the current criteria as starting point, while it should learn from the use of these criteria. To that end, feedback from procuring parties should be searched actively. Furthermore, the policy makers need an overview of the status of the procuring governmental parties.

Measuring

To be able to assess the influence of sustainable procurement on the behaviour of the market, we need to have a good overview of the "sustainable status" of both projects and governmental organisations. Hereby, a technical tool that is providing insight in the sustainable score per project should be set up. This score is calculated with the following formula:

*Percentage SP[13] project = SUM (percentage SPPG[14] * costs PG[15]) / total costs*

[13] SP = Sustainable Procurement

[14] SPPG = Sustainable Procurement per Product Group

Because the tool assesses the sustainable score based on the actual costs of a project, the problem of estimations is covered. Therefore, auditing the results is possible, thus minimising space for strategic behaviour. On the short term, the tool will be using the method of assessment of the current monitor. Concurrently, with the improvement of criteria, however, the policy makers should improve this monitoring method as well.
Next to the summary per project, the technical tool consists of a database enabling the complete overview of all project. Hereby, the complete score on "sustainable procurement (SP)" is given. This score is calculated with the following formula:

*Total percentage SP = SUM (percentage SP project * costs project) / total cost*

The improvements made to the monitor method are directly implemented in the technical tool. The policy makers might even decide to use the technical tool as new monitor tool.

To really influence the actual sustainable development of road infrastructure project via procurement, we provide a framework that integrates all presented measures to improve the current strategy. We present this framework in figure 3.

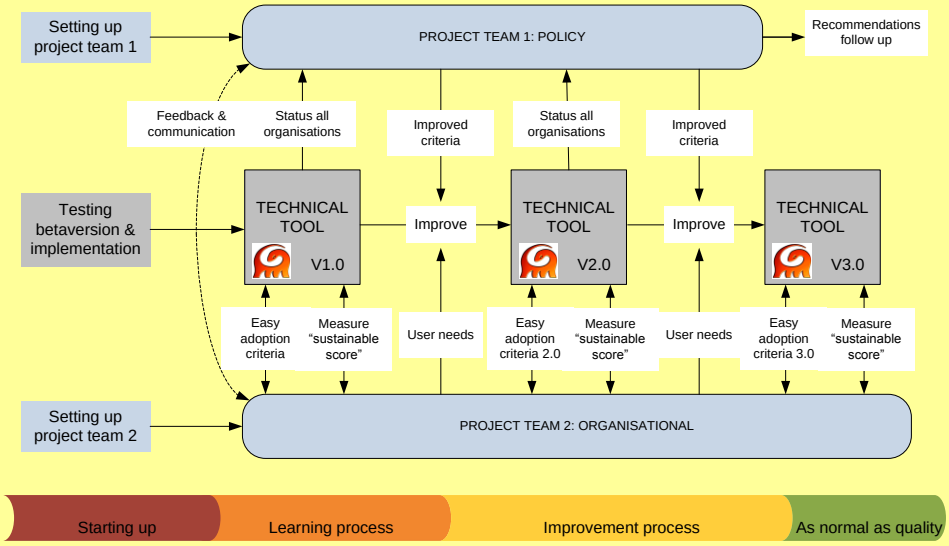

Figure 24: sustainable procurement framework

In figure 24, we present the framework that incorporates all improvements. The technical tool is an instrument to fill the gap between policy and procuring governmental parties. It helps the procuring governmental party to adopt the criteria easily and measure their "sustainable status". Concurrently, it provides the policy team with an overview of all organisations that use the tool.
To reach real influence on sustainable development of road infrastructure projects, however, project team 1 improves the criteria. This team gets feedback from the procuring governmental parties. In return, it provides information to these parties.

[15] PG = Product Group

On organisation level of procuring governmental parties, sustainability should be considered a core value. The technical tool is an instrument to start up this process by providing easy adaptations of criteria and an overview of the status of organisation with relation to sustainability.

5 Conclusions and further research

The objective of this paper has been to bring forward a framework that supports sustainable development of road infrastructure via sustainable procurement by the government. To this end, we have analysed the necessities to improve the current sustainable procurement strategy as well as measures to do so. We integrated the measures into a framework that fulfils the research objective (fig. 3).
The framework should be applied by the Dutch government to improve the current strategy of sustainable procurement of road infrastructure projects. It raises support for sustainable policy, enables an overview of the organisational status with relation to sustainability, improves the sustainable criteria, and stimulates cooperation of procurers and technicians during the early phases of projects.
The reader should keep in mind we have only investigated sustainable procurement of road infrastructure projects. Concurrently, governmental parties need to procure all products sustainably. Nonetheless, the use of the framework will form an example for other products.
To make the framework usable for the Dutch situation, specific information from the Dutch policy is used. Internationally, however, other methods and strategies might be applied. Therefore, before implementing this framework, the national policy should be analysed. The result, however, enables an easy comparison with international situations.
In a further research, the organisational situation should be investigated into more detail. We have been simplifying this situation by considering only procurers and technicians. Several other employees might, however, believe, rightly or wrongly, they should have a role during sustainable procurement.

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ANNEX 2 Interviews

At the start of the graduation process, the research description was very broad. Therefore, a typical "Technology, Policy, and Management" approach is taken. That is, determining the actual problem by interviewing several key players.

To ensure a representative survey, players at all levels of the governance are approached. Furthermore, a consultancy firm who advised several governmental parties concerning the issue is interviewed. Only at provincial level, relevant actors did not want to cooperate. However, this is compensated by an interview at the capital (stadsregio) of Amsterdam

The following interviews are carried out:

Table 14.21
Interviewees problem exploration

Interviewee	Profession
T. Smid-Verheul	Procurement coordinator at the municipality of Amersfoort
A. Veltman	Major of Someren and national ambassador of sustainable procurement
P. Kuijpers	Advisor at Rijkswaterstaat Staff DG / Market & Procurement
J. Reinhoudt	Advisor at BECO (international sustainability consultancy firm)
A. Colthoff	Head of market-group infrastructure at capitol (stadsregio) Amsterdam

The interviews were semi structured. This means, questions were carefully chosen beforehand. Nonetheless, follow up questions could be based on the given answers. The main goal of the interviews was twofold:

1. To determine the (perceived) problem of the current method to sustainable procure.

2. To enable demarcation based on added value.

During all interviews, the focus was on these aspects. Hereby, first some general questions about sustainable procurement and its implications are asked. Second, the influences of the current method in the specific organization are discussed. Finally, the most important needs of the organization regarding sustainable procurement are reviewed.

Here, we will focus on the conclusions were the interviewees connect. These are the broadly perceived problems, and assumed added value. The complete interview records can be found in the "interview report".

PROBLEM EXPLORATION

While they brought forward different arguments, all interviewees considered sustainable procurement in the current form not reaching its full potential. Four specific problems, why this is the case, were broadly supported among the interviewees.

- Lack of knowledge among employees (3x)
- Resistance among employees (3x)
- Low ambition of criteria (4x)
- Biased monitoring (3x)

Lack of knowledge

While the introduction of the SN method did raise the consciousness towards sustainability, employees at governmental parties, in great part, lack knowledge about the use of the SN criteria. Especially at municipalities with decentralized procurement, this problem occurs. A quick scan, carried out by VNG, underlines this, by showing the most important bottleneck at municipal level is the lack of knowledge of sustainable products and services (76%) (VNG, 2008).

Resistance

An often-heard argument against sustainable procurement is the idea it brings extra (acquire) costs. Furthermore, employees argue they lack time to analyse products for sustainability. Also, some employees believe sustainability to be a "policy hype", which interferes with other policy attention points like quality, safety, and economics. Conspicuously, several interviewees pointed out, the main resistance can be found in the GWW sector. More specific, the market group road infrastructure.

Low ambition of criteria

While the Dutch government aims to stimulate sustainable development by the market, the current SenterNovem criteria are not ambitious. Therefore, the criteria will probably not reach its initial goal. A quick scan, carried out by BECO, underlines this; by showing, various suppliers conclude the criteria to lack both ambition and incentives to innovate (BECO, 2008). Rijkswaterstaat even conclude, "The criteria might hinder sustainable innovation"

For instance, a minimum requirement (nr. 1) as stated in the concept criteria of road network is "The concrete surface consists of at least PM percentage concrete granulation". (SN, 2009) This restricts the solution space to a concrete road. Besides, it is not certain, whether the use of granulated materials is, actually, more sustainable when the complete process is taken into account (recycle energy, transport).

Measuring and Monitoring

The method of measuring SP is based solely on the stated minimum requirements (PvE, geschiktheidseisen) and absolute. Only then, when all these requirements are fulfilled, a project is to be concluded sustainable procured (100%). Consequently, when three important requirements are fulfilled, and a, relatively, less relevant requirement is not, a project is concluded not sustainable procured at all (0%). This is the case, even, when extra sustainable award criteria are set up during the tender phase.

The current monitor system uses the following formula: Sustainable procured projects (100%) * procure volume project / total procure volume. In 2008, only the 14 finished product groups were taken into account. Therefore, it will not be possible to, actually, monitor the progress. Furthermore, the monitor system bases its information completely on the answers governmental parties provide to a digital survey. The methods lacks, every sort of control, enabling parties to manipulate the monitor.

The greatest pitfall of the monitor, however, is the focus on use instead of results. For instance, the minimum requirement can be "set up an implementation plan". A project is, then, concluded 100% SP if this requirement is met and 0% SP if this requirement is not met. However, no information is provided on how the plan should be set up. Furthermore, the actual carrying out is not controlled. This way, a project not carried out following a set up

plan, which was insufficient in the first place, is considered sustainable procured. In addition, when a governmental party did not state the requirement to set up an implementation plan, but used reward criteria to influence the market to carry out the project sustainable, a project is concluded not sustainable procured. This is the case even, when this process results in a new, low cost, social, and ecological friendly project.

POTENTIAL ADDED VALUE

Interviewees concluded the potential for added value to be the biggest in road infrastructure projects. Three out of the five interviewees states this, while the other two agreed after inquiring.

The resistance against sustainable procurement is, often, concluded to be the highest among the rather conservative employees responsible for procurement of road infrastructure. Raising support in this market group can, therefore, be considered the biggest organisational challenge.

During the construction of road infrastructure projects, a great amount of materials (roads) and energy (engineering structures) is used. Improving these projects will have an enormous impact on sustainability as a whole. Consequently, a great potential for sustainable innovation is present.

Road infrastructure projects tend to high investments and thus procurement of governmental parties. For municipalities, these projects even cover an average of 25 to 50 percent of total expenditures (BECO, 2008). Accordingly, measuring these projects covers a great part of the monitor.

3 Lecture on tender process

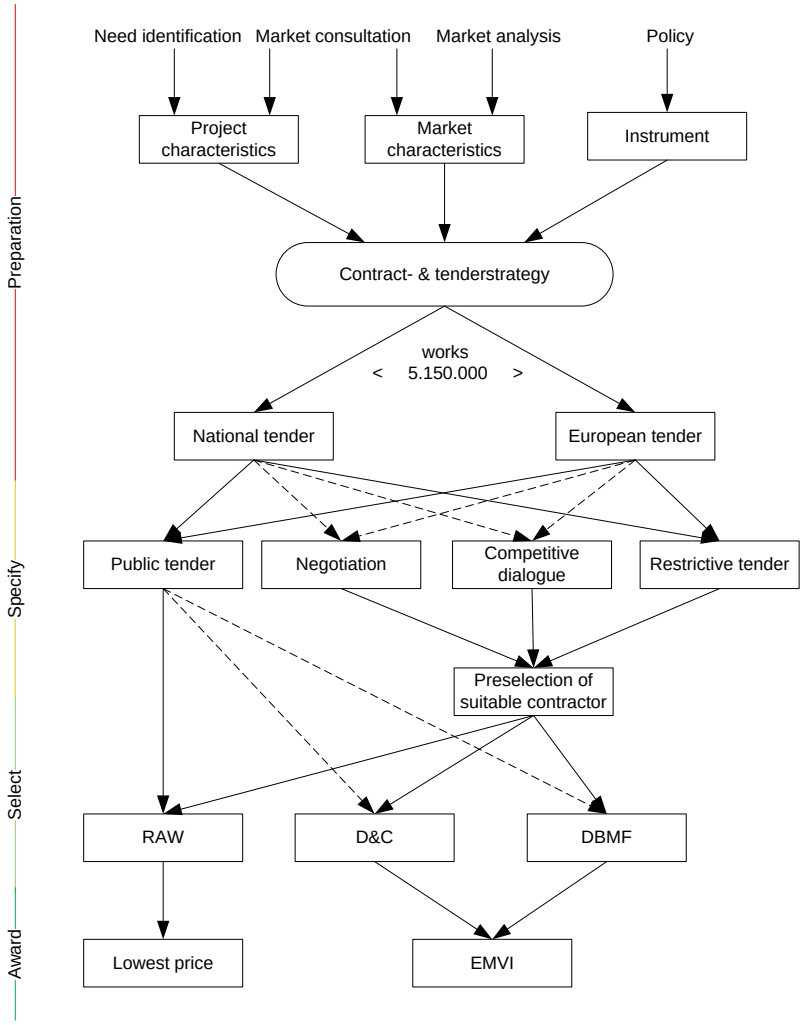
Based on attended lecture of Frits Creemer (2009), we visualised the tender process, from preparation to award, of a road infrastructure project in figure 13.25. For this thesis, a complete explanation of all details is not relevant. Therefore, we only explain the basis.

Traditionally, a procuring party prescribes the complete design, after which all building contractors can offer their price to execute this project. The party with the lowest price receives the contract (Public tender – RAW – Lowest Price).

Because the market, however, often has more expertise than the procuring parties, currently several innovative tender methods are available. Hereby, the building contractor is responsible for a part or the complete design. Because the assessment of proposals, hereby, often takes much time per proposal, parties are preselected. The design is often rewarded based on the award criterion "best value for money" (EMVI). Of course, several intermediate forms are possible.

In figure 13.25 ..., we see, immediately, the enormous impact of the preparation phase on the complete tender. Here, the need and the market and set up a contract and tender strategy. The type of contract used, and method of awarding depends on this strategy.

Figure 13.25
Visualization lecture on tender process



ANNEX

4 Criteria SenterNovem

To make sustainable procurement operational, the Dutch government chooses to apply social and environmental criteria before awarding a contract (MFA, 2007). SenterNovem, a government agency, has developed environmental criteria for 83 product groups. These product groups are part of twelve main groups. Civic engineering is the most relevant main group for this master thesis.

In April 2009, all product groups are ratified by the DBO[16]. However, all documents together exceed 2000. Therefore, we will sum up the relevant criteria (without explanation) here.

We state the criteria (minimum, award, and provisions) for the following, relevant, product groups (SenterNovem, 2009):

- Wegennet (Road)
- Kunstwerk (Engineering structure)
- VerkeersRegelInstallatie (Traffic and Travel Information)
- Riool (Sewer)
- Verlichting (Illumination)
- Conserveringswerken (Preservation)
- Grondwerk (Earthworks)
- Kabels en Leidingen (Cables and Pipes)

[16] Duurzame Bedrijfsvoering Overheid (Sustainable Management Governance)

2.1 Wegennet

Minimumeis nr. 1	(Bij uitvoering) **Verwerken/afvoeren van vrijkomende stoffen** 1. Indien steenachtige stoffen worden gebroken dan moet het breken conform de BRL 2506 plaatsvinden. 2. Teerhoudend asfalt(granulaat) moet worden afgevoerd naar en op basis van de Wet Milieubeheer vergunde be- en verwerkingsinrichting in Nederland voor de thermische reiniging van het teerhoudend materiaal. 3. (In het geval van een tijdelijke inrichting, dat niet onder de Wet Milieubeheer en het activiteitenbesluit valt) Op de locatie van uitvoering moeten voorzieningen zijn getroffen om verschillende soorten afvalstoffen ten gevolge van de werkzaamheden gescheiden op te slaan dan wel gescheiden af te voeren. Ook voor het gescheiden opslaan van vrijkomende secundaire grondstoffen moeten op de locatie van uitvoering voorzieningen worden getroffen. Bewijsmiddel: 1. Verklaring van de inschrijver dat hij aan deze minimumeis voldoet. Nader bewijsmiddel ten aanzien van aspect onder punt 1 genoemd: 2. Een beschrijving van de wijze waarop de inschrijver aan deze eis voldoet. Indien de inschrijver of onderaannemer beschikt over een KOMO productcertificaat 'BRL 2506 beton en/of menggranulaat' op naam van de inschrijver of onderaannemer, wordt voldaan aan deze eis.

Gunnings-criterium nr. 1	**Duurzaam materiaalgebruik** Naarmate de milieubelasting - berekend met een milieugerichte levenscyclusanalyse - lager is dan [X], wordt de inschrijving hoger gewaardeerd. De LCA dient uitgevoerd te zijn conform NEN 8006 en de geharmoniseerde methode voor de bepaling van de milieubelasting. Bewijsmiddel: 1. Een LCA-conform NEN 8006.

Gunnings-criterium nr. 2	**Grondbalans** Naarmate over de grenzen van een werk minder aan- en of afvoer plaatsvindt van grond, dat geschikt is als secundaire bouwstof, wordt de inschrijving hoger gewaardeerd. Dit criterium wordt als volgt gewaardeerd: Naar mate een hoger aandeel grond vrijkomend uit het werk binnen het

	werk (evt. in uitwisseling met naburige werken) wordt ingezet (in volumepercentage/m3 dan wel massapercentage/ton) wordt de aanbieding hoger gewaardeerd. Bewijsmiddel: 1. Een beschrijving van grondstromenplan van de inschrijver.

Gunnings-criterium nr. 3	**Benut de weginfrastructuur als energiebron** Naarmate de weginfrastructuur meer wordt benut als energiebron, wordt de inschrijving hoger gewaardeerd. Dit criterium wordt beoordeeld op bijvoorbeeld de hoeveelheid opgewekte energie in GJ / jaar. Bij de beoordeling wordt meegewogen: • Technisch realiteitsgehalte; • Gevolgen voor de gebruiksmogelijkheden van de weg; • Gevolgen voor onderhoud; [nadere weging door inkoper in te vullen]. De inschrijving wordt als volgt gewaardeerd: […] Bewijsmiddel: 1. De beschrijving.

Contract-bepaling nr. 1	**Beheer- en onderhoudsplan** Bij de oplevering van de weg wordt een beheer- en onderhoudsplan geleverd, waarin de onderhoudsmaatregelen worden beschreven die vereist zijn voor de instandhouding van de weg. Het plan beschrijft de wijze van beheer en onderhoud, nodig om de duurzame aspecten van de weg in stand te houden. [nader in te vullen door de aanbestedende dienst] Het plan bestaat in ieder geval uit de volgende onderdelen: • Beschrijving van de in acht te nemen beheersmaatregelen met inspectie-intervallen voor een periode van XX jaar, met bijbehorende instructies (ten minste beschrijving inspectiepunten, methodes, inschatting aantal mensuren); • Beschrijving van de in acht te nemen onderhoudsintervallen voor een periode van XX jaar, met bijbehorende instructies (ten minste beschrijving onderhoudswerkzaamheden en beschrijving benodigde materialen en inschatting aantal mensuren en eventuele relatie met andere werkzaamheden waarvoor bijvoorbeeld grondverzet gewenst is).

2.2 Kunstwerk

Minimumeis nr. 1	**Duurzaam ontwerp houten constructie** Het ontwerp en de ontwerpdetaillering voldoen aan onderstaande duurzaamheidprincipes. Voor constructies die worden blootgesteld aan weer en wind: • Er wordt geen gebruik gemaakt van filmvormende verfsystemen op houten oppervlakken. • Kopse vlakken van hout zijn afgeschermd van vocht. • De constructie is zo ontworpen dat er geen (hemel)water kan blijven staan. • Bij de toepassing van een houten vlak tegen een ander vlak wordt een afstand tussen deze vlakken aangehouden van minimaal 8 mm. Voor constructies die worden blootgesteld aan grond en/of water: • Er wordt geen hout in de constructie toegepast waar contact is met de grond. • Hout tot XX cm boven de waterspiegel wordt niet ingeklemd. <u>Bewijsmiddelen:</u> 1. De bij deze inschrijving te voegen verklaring van inschrijver dat aan deze minimumeis wordt voldaan. 2. Een beschrijving van de manier waarop aan de ontwerpprincipes wordt voldaan.

Minimumeis nr. 2	**Duurzaam ontwerp staalconstructie** Het ontwerp en de ontwerpdetaillering voldoen aan de volgende duurzaamheidprincipes: • De staalconstructie is zo ontworpen dat er geen(hemel)water in kan blijven staan en vuil zich kan ophopen • In de staalconstructie zijn scherpe randen afgerond. <u>Bewijsmiddel:</u> 1. De bij deze inschrijving te voegen verklaring

Minimumeis nr. 3	**Verwerken/afvoeren van vrijkomende stoffen** 1. Indien steenachtige afvalstoffen worden gebroken dan moet het breken conform BRL 2506 plaatsvinden. 2. Teerhoudend asfalt(granulaat) moet worden afgevoerd naar een op basis van de Wet Milieubeheer vergunde be- en verwerkingsinrichting in Nederland voor de thermische reiniging van het teerhoudend materiaal. 3. *(In het geval van een tijdelijke inrichting, dat niet onder de Wet milieubeheeren het Activiteitenbesluit valt)* Op de locatie van uitvoering moeten voorzieningen zijn

	getroffen om verschillende soorten afvalstoffen ten gevolge van de werkzaamheden gescheiden op te slaan dan wel gescheiden af te voeren. Ook voor het gescheiden opslaan van vrijkomende secundaire grondstoffen moeten op de locatie van uitvoering voorzieningen worden getroffen. Bewijsmiddel: 1. Verklaring van de inschrijver dat hij aan deze minimumeis voldoet. Nader bewijsmiddel ten aanzien van aspect onder punt 1 genoemd: 2. Een beschrijving van de wijze waarop de inschrijver aan deze eis voldoet. Indien de inschrijver of onderaannemer beschikt over een KOMO productcertificaat 'BRL 2506 beton en/of menggranulaat' op naam van de inschrijver of onderaannemer, wordt voldaan aan deze eis.
Gunnings-criterium nr. 1	**Duurzaam materiaalgebruik** Naarmate de milieubelasting - berekend met een milieugerichte levenscyclusanalyse lager is dan [XX], wordt de inschrijving hoger gewaardeerd. De LCA-analyse dient uitgevoerd te zijn conform NEN 8006 en de geharmoniseerde methode voor de bepaling van de milieubelasting. Bewijsmiddel: 1. Een LCA-conform NEN 8006.
Gunnings-criterium nr. 2	**Grondbalans** Naarmate over de grenzen van een werk minder aan- en of afvoer plaatsvindt van grond, dat geschikt is als secundaire bouwstof, wordt de inschrijving hoger gewaardeerd. Dit criterium wordt als volgt gewaardeerd: Naar mate een hoger aandeel grond vrijkomend uit het werk binnen het werk (evt. in uitwisseling met naburige werken) wordt ingezet (in volumepercentage/m3 dan wel massapercentage/ton) wordt de aanbieding hoger gewaardeerd. Bewijsmiddel: 1. Een beschrijving van grondstromenplan van de inschrijver.
Contract bepaling nr. 1	**Beheer- en onderhoudsplan** Bij de oplevering van het kunstwerk wordt een beheer- en onderhoudsplan geleverd, waarin de onderhoudsmaatregelen zijn beschreven die vereist zijn voor de instandhouding van het kunstwerk. Het plan beschrijft de wijze van beheer en onderhoud, nodig om de

	duurzame aspecten van het kunstwerk in stand te houden. Het plan bestaat in ieder geval uit de volgende onderdelen: • Beschrijving van de in acht te nemen beheermaatregelen met inspectieintervallen voor een periode van XX jaar, met bijbehorende instructies (ten minste beschrijving inspectiepunten, methodes, inschatting aantal mensuren); • Beschrijving van de in acht te nemen onderhoudsintervallen voor een periode van XX jaar, met bijbehorende instructies (ten minste beschrijving onderhoudswerkzaamheden en beschrijving benodigde materialen en inschatting aantal mensuren en eventuele relatie met andere werkzaamheden waarvoor bijvoorbeeld grondverzet gewenst is).

2.3 VRI

Minimumeis nr. 1	**Diminrichting in regeltoestel** a) Bij nieuwbouw moet een regeltoestel met diminrichting toegepast worden, conform paragraaf 2, lid 4 van de Regeling Verkeerslichten van 28 augustus 2001. b) Bij bestaande VRI-installaties moet een diminrichting worden toegepast als dit technisch mogelijk is, zonder meerkosten, en als de roodlicht- en lampbewaking blijven functioneren. <u>Bewijsmiddelen:</u> a1. Toevoegen verklaring van inschrijver waaruit blijkt dat de inschrijver aan de eis voldoet. a2. Meesturen specificaties van het regeltoestel en de diminrichting waaruit blijkt dat hieraan wordt voldaan. b1. Toevoegen verklaring van inschrijver waaruit blijkt dat de inschrijver aan de eis voldoet. b2. Meesturen specificaties van het regeltoestel en de diminrichting waaruit blijkt dat hieraan wordt voldaan, of motiveer waarom de diminrichting niet toegepast kan worden.

Minimumeis nr. 2	**Energiezuinige lichtbronnen** a) Bij nieuwbouw of complete vervanging van VRI's worden klasse II lichtbronnen, zoals bedoeld in de "Grensvlakdefinitie" Uitgave 3-2, januari 2004 van de ASTRIN (association traffic industries in the Netherlands), geïnstalleerd. b) Bij bestaande VRI's worden klasse II lichtbronnen, zoals bedoeld in de "Grensvlakdefinitie" Uitgave 3-2, januari 2004 van de ASTRIN, geïnstalleerd als het regeltoestel de technische mogelijkheden hiervoor heeft. Het regeltoestel is geschikt als het beschikt over een diminrichting en als de roodlicht- en lampbewaking blijven functioneren. Als het

	regeltoestel niet geschikt is voor toepassing van klasse II lichtbronnen kan de klasse I lichtbronnen geïnstalleerd worden, zoals bedoeld in de hiervoor genoemde "Grensvlakdefinitie" van de ASTRIN. Bewijsmiddelen: a1. Toevoegen verklaring van inschrijver waaruit blijkt dat de inschrijver aan de eis voldoet. a2. Meesturen specificaties van de lichtbronnen, waaruit blijkt dat hieraan wordt voldaan. b1. Toevoegen verklaring van inschrijver waaruit blijkt dat de inschrijver aan de eis voldoet. b2. Meesturen specificaties van de lichtbronnen en het regeltoestel, waaruit blijkt dat hieraan wordt voldaan

Gunnings-criterium nr. 1	**Duurzaam ontwerp van een VRI** De inschrijver werkt in een plan van aanpak voor het ontwerp van de VRI uit hoe hij invulling gaat geven aan: - energiebesparing - duurzaam materiaalgebruik voor een gebruiksperiode van 10 jaar. *Energieverbruik* Beoogd wordt een maximale besparing op energieverbruik in de gebruiksfase van het werk. *Duurzaam materiaalgebruik* Beoogd wordt een integrale afweging tussen het beperken van het grondstofverbruik, energieverbruik tijdens de productie, te verwachten onderhoud tijdens de levensduur, mogelijkheden voor hergebruik, botsveiligheid et cetera. Naarmate het energieverbruik meer wordt beperkt, wordt het plan hoger gewaardeerd. Naarmate het toe te passen materiaal het milieu minder belast, wordt het plan hoger gewaardeerd. Voor dit onderdeel worden punten als volgt toegekend: <…> Bewijsmiddel: 1. Het plan van aanpak.

Gunnings-criterium nr. 2	**Energiezuinige lichtbronnen en regeltoestellen** Naarmate de VRI-installatie (de lichtbronnen en de regeltoestellen) minder energie verbruikt, worden aan de aanbieding meer punten toegekend. Het totale energieverbruik van de VRI wordt meegewogen bij de beoordeling van de aanbiedingen. Voor dit onderdeel worden punten als volgt toegekend: <…>

	Bewijsmiddel: 1. Voeg de verbruiksspecificaties (van de toeleveranciers) van de onderdelen toe in kWh per jaar.

2.4 Riool

Minimumeis nr. 1	**Afvoeren materialen** Opgegraven en vrijgekomen materialen van riolering dienen ontdaan van aanhangend vuil en grond en vrij van chemische verontreiniging, te worden afgevoerd naar een erkend en voor dit werk gecertificeerde verwerker. Bewijsmiddelen: 1. Verklaring van de inschrijver dat aan deze minimumeis wordt voldaan. 2. Lijst met erkende en gecertificeerde verwerkers waarnaar materiaal wordt afgevoerd. 3. Kopieën van de certificaten van de verwerkers waarnaar materiaal wordt afgevoerd.

Minimumeis nr. 2	**Verwerken/afvoeren van vrijkomende stoffen** 1. Indien steenachtige afvalstoffen worden gebroken dan moet het breken conform BRL 2506 plaatsvinden. 2. Teerhoudend asfalt(granulaat) moet worden afgevoerd naar een op basis van de Wet Milieubeheer vergunde be- en verwerkingsinrichting in Nederland voor de thermische reiniging van het teerhoudend materiaal. 3. *(In het geval van een tijdelijke inrichting, die niet onder de Wet milieubeheer en het Activiteitenbesluit valt)* Op de locatie van uitvoering moeten voorzieningen zijn getroffen om verschillende soorten afvalstoffen ten gevolge van de werkzaamheden gescheiden op te slaan dan wel gescheiden af te voeren. Ook voor het gescheiden opslaan van vrijkomende secundaire grondstoffen moeten op de locatie van uitvoering voorzieningen worden getroffen. Bewijsmiddel: 1. Verklaring van de inschrijver dat hij aan deze minimumeis voldoet.

Minimumeis nr. 3	**Zware voertuigen – emissienormen** De voor de uitvoering van de opdracht in te zetten voertuigen zwaarder dan 3.500 kg voldoen tenminste aan de Euro 3-norm. Bewijsmiddelen: 1. Een bij de offerte overgelegde verklaring van de inschrijver dat hij voldoet aan deze eis. 2. Een afschrift van de typegoedkeuringspapieren (opvraagbaar bij de fabrikant) waaruit blijkt welke Euronorm(en) aan het type/de typen

	voor de uitvoering van de opdracht in te zetten voertuigen is/zijn toegekend. 3. Een bij de offerte gevoegd overzicht van voor de uitvoering van de opdracht in te zetten voertuigen met merknaam en type.

Minimumeis nr. 4	**Zware voertuigen – roetfilters** De voor de uitvoering van de opdracht in te zetten dieselvoertuigen zwaarder dan 3.500 kg, beschikken over de volgende voorziening voor beperking van emissie van fijnstof: • Roetfilter affabriek. • Indien roetfilter affabriek niet leverbaar is: retrofit of een installatie met een ten minste gelijkwaardige werking. Bewijsmiddelen: 1. Een bij de offerte overgelegde verklaring dat de inschrijver voldoet aan (deze eis in) het PvE. 2. Een bij de offerte overgelegde opgave van voor de uitvoering van de opdracht in te zetten voertuigen met merknaam en type, alsmede van de soort geplaatste roetfilter.

Minimumeis nr. 5	**Mobiele werktuigen – emissie-eisen** De bij uitvoering van werkzaamheden in te zetten mobiele dieselwerktuigen voldoen minimaal aan de emissie-eisen overeenkomend met de fasen uit de volgende tabel:

			EIS
Vermogen 18-75 kW	*Gebruik binnen bebouwde kom*	*Gebruik < 8 uur per etmaal*	*Fase II*
		Gebruik > 8 uur per etmaal	*Fase II met roetfilter*
	Gebruik buiten bebouwde kom	*Gebruik < 8 uur per etmaal*	*Fase I*
		Gebruik > 8 uur per etmaal	*Fase I*
Vermogen 75-560 kW	*Gebruik binnen bebouwde kom*	*Gebruik < 8 uur per etmaal*	*Fase II met roetfilter*
		Gebruik > 8 uur per etmaal	*Fase II met roetfilter*
	Gebruik buiten bebouwde kom	*Gebruik < 8 uur per etmaal*	*Fase I*
		Gebruik > 8 uur per etmaal	*Fase II*

Bewijsmiddelen:
1. Een bij de offerte over te leggen verklaring van de inschrijver dat hij voldoet aan deze eis.
2. Een afschrift van de typegoedkeuringspapieren (opvraagbaar bij de fabrikant) waaruit blijkt welke emissies/classificatie aan de typen voor

	de uitvoering van de opdracht in te zetten voertuigen zijn toegekend.

Gunnings-criterium nr. 1	**Energiezuinig ontwerp** Naarmate een ontwerp voor het rioleringsstelsel energiezuiniger is, wordt de inschrijving hoger gewaardeerd. Beoordeling vindt plaats op basis van een beschrijving van de volgende elementen die in het ontwerp zullen worden uitgewerkt met een daarbij behorende raming energieverbruik: • …; • [nader in te vullen door de inkoper]. Het geraamde energieverbruik wordt berekend in kWh/gebruiksjaar. Het plan wordt getoetst op technisch realiteitsgehalte en de hoogte van het geraamde energieverbruik van de bovengenoemde elementen. De inschrijving wordt als volgt gewaardeerd: […] <u>Bewijsmiddel:</u> 1. De beschrijving.

Gunnings-criterium nr. 2	**Zware voertuigen – emissienormen** Indien alle voor de uitvoering van de opdracht in te zetten voertuigen zwaarder dan 3.500 kg voldoen aan Euro 4-, Euro 5-, EEV (‘Enhanced Environmentally friendly Vehicle’ = een extra milieuvriendelijk voertuig) of Euro 6-norm, dan worden voor dit onderdeel [XX] punten toegekend. <u>Bewijsmiddelen:</u> 1. Een bij de offerte overgelegde verklaring van inschrijver dat hij voldoet aan dit gunningscriterium. 2. Een bij de offerte gevoegd overzicht van voor de uitvoering van de opdracht in te zetten voertuigen met merknaam en type voorzien van een afschrift van de typegoedkeuringspapieren.

Contract bepaling nr. 1	**Beheer- en onderhoudsplan** Bij de oplevering van de riolering wordt een beheer- en onderhoudsplan geleverd, waarin de onderhoudsmaatregelen zijn beschreven die vereist zijn voor de instandhouding van de riolering. Het plan beschrijft de wijze van beheer en onderhoud, nodig om de duurzame aspecten de riolering in stand te houden. Het plan bestaat in ieder geval uit de volgende onderdelen: • Beschrijving van de in acht te nemen beheermaatregelen met inspectieintervallen voor een periode van XX jaar, met bijbehorende

	instructies (ten minste beschrijving inspectiepunten, methodes, inschatting aantal mensuren). • Beschrijving van de in acht te nemen onderhoudsintervallen voor een periode van XX jaar, met bijbehorende instructies (ten minste beschrijving onderhoudswerkzaamheden en beschrijving benodigde materialen en inschatting aantal mensuren en eventuele relatie met andere werkzaamheden waarvoor bijvoorbeeld grondverzet gewenst is).

2.5 Verlichting

Minimumeis nr. 1	**Energielabel** De OVL-installatie moet ten minste voldoen aan de energieprestatie van label D van de Handleiding energielabeling openbare verlichting, april 2009 van de NSVV en SenterNovem. Bewijsmiddelen: 1. De bij deze inschrijving te voegen verklaring van inschrijver dat inschrijver aan de eis voldoet. 2. De bij deze inschrijving te voegen specificaties van de OVL-installatie (mastenplan, type mast, armatuur, lamp en VSA6) waaruit blijkt dat aan de eis wordt voldaan.

Minimumeis nr. 2	**Dimbare verlichting** *a. Bij nieuwbouw van OVL-installaties en bij complete vervanging van lampen en armaturen van bestaande OVL-installaties langs verkeerswegen.* - De OVL-installatie moet dimbaar zijn. *b. Bij nieuwbouw van OVL-installaties en bij complete vervanging van lampen enarmaturen van OVL–installatie, in woon- en verblijfgebieden.* - De OVL-installatie moet technisch geschikt zijn om gedimd te worden. Bewijsmiddelen: 1. De bij deze inschrijving te voegen verklaring van inschrijver dat inschrijver aan de eis voldoet. 2. Door inschrijver geleverde specificaties van de OVL-installatie (diminstallatie, lamptype en VSA) waaruit blijkt dat hieraan wordt voldaan.

Minimumeis nr.3	**Energiezuinige reclameverlichting** *Bij nieuwbouw van OVL-installaties en bij complete vervanging van lampen en armaturen van bestaande OVL-installaties langs verkeerswegen.* Het vermogen van de verlichting mag niet hoger zijn dan het aangegeven ambitieniveau in de volgende tabel.

Afmeting	Oppervlakte	huidig vermogen	Ambitie vermogen	Besparing
70 x 100 cm	0,700 m2	99 W	30 W	70%
80 x 96 cm	0,768 m2	110 W	36 W	67%
90 x 108 cm	0,972 m2	110 W	39 W	65%
100 x 120 cm	1,200 m2	165 W	45 W	73%
120 x 120 cm	1,440 m2	138 W	60 W	56%

Bewijsmiddelen:
1. De bij deze inschrijving te voegen verklaring van inschrijver dat inschrijver aan de eis voldoet.
2. De bij deze inschrijving te voegen specificaties van de verlichtingsinstallatie (armatuur, lamptype en VSA) waaruit blijkt dat hieraan wordt voldaan.

Gunnings-criterium nr. 1

Duurzaam ontwerp van de OVL

Naarmate de OVL-installatie **energiezuiniger** is dan [X], wordt de inschrijving hoger gewaardeerd.

Met een energiezuinig ontwerp wordt bedoeld een OVL-installatie die in de gebruiksfase zo min mogelijk energie verbruikt.

Beoordeling vindt plaats op basis van de volgende elementen:
• Het energieverbruik in de gebruiksfase, uitgedrukt in kWh/jaar;
• …..

Naarmate de **lichtvervuiling** van de OVL-installatie kleiner is dan [X], wordt de inschrijving hoger gewaardeerd. Met lichtvervuiling wordt de lichtuitstraling naar boven bedoeld. Beoordeling vindt plaats op basis van de lichtuitstraling naar boven per armatuur, uitgedrukt in lux**.**

Naarmate de OVL-installatie **duurzamer** is vervaardigd, wordt de inschrijving hoger gewaardeerd. Onder een duurzame OVL-installatie wordt verstaan een installatie die bij de vervaardiging en tijdens de levensduur het milieu minder belast dan de referentie-installatie (bijlage [X].

Dit onderdeel wordt beoordeeld op de volgende elementen:
• De mate waarin bij de productie gerecyclede grondstoffen zijn toegepast: hoe hoger het percentage, hoe beter.
• Mogelijkheden voor hergebruik: hoe meer, hoe beter.

Bij de beoordeling van de drie onderdelen worden meegewogen:
• Het technische realiteitsgehalte;
• Sterkte/degelijkheid/levensduur van (de onderdelen van) de installatie;
• Te verwachten onderhoud tijdens de levensduur.

Bewijsmiddel:

	Een beschrijving waaruit valt op te maken in welke mate de bovenstaande criteria (energiezuinigheid, lichtvervuiling en duurzaamheid) worden bereikt, en hoe dat gebeurt.

2.6 Conserveringswerken

Minimumeis nr. 1	**Toepassen oplosmiddelarme conserveringssystemen** Het conserveringssysteem* moet worden opgebouwd met conserveringsproducten waarvan het aandeel vluchtige organische stoffen (VOS) onderstaande grenswaarden per liter conserveringsproduct niet overschrijdt. C. MAXIMUM VOC CONTENT LIMIT VALUES FOR PROTECTIVE COATINGS Product Subcategory / VOC limit – g/l(*)(from 1.1.2012) a Multi-pack primers and intermediates 290 b Zinc primers 460 c 1-pack primers and intermediates 420 d Multi-pack finishes 420 e 1-pack finishes 440 f Tank linings 370 g Intumescent coatings – Solvent borne 440 Water borne 140 (*) g/l ready for use. <u>Bewijsmiddelen:</u> 1. De bij deze inschrijving te voegen verklaring van inschrijver dat aan deze minimumeis wordt voldaan. 2. Productspecificaties van toe te passen verfsystemen, waaruit het gehalte VOS in de conserveringsproducten blijkt.
Minimumeis nr. 2	**Weren van producten met lood- of chromaathoudende pigmenten** In toe te passen conserveringsproducten mogen geen lood- of chromaathoudende pigmenten zijn verwerkt. <u>Bewijsmiddelen:</u> 1. Verklaring van de inschrijver dat aan deze minimumeis zal worden voldaan. 2. De beschrijving van de toe te passen conserveringsproducten inclusief productspecificaties, waaruit blijkt dat deze geen lood- of chromaathoudende pigmenten bevatten.
Minimumeis nr. 3	**Verwerken/afvoeren vrijkomende afvalstoffen** De verschillende soorten afvalstoffen die bij de werkzaamheden vrijkomen, worden gescheiden opgeslagen en afgevoerd. Op de locatie van uitvoering worden voorzieningen getroffen voor gescheiden opslag van de afvalstoffen. <u>Bewijsmiddel:</u> 1. Verklaring van de inschrijver dat aan deze minimumeis zal worden voldaan.

Contract bepaling nr. 1	**Beheer- en onderhoudsplan** Bij de oplevering van het conserveringswerk wordt een beheer- en onderhoudsplan geleverd, waarin de omvang van de te nemen inspectie- en onderhoudsmaatregelen met betrekking tot de conservering en een raming van de bij deze maatregelen behorende kosten voor een bepaalde periode (van bijvoorbeeld 25) jaar staan weergegeven. Het plan dient ten minste de volgende onderdelen te bevatten: • Beschrijving van de gebruikte materialen en de kwantitatieve gegevens daarvan. • Beschrijving van de in acht te nemen inspectie-intervallen, met bijbehorende instructies (ten minste beschrijving inspectiepunten, methodes, inschatting aantal mensuren). • Beschrijving van de in acht te nemen onderhoudsintervallen, met bijbehorende instructies (ten minste beschrijving onderhoudswerkzaamheden en beschrijving benodigde materialen en inschatting aantal mensuren). • De vermelding van de voor de diverse onderdelen overeengekomen garantietermijnen.

2.7 Grondwerk

Gunnings-criterium nr. 1	**Grondbalans** Indien de grondbalans binnen het project gesloten is, worden [X] punten toegekend. Met gesloten wordt bedoeld: binnen de grenzen van een werk vindt geen af- of toevoer van grond plaats. Bewijsmiddel: Een bij de offerte overlegde verklaring van acceptatie van dit criterium.

2.8 Kabels & Leidingen

Minimumeis nr. 1	**Afvoeren van materialen** Opgegraven en vrijgekomen materialen van het kabel- en/of leidingensysteem dienen ontdaan van aanhangend vuil en grond en vrij van chemische verontreiniging, te worden afgevoerd naar een erkend en voor dit werk gecertificeerde verwerker. Bewijsmiddelen: 1. Verklaring van de inschrijver dat aan deze minimumeis wordt voldaan. 2. Lijst met erkende en gecertificeerde verwerkers waarnaar materiaal wordt afgevoerd. 3. Kopieën van de certificaten van de verwerkers waarnaar materiaal wordt afgevoerd.

Minimumeis nr. 2	**Verwerken/afvoeren van vrijkomende stoffen** 1. Indien steenachtige afvalstoffen worden gebroken dan moet het

	breken conform BRL 2506 plaatsvinden. 2. Teerhoudend asfalt(granulaat) moet worden afgevoerd naar een op basis van de Wet Milieubeheer vergunde be- en verwerkingsinrichting in Nederland voor de thermische reiniging van het teerhoudend materiaal. 3. *(In het geval van een tijdelijke inrichting, die niet onder de Wet milieubeheer en het Activiteitenbesluit valt)* Op de locatie van uitvoering moeten voorzieningen zijn getroffen om verschillende soorten afvalstoffen ten gevolge van de werkzaamheden gescheiden op te slaan dan wel gescheiden af te voeren. Ook voor het gescheiden opslaan van vrijkomende secundaire grondstoffen moeten op de locatie van uitvoering voorzieningen worden getroffen. Bewijsmiddel: 1. Verklaring van de inschrijver dat hij aan deze minimumeis voldoet.

Gunnings-criterium nr. 1	**Energiezuinig ontwerp** Naarmate een ontwerp voor kabels en leidingen energiezuiniger is, wordt de inschrijving hoger gewaardeerd. Beoordeling vindt plaats op basis van een korte beschrijving van de volgende elementen die in het ontwerp zullen worden uitgewerkt met een daarbij behorende raming energieverbruik: - … - [nader in te vullen door de inkoper] Het geraamde energieverbruik wordt berekend in kWh/gebruiksjaar. Het plan wordt getoetst op technisch realiteitsgehalte en de hoogte van het geraamde: - energieverbruik van de bovengenoemde elementen. - De inschrijving wordt als volgt gewaardeerd: […] Bewijsmiddel: 1. De korte beschrijving van het energiezuinige ontwerp.

Contract bepaling nr. 1	**Beheer- en onderhoudsplan** Bij de oplevering van het kabel- en/of leidingensysteem wordt een beheer- en onderhoudsplan geleverd, waarin de onderhoudsmaatregelen zijn beschreven die vereist zijn voor de instandhouding van het kabel- en/of leidingensysteem. Het plan beschrijft de wijze van beheer en onderhoud, nodig om de duurzame aspecten van het kabel- en/of leidingensysteem in stand te houden. *[nader in te vullen door de inkoper]* Het plan bestaat in ieder geval uit de volgende onderdelen: • Beschrijving van de in acht te nemen beheermaatregelen met inspectie-intervallen voor een periode van XX jaar, met bijbehorende instructies (ten minste beschrijving inspectiepunten, methodes, inschatting aantal mensuren); • beschrijving van de in acht te nemen onderhoudsintervallen voor een periode van XX jaar, met bijbehorende instructies (ten minste

	beschrijving onderhoudswerkzaamheden en beschrijving benodigde materialen en inschatting aantal mensuren en eventuele relatie met andere werkzaamheden waarvoor bijvoorbeeld grondverzet gewenst is).

ANNEX

5 Quick-scan SenterNovem criteria

In this quick-scan, we chart the criteria of the relevant product groups. SenterNovem, already, provides the corresponding sustainable aspect of the criteria in the criteria documents. A brief analysis of the criteria shows all criteria of the relevant product groups are part of the themes material use, energy, and living environment (SenterNovem, 2009).

Because these themes are, considerably, broad, we subdivide the themes based on the present criteria. In table 13.22, 13.23, and 13.24, the sub-themes are given. For each sub-theme, we describe the intended influence of the criteria. We distinguish the following sub-themes:

Material use

Table 13.22
Sub themes material use

Sub-theme	Criteria
Disposal	Influence method of removing and processing disposal
Mass diagram	Influence supply and discharge of soil. Hereby, "cut-and-fill" is stimulated
Environmental impact	Influence the integral design. Hereby, minimising of the environmental impact during the complete life cycle is intended.
Maintenance plan	Influence the maintenance plan. Hereby, the building contractors are requested to plan the maintenance on beforehand.
Sustainable use	Influence the use of materials by prescribing the sustainable design method and excluding toxic materials.

Energy

Table 13.23
Sub themes energy

Sub-theme	Criteria
Reduction	Influence the integral design to minimise the overall energy demand.
Alternative	Influence the use of alternative energy.
Efficiency	Influence energy use by promoting energy efficient and dimming equipment
Emission	Influence emission by demanding or promoting certain "green" (working) vehicles.

Living environment

Table 13.24
Sub theme living environment

Sub-theme	Criteria
Light pollution	Influence the design. Hereby, minimal light pollution is intended.

In table 13.25, on the next page, we chart all criteria per (sub) theme, per product group. We distinguish the type of criteria, because, in the monitor, their significance differs. For all product groups, both selection criteria, and suitability demands lack. Therefore, we only distinguish:

- "Minimum criteria" **(M)**
- "Award criteria" **(A)**
- "Provisions" **(P)**

Both the minimum criteria and provisions are important for the monitor. However, the award criteria are facultative, and do not influence the "score" of sustainable procurement.

Based on the quick-scan, we can identify the prominent elements influenced by the current criteria. Furthermore, we visualise the type of criteria used per (sub) theme.

Table 13.25
Quick scan criteria per theme per product group

Product group	Material Use															Energy										Living environment		
	Disposal			Mass diagram			Environmental impact (LCA)			Maintenance plan			Sustainable use			Reduction			Alternative energy			Efficient use			Emission			Light pollution		
	M	A	P	M	A	P	M	A	P	M	A	P	M	A	P	M	A	P	M	A	P	M	A	P	M	A	P	M	A	P
Road	1				1			1				1								1										
Engineering structure	1				1			1				1	2																	
Traffic and travel information								1a[17]									1b						2							
Sewer	2											1					1								3	1				
Illumination								2a									2b						3						1c	
Conservation works	1											1	2																	
Earthworks					1																									
Cables & Pipes	2											1					1													
Total	7				3			5				5	4				5			1			5		3	1			1	

M = "Minimum criterion"
A = "Award criterion"
P = "Provision"

Based on the number of criterion, we assume the themes material use and energy are spearheads of sustainable procurement of "road infrastructure". In total, 36 criteria cover 41 sub themes. Of these, 25 criteria influence material use, while 15 criteria cover energy. Only one criterion covers the theme living environment. Furthermore, this only encompasses light pollution.

The most prominent sub-themes are "disposal of materials", "maintenance plan for materials", "sustainable use of materials", and "efficient use of energy". Hereby, 7, 5, 4, and 5 criteria respectively influence the sub-theme. "Disposal" consists of technical minimum criteria prescribing the removal and process of disposal. "Maintenance plan" consists of provisions to make a plan to maintain the design. "Sustainable use" consists of technical demand on the design, and exclusion of toxic materials. Furthermore, "efficient use of energy" consist of the request for efficient equipment, and the possibility to dim. (SenterNovem, 2009).

While 3 technical demands, and 1 award criterion, influence the emission, these all belong to the product group sewer. Further, only award criteria are prescribed. Regarding materials, 3 criteria influence the sub-theme "mass diagram", and 5 criteria "environmental impact". Concerning energy, 5 award criteria influence "reduction", while one criterion influences "alternative energy". Furthermore, 1 award criterion covers the living environment, by influencing "light pollution".

[17] If a, b, or c is added to the number, the criterion is part of more sub-themes.

ANNEX

6 Quick-scan tender method

In this quick-scan, we analyse the type of tender method used by governmental procurement parties. To this end, we used the tender requests for road infrastructure projects on "aanbestedingskalender.nl" between 01/08/09 and 01/09/09.

Illustration 13.14
Quick-scan tender requests on aanbestedingskalender.nl

After exclusion of double publications and non-road infrastructure projects like the construction of sea walls, 47 tender requests remain. In table 13.26, the awarding authority, date of tender, a short description of the project, and the tender and award method is given.

Table 13.26
Quick-scan of tender method

Awarding authority	Date of tender	Description	Tender method	Award
Municipalities				
Enkhuizen	30/08/09	Reconstructie riolering en herinrichting Noorderhavendijk	Public	Lowest price
Olst-Wijhe	31/08/09	Bouwrijpmaken Noorder Koeslag 2e fase	Public	Lowest price
Venlo	01/09/09	Koninginneplein aanleg tunnelconstructie & openbare ruimte	Public	Lowest price
Alphen a.d. Rijn	03/09/09	Reconstructie Withenluststraat, Van Brederodestraat en Buitendorpstraat	Public	Lowest price
Weststellingwerf	03/09/09	herinrichting Martiniwijk te Wolvega	Public	Lowest price
Haarlem	04/09/09	Rioolvervanging vondelweg (ventweg)	Public	Lowest price
Vianen	07/09/09	Herinrichting busstation Lekbrug A2	Public	Lowest price
Raalte	07/09/09	Sloop en sanering Heesweg 48 en 50	Public	Lowest price
Roosendaal	08/09/09	Rucphensebaan - Dijkrand en Oostpoort VRI	Public	Lowest price
Oss	08/09/09	Herinrichting Singel 1940-1945	Public	EMVI
Enschede	10/09/09	Rioolvervanging en herinrichting Dr. Lovinkstraat	Public	EMVI
Enschede	10/09/09	Aanpassing rotonde Buurserstraat en vervangen asfalt kruispunt Buurserstraat – De Reuver	Public	EMVI

Arnhem	10/09/09	Groene Weide	Public	Lowest price
Roosendaal	11/09/09	Overstortriool Staringlaan – Kletterwater	Public	Lowest price
Amsterdam	14/09/09	Herinrichting Timorplein	Public	EMVI
Uden	17/09/09	Onderhoud gesloten verhardingen te Uden	Public	Lowest price
Delft	22/09/09	Harnaschpolder Delft, Bruggen en Frontmuren	Public	Lowest price
Almere	24/09/09	Aanleg kunstwerk 4009, 4010 en 4023 in gebied 4B en 4C	Public	Lowest price
Wijchen	24/09/09	Asfaltonderhoud 2009	Public	Lowest price
Leeuwarden	24/09/09	Herinrichting Alvestedeplein	Public	Lowest price
Heerlen	25/09/09	Rioolrenovatie Wilhelminastraat B2009-20	Public	Lowest price
Haarlem	25/09/09	Toegankelijk maken bushaltes buslijn 2 oost en buslijn 3	Public	Lowest price
Utrecht	25/09/09	Herinchting Nansenlaan 103 SW 09	Public	Lowest price
Utrecht	28/09/09	Reconstructie Keulsekade	Public	Lowest price
Assen	30/09/09	Fietsbruggen Kloosterbos	Public	Lowest price
Landgraaf	29/09/09	Reconstructie 't Eikske te Landgraaf"	Public	Lowest price
Amsterdam	29/09/09	Renovatie verlichtingsinstallatie van parkeergebouw Kleiburg	Public	Lowest price
Dantumadiel	30/09/09	Bouwrijp maken Bestemmingsplan Hoeksterlaan te Damwâld	Public	Lowest price
Utrecht	30/09/09	Hoograven fase 2, rioolvervanging en afkoppelen	Public	Lowest price
Rotterdam	07/10/09	Verkeersregelinstallatie op de kruising Prins Alexanderlaan - Burgaslaan	Public	Lowest price
Texel	12/10/09	Rotonde Kogerstraat	Public	EMVI
Texel	12/10/09	Fietspad Californieweg	Public	EMVI
Utrecht	12/10/09	Rioolrenovatie Utrecht	Public	Lowest price
Alkmaar	15/10/09	Herinrichting Spilstraat	Public	Lowest price
Provinces				
Zuid-Holland	26/08/09	Herinrichting Meeslouwerplas en aanleg geluidswallen	Public	Lowest price
Gelderland	04/09/09	Instandhouding N309 Flevoweg te Elburg en N310 herstel winterschade Doornspijk	Public	Lowest price
Gelderland	08/09/09	Capaciteitsuitbreiding en onderhoud N325 Pleyroute	Public	Lowest price
Noord-Brabant	09/09/09	Aanleg bermverhardingen en herstellen van geleiderail op de N279	Public	Lowest price
Utrecht	09/09/09	Onderhoudswerkzaamheden 4 beweegbare bruggen Provincie Utrecht	Public	Lowest price
Noord-Brabant	09/09/09	Herinrichten kruispunt N289-Putsmolen	Public	Lowest price
Zuid-Holland	10/09/09	Lichtopstanden Kaag	Public	Lowest price
Fryslân	23/10/09	Kruising Molenkrite Rijksweg 7 Sneek	Public	Lowest price
Agency				
RWS	23/10/09	Programma Spoedaanpak Wegen, Pakket D	Non-public	EMVI
RWS	26/10/09	Het realiseren van DVM systemen	Public	EMVI
RWS	06/11/09	Programma Spoedaanpak E (A58 en A2)	Non-public	EMVI

RWS	06/11/09	Programma Spoedaanpak N52 pakket B	Non-public	EMVI
RWS	22/12/09	Project Renovatie Bruggen	Non-public	EMVI

In the table, we see, in the analysed period, 34 requests of municipalities, 8 requests of provinces, and 5 requests of Rijkswaterstaat, the agency of the ministry of transport, public works, and water management.

All requests carried out by municipalities and provinces cover a public tender. In contrary, only one of the tenders carried out by Rijkswaterstaat is public, while the other four consist of pre-selection.

Among all 34 requests of municipalities, only six base the award of the contract on the criterion EMVI. These are tenders of Oss, Enschede (2), Amsterdam, and Texel (2). For the rest, the present contracts were all RAW contracts.

Among the 8 requests of provinces, all contracts are award based solely on the lowest price. Apparently, at least during the analysed period, the provinces dislike the method of EMVI.

While both the municipalities and, especially, the provinces barely use the method of EMVI, RWS awards all five contracts based on this concept of 'most value for money'.

ANNEX 7 Case study protocol

This protocol contains the instruments as well as the procedures and general rules to carry out the case studies. It is set up as a guideline to structure the case study research and increase the reliability of its outcome. It provides information about the general approach. The protocol is largely based on Verschuren and Doorewaard (1999), Yin (2003), and Franklin et al (1997).

Case study project

The case study project forms a part of a more extensive research project (master thesis). The objective of the case study is, therefore, to contribute to the achievement of the objective of the master thesis. To this end, the case studies should provide information about the technical, institutional, and process aspects of real-life road infrastructure projects.

From technical point of view, it should reveal sustainable criteria, the results of using these criteria, and methods to assess the criteria. From institutional point of view, the network of involved actors and their roles should be charted. Furthermore, the characteristics of the network should become clear. From a process point of view, the core process challenges faced, and solutions used, during the (pre) procurement process should become apparent.

Due to the character of the thesis subject, a somewhat unusual case study approach is taken, that is, an adaptive approach. While three cases are selected, the (presence of) follow-ups depend on the expected added value and time consumption. The strategy is visualized in figure 13.26.

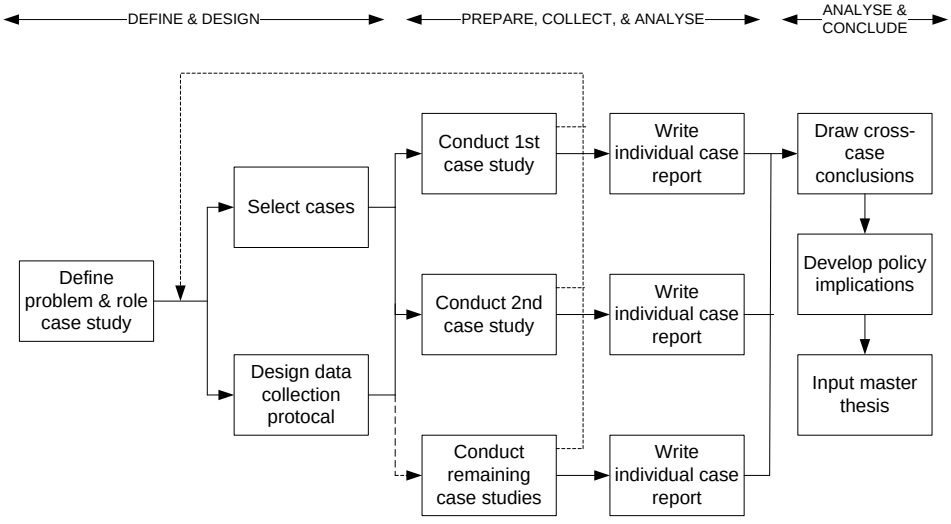


Figure 13.26
Case study method (adjusted from Cosmos, 2004)

Before selecting cases, the theoretical context is analysed and the problem is defined. Based on the potential added value, cases are selected. As mentioned before, this is more adaptive than exactly determined on beforehand. After designing a data collection strategy, a selected case is conducted. After each case, it is determined whether or not new cases should be selected. Of each individual case, a report is written, after which conclusion are drawn based on all cases. These cases should result in information of the policy implication, which form important input for the master thesis research.

Field procedures

In a case study, depth is realised by using various labour-intensive methods for generating data. During the research, several methods will be combined, called triangulation of methods, to raise reliability. As Yin (2003) points out, evidence for case studies may come from six sources: documents, archival records, interviews, direct observation, participant-observation, and physical artifacts. Realizing all these sources have strengths and weaknesses, multiple sources of evidence will be used. This triangulation of sources should neutralise the weaknesses, and raise both validity and reliability.

This protocol only provides a general overview of potential sources. Per case, however, a specific source overview will be given. This can be found in the case study database in annex 5.

Documents

The most important use of documents, for case studies, is affirming evidence. It should underline conclusions drawn by other sources. However, it should be barried in mind; every document is written for a specific purpose and audience other than those of the case study. Consequently, "documentary evidence reflects a communication among other parties attemting to achieve some other objectives" (Yin, 2003). Nonetheless, documentary will form an important aspect of all case studies. Especially, due to their nature, several documents are highly reliable. Furthermore, the combination of present documents clearly reflects the progress during the process. The following documents will be used during the case studies:

- Administrative documents: contracts, tender documents, proposals, progress reports, covenants
- Formal studies: technical study, communication plan, evaluation
- External communication: Newsletters, minutes of meetings
- Internal communication: letters, mail, announcements, minutes of meetings, agendas

Archival records

The main contribution of archival records is that it clarifies the context in which a certain case took place. It often provides quantitative information in the form of computer files and records. Although, this source will not be very important several records will be relevant:

- Maps and charts of geographical characteristics of the project area
- Organizational records: organizational charts, budget during projects

Interviews

One of the most important sources of case study information is the interview. Specific interviewees can provide important insights into a situation. They cannot only provide an overview of the process, but also about the reasons behind it. Furthermore, they know details, not mentioned in documents. Nonetheless, it should be realized, interviewees are subject to common problems of bias, poor recall, and poor or inaccurate articulation. Therefore, the outcomes should be corroborated with information from other sources (Yin, 2003). While the exact interviewees differ per case, at least the following roles are relevant:

- Project manager
- Executive leader
- Procurement manager
- Environmental manager

Direct observation

The reason for direct observation is the opportunity to observe the results of a project in real-life. While lacking enough technical (and historical) experience to judge the result, a good impression can be made about the current situation. This information must be seen as additional information about the topic being studied. Direct observation will be made of the completed road infrastructure projects, preferably alongside the project or executive leader.

Participant observation

Participant-observation is a special mode of observation in which the observer itself participates in the events being studied. While this source provides opportunities to collect specific information, it is not used during the case studies. The reason for this is participant observation is highly time consuming, while the outcome might be biased due to the role of the observer. However, the workshop as described in annex 6 can be considered a combination of a direct and participant observation.

Physical artifacts

During a field visit (direct observation), physical artefacts can be observed. The most interesting artefacts will be engineering works. However, as mentioned at direct observation, only an impression can be made.

Contacts

A brief survey of potential case studies indicates finished projects, in which sustainable criteria are included, are scarce. However, some important contact persons became clear. In table 13.27, these contacts are described. This list, however, is not to be considered finite.

Table 13.27
Contact persons case studies

Naam	Functie	Contactgegevens
Ed Milder	Projectmanager afdeling wegen provincie Utrecht	ed.milder@provincie-utrecht.nl 030 – 2583265
Paula Kuijpers	Adviseur Rijkswaterstaat staf DG / Markt & Inkoop	paula.kuijpers01@rws.nl 070-3518209 06-15359037
Michiel Beek	Regisseur milieutaken gemeente Zeis	m.beek@zeist.nl 030 - 6987 422
Axel de Boer	Programmavoorzitter duurzaam inkopen VROM	Axel.deBoer@minvrom.nl
Lie Chahboun – van der laag	Programmavoorzitter duurzaam inkopen SenterNovem	l.chahboun@senternovem.nl
Marjolijn Balkenende	Inkoop- en aanbesteedadviseur AKI prorail	marjolijn.balkenende@prorail.nl

Questions

Here, the specific questions that should be answered by the case study are described. By keeping these questions in mind during the case study, the focus will be on the correct data and information. Providing answers to these specific questions forms important imput to the more general questions as stated in §2.4

Technical

Which (sustainable) criteria are used during the development of RI projects?

What tools or methods are used to assess these criteria during the procurement process?
How did the criteria influence the result of the project?

Institutional
Which parties were involved during the public procurement process of RI projects?
What were the roles of these parties?
What network characteristics were present in the public procurement process of RI projects?
How was cooperation of all employees stimulated?

Process
How preceded the integrating sustainable criteria during procurement?
What were the core process challenges when integrating public procurement of RI projects?
What measures are taken to overcome these challenges?

Case study outline
The case study outline per single case research will be as follows:
1. Information source
2. Technical considerations
3. Institutional considerations
4. Process considerations
5. Conclusions

ANNEX

8 Interview template case study

Datum :
Geïnterviewde :
Case :
Rol in project :

Vindt u het goed als ik dit gesprek opneem?

1. Opening
1.1 Persoonlijke introductie
1.2 Introductie afstudeeronderzoek
1.3 Introductie geïnterviewde (functie / rol tijdens project)

2. Procesreconstructie
2.1 Algemeen (verloop, waarom duurzaam)
2.2 Technisch
- 2.21 Welke criteria zijn opgenomen om duurzame oplossingen te bereiken?
- 2.22 Hoe is gemeten of inschrijvingen hieraan voldoen?
- Klopt dit met het uiteindelijke resultaat?

2.3 Institutioneel
- 2.31 Hoe is de samenwerking verlopen?
- 2.32 Is uw belang uiteindelijk goed vertegenwoordigd?
- 2.33 Welke wetgeving / convenant heeft bijgedragen aan de oplossingen?

2.4 Proces
- 2.41 Is het proces soepel verlopen (alle partijen enthousiast)? Wat waren de knelpunten?
- 2.42 Hoe zijn knelpunten weggenomen / voorkomen?
- 2.43 Wat is er van het proces geleerd?

3. Afsluiting
3.1 Controle van interviewuitwerking
3.2 Mogelijkheid om contact op te nemen voor extra informatie

Hartelijk dank voor uw informatie

Persoonlijke aandachtspunten
- Objectief luisteren naar geïnterviewde
- Vraag naar bewijslast voor stellingen van geïnterviewde
- Laat geïnterviewde redelijk vrij spreken, maar bespreek alle aspecten
- Let op je doel:
  Identificeren knelpunten en oplossingen (best-practices) DUIK wegproject

ANNEX

9 Case study

During this case study, three cases are in depth analysed. In annex 6, the case study protocol is given. It contains the instruments as well as the procedures and general rules applied during the carrying out of the case study. During two cases, interviews were an important source of information. In annex 8, the interview template used can be found.

The focus during the cases was on quality rather than on quantity. Especially in the current environment, only few road infrastructure works are carried out following the idea of sustainable procurement. Therefore, more added value was present in profound analysis of these cases than in superficial analysis of all road projects. This included, among others, own observation. This method was, of course, time consuming.

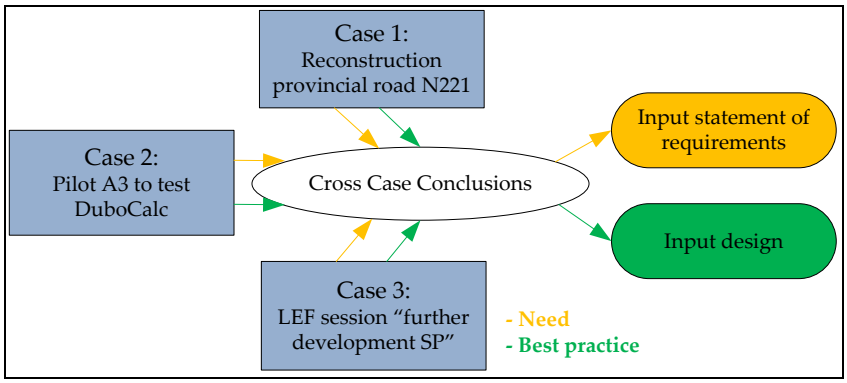
In the first case, the reconstruction project of the provincial road N221 is analysed. This project, probably, is the only finished provincial road infrastructure project executed with the idea to sustainable build it. Although the policy of sustainable procurement was not known, several sustainable measures are explicitly taken by use of an innovative tender.

In the second case, the fictive pilot project of the A3 is analysed. During this project, the usefulness of DuboCalc, a program to quantify sustainability is tested. RWS considers DuboCalc the basis to sustainable procure (road) infrastructure projects. During the project, contractors provide a fictive proposal and evaluated the project, process, and DuboCalc.

In the third case, the LEF sessions "further development sustainable procurement GWW" are analysed. During two workshops, relevant actors had a brainstorm about improvements of current SenterNovem criteria. The aim of these sessions is to start the process towards "functional and adequate criteria", optimal for the innovative tender method.

Finally, we draw cross case conclusions based on the analysis. This will provide both input for the statement of requirements (needs) and input for the design (best practice).

Figure 14.27
Contribution cases



A3.1 CASE I: RECONSTRUCTION N221 BAARN

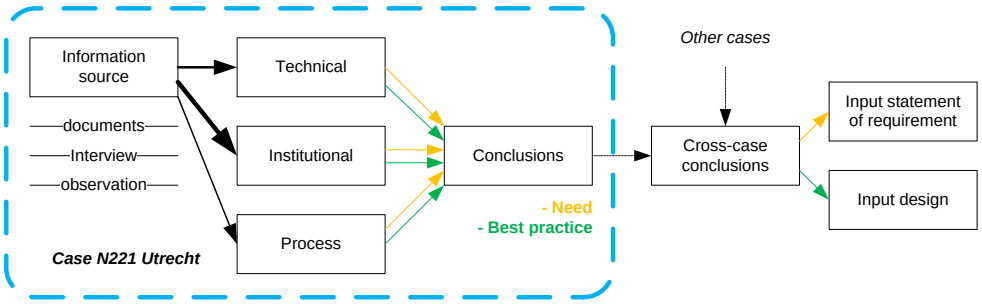
The first case describes the reconstruction of the N221 (Amsterdamsestraatweg). The N221 is, as a provincial road, under control of the province of Utrecht. Within the project scope, however, the road crosses territory of Baarn.

The project is set up as a pilot for integrating sustainable building (DuBo) in road infrastructure projects. As such, proposals are not only assessed on quotation, but also on (sustainable) quality. Furthermore, the province, for the first time, used a Design & Construct contract.

Although the project is relatively old (2004), it does provide much information. Because the project is set up as a pilot, much information is available. Especially, because Ed Milder kindly co-operated to find all relevant documents and contacts. Furthermore, this project might very well be the only finished provincial road infrastructure project executed with the idea to sustainable build it.

In figure 14.28, a visualization of the position of this case study within the complete research thesis is given.

Figure 14.28
Location N221 case study



First, an overview will be given about the information sources used in this case study. This includes documents, interviews, and observation. Second, the technical aspects of the project will be analysed. Here, the project is described, and the sustainable implications of the project are given. Third, the institutional considerations of the project are analysed. These include the parties involved, the type of tender, and the juridical implications. After this, the process itself is analysed. Finally, conclusions are drawn about both the (remaining) needs of the province of Utrecht and the best practices.

INFORMATION SOURCE

The information necessary to carry out the case study was relatively, hard accessible. Especially, because the project is executed 5 years ago, and exactly remembering it gave employees some trouble. However, due to the support of Ed Milder, all relevant documents are found. With this information, also, relevant interviewees are set in train.

Documents

The province of Utrecht generously agreed to give along several documents relevant for the case study. These documents include, among other, meeting documents, proposals, and evaluation documents. In table 14.28, all documents used during this case study are given.

Table 14.28
Documents case study RWS

	Document	Source	Description
D1.1	A-stuk nr 14: GS vergadering 01-09-1998	PE Utrecht	Meeting document describing the (PE) decision to reconstruct the N221
D1.2	B-stuk29: GS vergadering 24-06-2003	PE Utrecht	Meeting document describing the (PE) decision to follow the idea of sustainable building.
D1.3	Traverse Baarn nr.1 t/m 6 informatiebladen	Province Utrecht	Magazine providing neighbors with information about the reconstruction.
D1.4	Convenant Duurzaam Bouwen Regio Eemland	Eemland	Covenant of several parties within the region of Eemland agreeing to seriously take sustainability into account during (the procurement of) projects.
D1.5	Duurzaam bouwen N221 Traverse Baarn	ARCADIS	Report with the results of a workshop held at the province of Utrecht to investigate possible sustainable measures within road infrastructure projects.
D1.6	Inschrijvingsdocument N221 (3x)	Contractors [18]	The proposals of contractors to reconstruct the N221. The documents contain the sustainable measures every contractor takes.
D1.7	Communicatieplan Reconstructie N221 Baarn	Korbee & Hovelynck	Plan of communication before, during, and after the reconstruction of N221
D1.8	Reconstructie Amsterdamsestraatweg	KWS	Intention of reconstruction N221
D1.9	Gunningsadvies	Provincie Utrecht	Assessment of proposals to reconstruct the N221 based on Economic Most Valuable Proposal (EMVI)
D1.10	CPX-metingen N221 te Baarn	KWS	Report of CPX – measurement before and after reconstruction to assess the sound damping
D1.11	Snelheidsmetingen N221 Baarn	Grontmij	Report of speed measurement at three locations of the N221 to assess the influence of the reconstruction on driven speed.
D1.12	Evaluatie verkeersslachtoffers N221	Province Utrecht	Evaluation of traffic casualties to measure the influence of the reconstruction on traffic safety.

Interviews

Next to the documents, interviews were an important source for information. The main interviewee was E.A.M Milder, who was responsible for the complete project. As such, he was able to provide the telephone numbers of the executive leader, a representative of the municipality of Baarn, and a contact person of the contractor of the project. Conspicuously, the procurement department of the province was not involved at all during the project. In table 14.29, the interviewees are identified.

Table 14.29
Interviewees case study RWS

	Interviewee	Profession	Role in project
I1.1	E.A.M Milder	Project manager prov. Utrecht dep. Roads/ Team projects	Project leader orientation phase
I1.2	A. van Bree	Advisor / Project manager prov. Utrecht dep. Roads	Project leader execution phase

[18] KWS Infra, Ballast Nedam, Bruile Ede

I1.3	G.J. Hoitink	Staff member traffic municipality Baarn	Representative of the municipality of Baarn
I1.4	W. van Vliet	Communication manager InfrA2 KWS	Constructor of KWS

Observation

Because the reconstruction of the N221 is completely carried out, it was possible to observe the result. Ed Milder kindly organized a lease car and came along to explain the taken measures (ph. 14.2). Own observation from the scene are referred to as O1.1.

Photo 14.2

Observation of intersection "Oranjeboom". In front, lease car of province Utrecht.

TECHNICAL CONSIDERATIONS

The most important technical aspects within the project are the actual (sustainable) technical solutions set up during the reconstruction of the N221. Based on these solutions, the technical needs and best practices will be analysed. To that end, a description of the executed project will be given. Furthermore, the technical solutions provided during the reconstruction will be evaluated.

Project Description

The project at hand is the reconstruction of the N221 (Amsterdamsestraatweg) from the roundabout Drakenburgerweg to the intersection "Oranjeboom" (van Heutszlaan/Hilversumsestraatweg (N415)). The reconstruction covers approximately 2 kilometres (D1.1; D1.8).

The function of the road is to open up the area, meaning the road links the local and the national roads. Immediate causes of the reconstruction are the number of accidents, unsafe crossing, and noise hindrance (D1.2).

The main aspects of the reconstruction are (D1.3):

- Adjusting the sideways connections
- Renewing the coating
- Renewing the cycle- and footpaths
- Speed regime 80-50-80

In figure 14.29, the project scope is visualized.

Figure 14.29
Project scope reconstruction N221 Baarn (adjusted from D1.3)

The initial design included a double lane roundabout on the intersection Oranjeboom (D1.1). At the instance of neighbours, this roundabout is substituted by a "duurzaam veilig (sustainable safe)" intersection. Project leader (orientation phase) Ed Milder, requested the released money to add sustainable measures to the road project (I1.1; I1.2).

To make an inventory of potential sustainable measures for the reconstruction of N221, Arcadis carried out interviews, workshops, and technical staff meetings (I1.1). Hereby, input is received from several disciplines[19] within the province. Based on the input, Arcadis gave recommendations for tangible (technical) sustainable measures (D1.8).

After estimating the measures, the province of Utrecht decided to prescribe the most important measures as put forward by Arcadis. Furthermore, the integral report is provided to the contractors. The winning contractor, KWS, proposed to take several extra sustainable measures advised in the report (I1.2).

Sustainable measures

Given all measures taken, we identify four main themes (D1.3; D1.5; D1.6; D1.8; I1.1; I1.2):

- Sustainable safe
- Energy reduction
- Living environment
- Sustainable use of materials

In table 14.30, the sustainable measures are charted per theme. Furthermore, the initiators of the measures are distinguished by (D1.6):

[19] Design, Execution, Maintenance, Environment, Energy, Water, Project leader, Program management

Prescribed in statement of requirements (method chosen by province)

Function prescribed (method chosen by contractor)

Extra (proposed by contractor)

Table 14.30
Sustainable measures per theme

Sustainable safe	Energy reduction	Living environment	Sustainable use of materials
Separation of carriageway and bicycle path	Dynamic traffic distribution (VRI) with led	Speed regime 80-50-80 km/hr	Concrete centre conductor
Shutting down sideways to lower points of conflict	Dynamic illumination system (dipped at night) with high pressure sodium vapour lamp	Sound attenuation asphalt	Use of granulated concrete
Safer traverse via centre conductors		Rain is received in a separate drain system and infiltrated in soil	Reuse of materials
Sustainable safe intersection		Reserving and replanting of trees	Separation of tarred asphalt
Cat's eyes on centre conductors for visibility		Water-permeable bicycle paths "Gasfalt"	Apply secondary- and recycled materials
Spettermarkering (Spatter marking) to raise visibility		Contractors communication advisor	Strive for a closed mass-haul diagram
Reflexing White compound in concrete			

Evaluation of (sustainable) technical solutions

Here, we will analyse the provided technical solutions. Off course, not all measures can be analysed into depth. However, given the studies available, and observations made, every theme will be reviewed.

Overall, all parties conclude the project to be a success. While the interviewees conclude the process to be rather hard, all agree the result is a nicely adjusted road. Also, the rather critical neighbours were satisfied (I1.1; I1.2; I1.3; I1.4). In figure 14.30, a presentation of the old and new situation within build-up area is given.

Figure 14.30
Old and new situation N221 (D1.3)

Evaluation of sustainable safe

The project is carried out given the idea of sustainable safety. Tangible fulfilment of this idea can be found in the separation and elevation of the bicycle path (ph. 14.3), and elevation of the intersection ("Oranjeboom"). Furthermore, cat's eyes on the centre conductors should raise attention (ph. 14.4), while spatter marking should be better visible under all conditions (ph. 14.5).

Photo 14.3
Separation and elevation of bicycle path (O1.1)

In the new situation (O1.1):

1. The bicycle path is separated from the car lane.
2. The crossing path is elevated 8 cm to raise attention.
3. Walkers and cyclists are given priority.
4. Differentiated road markings are used to "self explain" the user (4)

All these aspects are in line with the idea of Sustainable Safety, and specifically "Richtlijn Essentiele herkenbaarheids-kenmerken van weginfrastructuur (Directive essential recognizable characteristics of road infrastructure) (EHK)" (CROW, 2003).

Photo 14.4
Cat's eye on centre conductor (O1.1)

18 Cat 's eyes are constructed on the centre conductor. A cat's eye is a reflectors that lights up if the head lamps of a car are pointed at it.

Photo 14.5
Spatter marking (O1.1)

Spatter marking (below) is assembled by spattering the marking on the surface. This method should improve the visibility, especially at night and under bad weather conditions. It is, however, unknown if users actually experience this (O1.1).

To evaluate the impact of all the safety measures, the number of accidents before and after the reconstruction is used. With this information, it might not be possible to evaluate the measures separately, but it does provide information about the integral influence on safety.

In table 14.31, we see a small decrease of accidents in the year the N221 is reconstructed. After the acceptance of the reconstructed road, we see a serious decrease in 2005. From this, the province of Utrecht concludes the combination of safety measures did work (D1.12).

Table 14.31
Evaluation of accidents on N221 (D1.12)

Accident	2001	2002	2003	2004	2005
Fatal	0	0	1	0	0
Injury	4	4	7	3	1
Material	12	13	9	10	4
Total	**16**	**17**	**17**	**13**	**5**

The measure "Reflexing White compound in concrete", however, did not add to this result, because the material did not become visible during these years (I1.2; I1.4)

The conclusion of the improved safety seems correct given the obvious decrease of accidents in 2005. One should keep in mind, however, the influence of the diminished speed limit (80 to 50) within the build-up area. Also, no numbers are available for 2006 and beyond. Nonetheless, the integral project, indisputable, had a great and positive impact on the overall safety.

Evaluation of energy reduction

While two specific measures to lower the energy consumption are prescribed, no information is available about the actual energy reduction provided by these measures. Therefore, it is not possible to evaluate the influence of these aspects.

Evaluation of living environment

The most relevant studies for living environment are speed measurement and noise pollution. Grondmij and KWS, respectively, carried out these studies. In table 14.32, the results of three traffic speed measurements at the new N221 are shown (D1.11).

Table 14.32
Speed measurement at N221 (D1.11)

Location	Hm 34		Hm 34.5		Hm 35.1	
Max speed	80 km/hr		50 km/hr		80km/hr	
Direction	Baarn	Soest	Baarn	Soest	Baarn	Soest
Average speed	57.8	56.6	49.3	50.1	57.2	55.1
85 percentile	63.8	62.55	55.1	55.1	66.06	64.0

The speed within the 50 km/hr area is reasonable with an 85 percentile of 55 km/hr. Two speed measurements approximately 300 meters from the 50 km area resulted in results far beyond 80 km/hr. Therefore, the speed measures also have impact before and after the 50 km area. From this, the province concluded the reconstruction sort the desired effect (D1.11).

In table 14.33, the results of two CPX measurements (before and after reconstruction) are given. The Close-Proximity Method (CPX) measures the noise emission from a standard passenger car tire when rolling over a road surface. The CPX measurement is described in the ISO standard ISO/CD 11819-2 (D1.10)

Table 14.33
Measurement of noise pollution N221 (D1.10)

Average SPB value [dB(A)]	50 km/hr	80 km/hr
Before reconstruction	68	74.8
After reconstruction	64.9	70.8
Difference	-3.1	-4

The results of the CPX measurement show the construction of the sound attenuation asphalt "ZSA" did work (D1.10). With a noise damping of 3.1 and 4 Decibel respectively, the goals of the province are met. Furthermore, neighbors did experience the decrease of noise quoting: "Finally I can sleep with open windows" (I1.2).

A very important aspect for inhabitants was the reserving of trees. Therefore, the province decided to adjust the cross section of the bicycle path. In photo 14.6, it can be seen, the bicycle path is constructed further away from the car lane. This way, chopping down 18 trees is prevented.

Photo 14.6
Reserving of trees by adjusting cross section of bicycle path (O1.1)

Evaluation of sustainable use of materials

While the contractor proposed to take several extra measures, no information is available about the actual use of materials. Given the fact that most of the proposed measures also have economic advantages (reuse of materials, closed mass-haul diagram, etc.), however, it can be assumed the contractor kept his promises.

The main advantage of a concrete centre conductor should be that no weeds grow on the conductor. Therefore, the need for maintenance is minimized. During the observation, it became clear, the conductor is not damaged and, indeed, free of weeds. This can be seen at photo 14.7.

Photo 14.7
Concrete centre conductor (O1.1)

Unfortunately, it became clear during the observation, both the bicycle path and the car lane were partly damaged (photo 14.8). This can be explained by the high traffic intensity on the N221, and the relatively low life span of sound attenuation asphalt (I1.2). Nonetheless, it is a shame this damage is a fact, already five years after construction.

Photo 14.8
Damaged bicycle path (left) and care lane (right) (O1.1)

INSTITUTIONAL CONSIDERATIONS

The institutional aspects within the project are the (institutional) agreements between actors, the type of tender and contracting, and other juridical implications. While analysing the institutional needs and best practices, the center of excellence is the influence (in)formal institutional agreements and environment had on the behaviour of actors.

Actors

During the project, several actors were involved. Based on the communication plan, the contract proposals, the evaluation studies and interviews, the main actors are identified (D1.6; D1.7; D1.11; I1.1):

- Municipality of Baarn
- Province of Utrecht
- Neighbours
- Contractor
- Advisors

Municipality of Baarn

The provincial road N221 crosses territory of Baarn. Therefore, the municipality of Baarn was involved in the decision process. The municipality influenced the design process of the province to raise support among the neighbours. On the other hand, the municipality did support the reconstruction financial.

Province of Utrecht

As initiator of the reconstruction, the province of Utrecht had a great stake in the process of reconstruction. Especially, the department transport was accountable for a good result. Under the responsible project leader, several market groups cooperated. As officer, the provincial executive did agree with the ideas of the project leader and financed the contractor.

Neighbours

While the neighbours did support the goals of the reconstruction, they did not agree with several proposed measures. They influenced the province of Utrecht both directly and indirect. Here for, among others, action committees were formed. Two design changes directly relate to the participation of the neighbours:

1. The design of a cross section instead of a roundabout at “Oranjeboom”
2. The saving of 18 trees by relocation of the bicycle path

Contractor

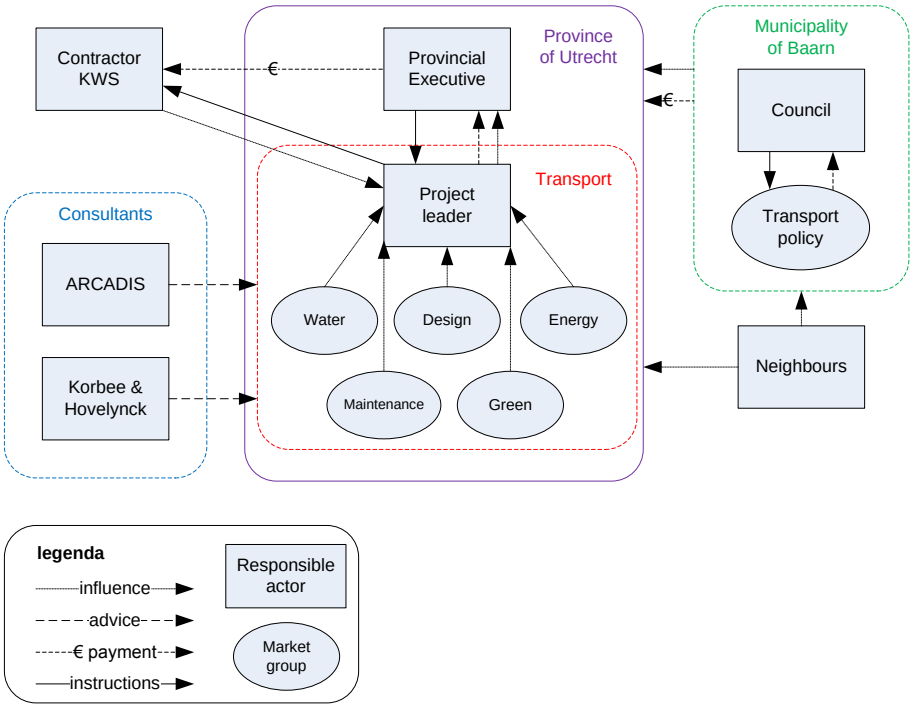
The contractor of the reconstruction project, KWS, was a key player during the project. It did not only carry out the instructed measures, but proposed extra measures. This was also the reason they won the tender. After completion, all parties were satisfied with the executed work. KWS completed the work even before the promised date.

Consultants

Two consultants played a significant role during the reconstruction project. ARCADIS helped the project leader to add sustainable measures to the project. To that end, actors of several disciplines provided input in two workshops. Korbee & Hovelynck helped the project leader with a communication plan.

In figure 14.31, the actors and their interactions are visualized.

Figure 14.31
Actor network N221



Informal institutional environment

When analyzing the informal institutional environment, the cultures at the province of Utrecht and at contractor KWS are most relevant. The background of both cultures can be found in the decades used contract award based on lowest price.

Provincial culture

As awarding authority, the province of Utrecht has an enormous impact on the result of the project. Within the province, the focus of projects often is on reducing costs. While sustainability is considered important, the expected increase of costs is a serious burden. Furthermore, the clerks believe their actions already to be very sustainable. (I1.1; I1.2).

Within this culture, the interest during the project for sustainable building is remarkable. A concurrence of circumstances, however, enabled this. Firstly, due to design changes, calculated money became available. Secondly, the project leader had a personal interest in sustainable building, and requested this money to add sustainable measures. Thirdly, these measures could raise support among the critical neighbours (I1.1; I1.2).

The project was set up as a pilot for sustainable building. While all parties considered the pilot a great success, no follow up ever took place (I1.1; I1.2; I1.4). Here the influence of the culture can be found. At this moment, the attention for sustainability does not have its root in policy and procedures, and largely depends on the project leader (I1.1).

Contractor's culture

The culture at the contractor is extremely conservative. Its actions are largely determined by economic motives. Sustainable measures are often taken due to economic advantages. Recycling materials and lowering energy utilization, for instance, both cuts cost (I1.4). When

searching for optimization, the contractor will rather try to minimize costs than to optimize sustainable innovation.

Of course, the contractor largely depends on the awarding authority for his income. Therefore, if the assigning of a contract depends on sustainable measures, an obvious motive is present. For exactly this reason, the contractor put much effort into the sustainable aspects during the tender process of N221 (I1.4).

Formal institutional environment

When analyzing the formal institutional environment three elements are most relevant:

- Legal environment of reconstructing road infrastructure
- Policy regarding sustainable building
- Legal environment of procurement / tender process

Legal environment reconstruction

The legal environment of reconstructing the N221 determines the framework in which measures should remain. The most relevant laws in the project were the "Wegenverkeerswet", precursors of "Wet Ruimtelijke Ordening", and "Wet Geluidshinder".

The basis of all rules on the road can be found in the "Wegenverkeerswet". Most relevant during the reconstruction were the rules relating the new speed regime and road marking.

The precursors of "Wet Ruimtelijke Ordening" provided the possibilities to adjust the regional- and development plan. This included the expropriation of ground to enable widening of the road.

Due to the high sound pollution before the reconstruction, the "Wet Geluidshinder" obliged sound reduction measures. The law, therefore, was an initiator for these 'sustainable living environment' measures.

Policy sustainable building

The government pointed out the sector "construction industry", in the "Nationale Milieubeleidsplannen (National Environmental Policy)" and "Plan van Aanpak Duurzaam Bouwen (Plan Building Sustainable)", to accomplish sustainable development. Furthermore, the "Beleidsprogramma" (policy) 2000-2004 amplifies this.

The policy regarding sustainable building at governmental level formed an initiator for several parties within the region of Eemland, to conform to take sustainable measures. While the concept of sustainable procurement was not known during the project, sustainable building was.

Legal environment reconstruction

During the tender process of the reconstruction, the province did not use a regular RAW contract. Therefore, the province used the regulatory requirements as described in the UAV-GC 2000, the precursor of UAV-GC 2005.

Concerning the tender process, both the precursors of ARW 2005 (UAR 2001) and BAO (Boa) were relevant. Without any legal problem, the province preselected three parties based on their experience with sustainable building. The process, thus, can be concluded a restricted tender (I1.1).

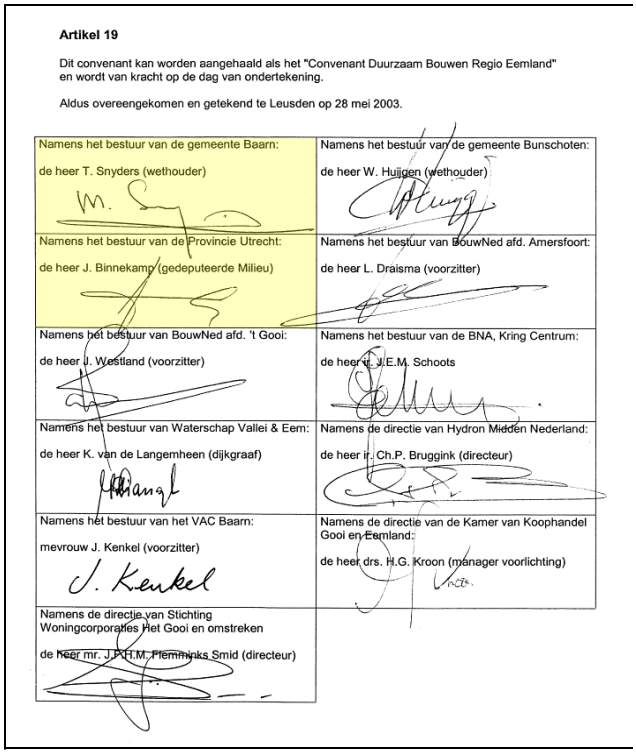
Institutional arrangements

When analyzing the institutional arrangements, the formal "Eemland covenant" and the contract between the province of Utrecht and the contractor are most relevant. Furthermore, the informal relations "province/contractor", and "province/municipality" played a significant role in the project.

Eemland covenant

Considering the governmental policy regarding sustainable building, several parties, within the region Eemland, signed the "Convenant Duurzaam Bouwen Regio Eemland (Covenant Building Sustainable Region Eemland)" (fig 14.32).

Figure 14.32
Signed Eemland Covenant 2003



Artikel 19

Dit convenant kan worden aangehaald als het "Convenant Duurzaam Bouwen Regio Eemland" en wordt van kracht op de dag van ondertekening.

Aldus overeengekomen en getekend te Leusden op 28 mei 2003.

Namens het bestuur van de gemeente Baarn: de heer T. Snyders (wethouder)	Namens het bestuur van de gemeente Bunschoten: de heer W. Huijgen (wethouder)
Namens het bestuur van de Provincie Utrecht: de heer J. Binnekamp (gedeputeerde Milieu)	Namens het bestuur van BouwNed afd. Amersfoort: de heer L. Draisma (voorzitter)
Namens het bestuur van BouwNed afd. 't Gooi: de heer J. Westland (voorzitter)	Namens het bestuur van de BNA, Kring Centrum: de heer ir. J.E.M. Schoots
Namens het bestuur van Waterschap Vallei & Eem: de heer K. van de Langemheen (dijkgraaf)	Namens de directie van Hydron Midden Nederland: de heer ir. Ch.P. Bruggink (directeur)
Namens het bestuur van het VAC Baarn: mevrouw J. Kenkel (voorzitter)	Namens de directie van de Kamer van Koophandel Gooi en Eemland: de heer drs. H.G. Kroon (manager voorlichting)
Namens de directie van Stichting Woningcorporaties Het Gooi en omstreken de heer mr. J.P.H.M. Flemmiks Smid (directeur)	

The goal of the covenant is "to raise building sustainable within the region Eemland to a higher level both in ambition and execution". Most relevant, in this case study, are the parties "municipality of Baarn", and "province of Utrecht".

The project leader used the covenant to pursue the Provincial Executive to reserve money for sustainable measures. In this case, this meant the use of set free budget. Furthermore, the municipality of Baarn was requested to keep their promise via financial means (I1.1; I1.2). The project leader convinced both parties.

Contract

The contract between KWS and the province of Utrecht is a special one. During interviews, it became clear the ideas about the contract differ. Parties describe the contract either as Design & Construct (I1.1; I1.4), or Engineer & Construct (I1.2). Commonly, all parties agreed the contract was not a "regular" RAW contract.

Based on the information, we can conclude the contract consist of three elements (D1.6):

1. A RAW part in which exactly is described how the road should be reconstructed, including amount of materials.
2. An E&C part in which exactly is described what (not how) sustainable measures the contractor should take at least (e.g. sound attenuation asphalt).
3. A D&C part for extra measures the contractor can propose to score bonus points.

The first element is based on the lowest price principle. The contractor should minimize the quotation of element to win the tender. For the other two elements a ceiling price is given. To score on these elements, the quality of element 2, and the added measures of element 3 are relevant. The total contract is based on EMVI.

The chosen tender method provides several advantages. The EP knew, beforehand, exactly what the costs of sustainable building were due to the ceiling price. Furthermore, both competition on price and sustainable quality is present (I1.1; I1.4).

Relations

Since the fraud in the Dutch construction industry, governmental parties are reserved regarding their relation with contractors. Nonetheless, communication is a critical success factor towards sustainable building. Before contracting, market consultation can provide the province with information about the current technological possibilities (I1.2). During the execution phase, communication enables necessary adjustments (I1.4).

All parties conclude the communication and collaboration between the contractor and the province to be excellent. Unfortunately, this is not completely common. The project team reached this success by the effort of individual project members (I1.1; I1.2; I1.4).

The relation between the project leader and the clerks of the municipality of Baarn was good. However, there were struggles with the council about the financial contribution and the speed regime. To preserve the relationship, the province of Utrecht admits to change the design significantly (I1.1). These changes were based on the wishes of neighbors.

PROCESS CONSIDERATIONS

The process towards the reconstruction of the N221 has been very intensive. In table 14.34, a chronological overview of the events during the process is given.

Within the process, five stages can be determined:

- Orientation (1996-1998)
- Design (1998-2003)
- Contracting (2003-2004)
- Realization (2004)
- Evaluation (2004-2006)

Table 14.34
Chronologic reproduction of process events

Date	Event
1996	Problem exploration by Provincial Council (PC) Utrecht
1996, January	Information meeting to determine the current problems together with neighbours and other stakeholders
1996, April	Information meeting to present possible measures to neighbours and other stakeholders
1997, October	PC approval of reprioritization of road projects during "begrotingsbehandeling"
1998, February	Feedback meeting with neighbours and other stakeholders
1998, September	Provincial Executive (PE) decides to reconstruct the road section "intersection Oranjeboom – Drakenburgerweg (N221)" and to construct a double lane roundabout on the intersection Oranjeboom.
1998, September	Positive advise of commission "Verkeer & Vervoer"
1999, March	PE decides to 1) maintain the speed limitation 80-50-80 km/hr, 2) separate the execution of intersection "Oranjeboom" from project, 3) small adaptations to minimise number of trees cut down.
2001, February	PE decides to make €79.500 available for " het ervaringsproject Duurzaam Bouwen N221 traverse Baarn"
2002, March	Workshop with employees of the province of Utrecht and Baarn to determine the main Sustainable Building (DUBO) themes and to form goals.
2002, April	Follow-up workshop to determine the ambition and potential measures for Sustainable building of the project N221 urban connector Baarn.
2002, July	Report with conclusions from workshops provided by ARCADIS.
2003, April	Communication plan reconstruction N221 Baarn by Korbee & Hovelynck
2003, May	Signing "Convenant Duurzaam Bouwen Regio Eemland" by, among others, municipality of Baarn and province of Utrecht.
2003, June	PE decides to 1) apply sustainable measures within the project, 2) replacement of the current traffic system (VRI) instead of a roundabout
2003, September	Request for proposals by contractors.
2003, November	Nota van inlichtingen overeenkomst 530
2003, December	Tender by KWS, Ballast Nedam, and Bruil Ede.
2004, January	Aanbieden aan KWS
2004, March	(KWS) Measuring sound level before reconstruction with CPX method
2004, April	Start of reconstruction by KWS
2004, September	Delivery of project by KWS
2004, November	Evaluation by KWS: Measuring sound level with CPX method
2005, October	Evaluation by Grondmij: Measuring speed of vehicles
2006, October	Evaluation by Province Utrecht: Measuring number of accidents

It took eight years after the first information meeting with stakeholders before the actual reconstruction started. During these years, the design is optimised to minimise number of trees cut down. Furthermore, the decision is made to replace the VRI instead of building a roundabout. Both measures are directly caused by the participation of neighbours.

On project level, the province took several notable actions to reach a sustainable road. Although not in logical sequence, the following actions are taken:

- the province determined the main sustainable themes and goals (focus)
- the province determined their ambition
- the province determined potential measures
- the province set apart budget to take sustainable measures

The budget to implement the sustainable measures, only, became available when the PE decided not to construct the roundabout. Simultaneously, the PE formally decide to set apart budget to take sustainable measures. Therefore, the provincial (sustainable) ambition is reached due to a disappointment on another aspect. After all, the province was in favor of the roundabout.

To ensure sustainable building of road infrastructure projects, the budget should not be dependent on design changes. Furthermore, integral goals and ambitions should be present for road infrastructure projects.

CONCLUSIONS

Based on the analysis, we draw conclusion about both the best practices and the (remaining) needs of the province of Utrecht. Overall, the reconstruction of the N221 is a success. All actors are satisfied with the result. Nonetheless, several aspects are open to improvement. Especially, after the successful pilot, sustainable building did not rooted in policy and procedures.

Best practices

In table 14.8, the best practices concerning sustainable procurement are given. Hereby, we made a distinction between the technical, institutional, and process elements.

Table 14.35
Best practices reconstruction N221

Technical	Institutional	Process
Nicely adjusted road	Innovative contract	Good preparation
Maintenance free conductor	Ceiling price for sustainable building	Determination of sustainable themes and goals
Improvement living environment	Participation of neighbours	Determination of ambition and potential measures
Improvement safety	Good communication	
Budget for sustainable measures	Good cooperation contractor	
	Project leader initiates SB	
	Eemland covenant	

Technical

The technical result of the reconstruction of N221 is a success. All actors conclude the result to be a nicely adjusted road. The sustainable measures resulted in risen safety, and an improved living environment. This success was only possible due to the set free budget for sustainable measures.

Institutional

During the project, the province used, for the first time, an innovative contract. The chosen contract provides the advantage of both competition on price and sustainable quality. Furthermore, the EP knew, beforehand, exactly what the costs of sustainable building were due to the ceiling price.

The province did accommodate the participation of the rather critical neighbors. Based on their reactions, small design adaptations were made to minimise the number of trees cut down. Together with good communication, this, somewhat, raised the support during the process.

Good cooperation between the contractor and the province enabled the success of the project. Close cooperation enabled good communication with the neighbours. Furthermore, small adjustments to the original design were made in consultation with the province.

Based on personal interest, the project leader initiated sustainable building in the project. He pursued the Provincial Executive to reserve money for sustainable measures. To that end, he used the signed Eemland covenant. This way, he convinced the PE to substantiate their promises towards sustainable building.

Process

Because the reconstruction of the N221 was rather complex, an extensive preparation of the project is carried out. This prevented unexpected incidents. The project was delivered within time and budget. An important success factor regarding the sustainable measures is the, beforehand, cooperative determination of sustainable themes, goals, ambition, and potential measures.

Needs of province

In table 14.9, the encountered problems and (remaining) needs of the province of Utrecht are given. Hereby, we made a distinction between the technical, institutional, and process elements.

Table 14.36
Needs of province of Utrecht related to N221

Technical	Institutional	Process
No information on energy reduction	Province focus on reducing costs	Illogical sequence sustainable process
No information on impact sustainable material measures	Clerks consider their work sustainable enough	No integral sustainable ambition
Damaged car lane	Conservative contractor	Long preparation
Damaged bicycle lane	Participation of neighbours	Sustainable building no roots in policy and procedures
Budget for sustainable measures		

Technical

Although the province prescribed two specific measures to lower the energy consumption, no information is available about the actual energy reduction provided by these measures. Furthermore, the impact of the "sustainable material' measures proposed by the contractor is not clear. This information is necessary to know if the ambition is reached.

Both the bicycle path and the car lane are, five years after construction, somewhat damaged. This can be explained by the high traffic intensity on the N221, and the relatively low life span of sound attenuation asphalt. We can conclude, a tradeoff has to be made between sound attenuation by asphalt and life span.

While budget for sustainable measures was a best practice during the project, it remains a need for other project. The budget became available by circumstances, not by policy. During other projects, budget for sustainable measures is, regular, not available.

Institutional

A problem to implement sustainable procurement is the conservative culture both at the contractors and at the province. The background of both cultures is searching for the lowest

(proposal) price. Therefore, a cultural change is necessary at both parties. At the province, this is hardened by the belief of clerks their work is sustainable enough.

While the participation of neighbours resulted in more attention for sustainable measures, there were also pitfalls. The participation resulted in the decision to reconstruct the crossing instead of replacing it with a roundabout.

Process

Although al important steps were present during the process towards sustainable measures, the sequence was illogical. The most important aspects, formal decisions to sustainable build the project and making budget available, only took place after 7 years.

During the project, no integral sustainable ambition of the province was present. Therefore, the project team had to start with the very basic by determining themes and goals. This is one of the reasons; the preparation of the project took 8 years.

After the completion of the pilot project, sustainable building did not rooted in policy and procedures. Therefore, the procurement process, and the interest in sustainable building largely depends on the project leader.

A3.2 CASE II: REALIZATION A3 SUSTAINABLE BUILDED ROAD

The second case describes a fictive tender set up by Rijkwaterstaat (RWS). The tender comprises the realization of a national highway A3. As part of the proposal, contractors had to enclose a sustainability score, based on the software program DuboCalc. The main goal of this project was to test the usefulness of DuboCalc, as program to quantify sustainability, and basis to sustainable procurement of (road) infrastructure projects.

Although this case describes a fictive project, it does provide very much information. The pilot closely imitates a real tender, though on aspects simplification was necessary. The project is set up as a learning process for RWS. Consequently, relatively much information from feedback and evaluation was present. The contractors did not only provide a fictive proposal but also remarks on the project, process, and software program.

In figure 14.33, a visualization of the position of this case study within the complete research thesis is given.

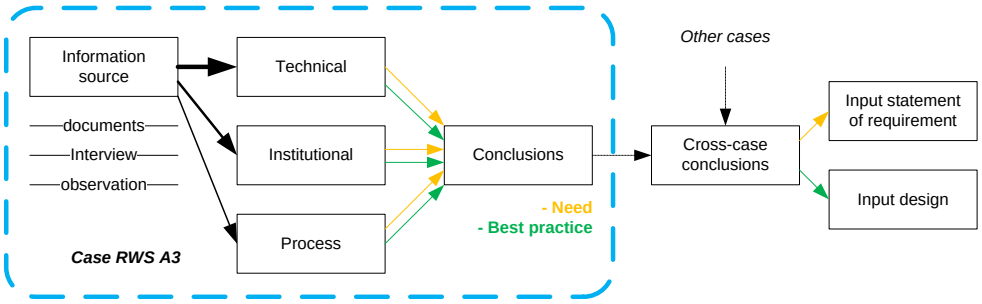


Figure 14.33
Position RWS case study

First, an overview will be given about the information sources used in this case study. This includes documents, interviews, and observation. Second, the technical aspects of the project will be analysed. Here, the fictive project is described, DuboCalc is introduced, and the sustainable implications of the project are given. Third, the institutional considerations of the project are analysed. These include the parties involved, the type of tender, and the juridical implications. After this, the process itself is analysed. Finally, conclusions will be drawn about both the (remaining) needs of RWS and the best practices.

INFORMATION SOURCE

The information necessary to carry out the case study was comparative, easy accessible. Mainly, because RWS already structured relevant documents in a digital archive for own use. Furthermore, the pilot is carried out very recently (may, 2009).

Documents

RWS agreed to send several documents relevant for the case study. These documents include, among other, the statement of requirements, the protocol, and the invitation. However, for convenience reasons, documents directly related to the contractors (proposals, mail, etc.) were made available, only, at the office of RWS in Utrecht. In table 14.10, all documents used during this case study are given.

Table 14.37
Documents case study RWS

	Document	Source	Description
D2.1	Protocol duurzaam inkopen RWS	RWS	Manual (for contractors) with information how and why to use DuboCalc
D2.2	Vraagspecificatie deel 1 DI A3-2009	V&W	Statement of requirements regarding products and intermediate products (what)
D2.3	Vraagspecificatie deel 2 DI A3-2009	V&W	Statement of requirement regarding processes of contractor during implementation (how)
D2.4	Inschrijvings- en beoordelingsdocument niet openbare aanbesteding DI A3-2009	RWS	Document providing information about the tender procedure, requirements regarding the content of the proposal, the award criteria, and assessment procedure.
D2.5	Uitnodiging inschrijving fictief pilotproject A3 Duurzaam gebouwde weg	RWS	Invitation to potential contractors. The goal of the fictive project and potential benefits of participation are described.
D2.6	Gebruikershandleiding DuboCalc v2.0	RWS	User's guide of the software program DuboCalc.
D2.7	Inschrijvingsdocument A3 (4x)	Contractors [20]	Fictive proposals of contractors (4x). Furthermore, this document contains remarks of the contractors.
D2.8	Technische beoordeling aanbiedingen	RWS	Technical assessment of the proposal by the judging-committee
D2.9	MKI beoordeling aanbiedingen	RWS	Assessment of the "DuboCalc" score by the judging-committee
D2.10	Gunningsadvies A3	RWS	Description of the fictive award of contract
D2.11	Samenvatting bevindingen pilot A3	RWS / Contractors	Summary of the remarks of the contractors regarding the project, process, and software program
D2.12	Verslag bijeenkomst evaluatie A3	Advin	Report of the evaluation meeting with RWS and the contractors
D213	Artikel "Eerste resultaten DuboCalc stellen teleur"	Coenen, I	Negative article about DuboCalc released in Cobouw.

Interviews

Next to the documents, interviews were an important source for information. RWS already extensively evaluated the process with the contractors. The remarks of these contractors were, also, clearly documented. Less information, however, could be found about RWS's own perception. Therefore, the key players of RWS for this project are interviewed. In table 14.9, these interviewees are identified.

Table 14.38
Interviewees case study RWS

	Interviewee	Profession	Role in project
I2.1	M. de Haan	Specialist Environment & Ecology RWS	Project leader of the fictive pilot A3
I2.2	G. Schweitzer	Advisor Environment & Ecology RWS	Specialist DuboCalc and member judging-committee
I2.3	J. Duijsens	Senior advisor RWS	Leader judging-committee

Observation

As mentioned before, not all documents were made available. Furthermore, RWS did not want to disclose DuboCalc, mainly to prevent a distribution of the unfinished beta version. Nonetheless, RWS did agree to make both the documents and program available at their

[20] BAM, Balast Nedam, KWS Infra, GMB-Ooms-Rasenberg

office. During two days, both the software program and documents are consulted. Own experiences with the software program are referred to as O2.1.

TECHNICAL CONSIDERATIONS

Two relevant technical aspects can be identified:

- The fictive project inquires technical solutions.
- A technical approach is taken by using a software program to quantify sustainability.

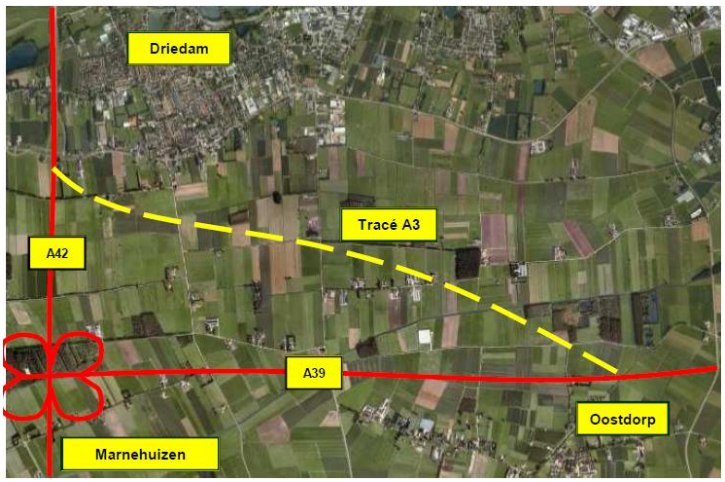
For both aspects, the technical needs and best practices will be analysed. To that end, first a description of the fictive project will be given. Secondly, the software program DuboCalc will be elaborated upon. Thirdly, the high- and lowest scoring proposals will be compared. Finally, the remarks of the contractors considering DuboCalc will be analyzed.

Project Description

The project at hand is fictive, set up to test the usefulness of DuboCalc, a program that enables to measure the environmental impact of proposals (quantified in costs) (D2.1). The fictional pilot closely imitates a real tender, though on aspects simplification was necessary (I2.1).

The project covers the realization of an (fictive) new road A3. The national highway connects the current highways A39 (Marnehuizen-Oostdorp) and A42 (Marnehuizen-Driedam). The function of the road is to raise the quality of life, accessibility, and road safety of the region (D2.2). The alignment is visualized in figure 14.34.

Figure 14.34
Alignment A3 (D2.2)

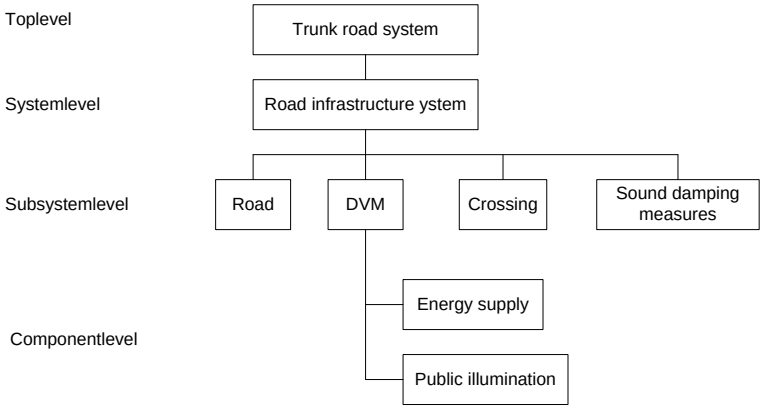


The fictive project A3 consists of (D2.5):

- National highway: 5 kilometers motorway, 2x2 traffic lanes with emergency lane and obstacle-free zone.
- Engineering structures: 3 culverts cross the motorway
- Illumination (dynamic)
- Sound-damping measures

The statement of requirement is set up using System Engineering (SE). A typical SE approach is to subdivide the project in levels (top, system, subsystem, and component). The levels distinguish by abstraction. The higher levels are more abstract. Also, the requirements at system level are binding for the complete system, including the lower levels. In figure 14.35, the object tree is given.

Figure 14.35
Object tree (D2.2)

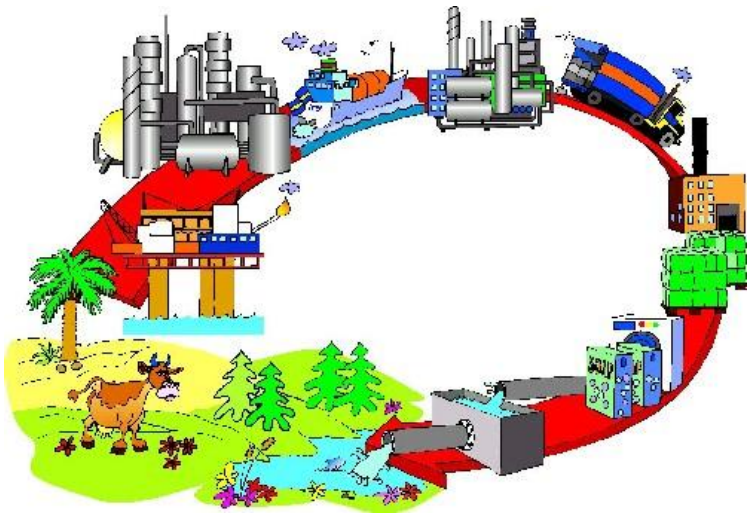


The incentive to sustainable design the system is intended by making sustainability basis to a fictive discount on the proposal (D2.1; D2.5; I2.2). As such, sustainability has to be quantified with the software tool DuboCalc.

DuboCalc

To quantify sustainability, RWS developed the tool DuboCalc. This software program calculates the environmental costs of the design by analyzing the complete life cycle of used materials and energy. The methodology is based on the standardized framework for Life Cycle Analysis (ISO 14.040 series) (D5.1; D5.6). Hereby, the similar software tool for buildings GreenCalc+ served as an example. This broadly accepted LCA-based software tool currently defines levels, enabling certifying buildings based on quality (D5.1).

Illustration 14.15
Example of life cycle (RIVM, 2009)



DuboCalc converts the environmental impact of a design into tangible equivalents such as CO2 and SO2. Following this, the presence of these equivalents is translated into shadow prices. The "MilieuKostenIndicator" (environmental costs indicator) (MKI) represents the complete shadow price for the design (D2.1).

The environmental impacts taken into account in DuboCalc are (O2.1):

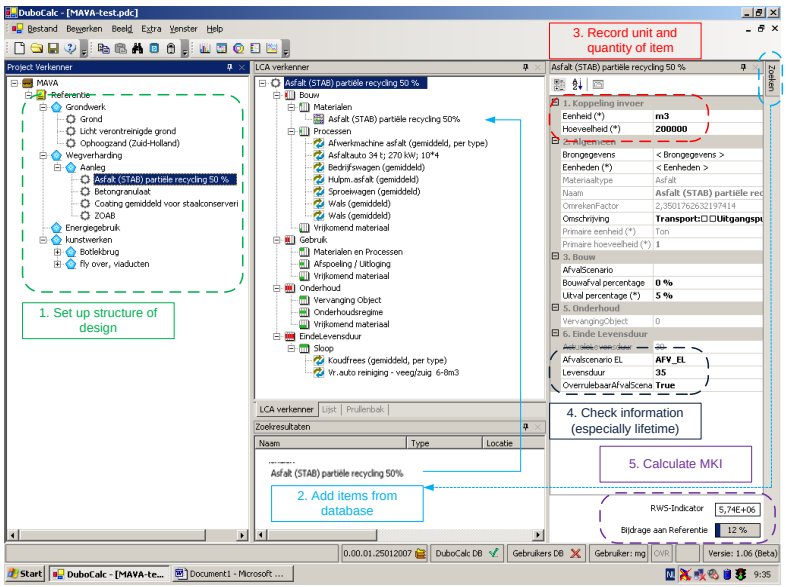
- Greenhouse effect (kg CO2)
- Acidification (kg SO2)
- Lesion ozone layer (kg CFK 11)
- Abiotic exhaustion (kg Sb)
- Philanthropic toxicity (kg DB)
- Terrestrial ecotoxicity (kg DB)
- Aquatic ecotoxicity (kg DB)
- Smog formation (kg Ethylene)
- Eutrophication (kg PO4)
- Energy (MJ)
- Hazardous waste (kg)
- Non hazardous waste (kg)

The information necessary to calculate the MKI is the amount and type of materials used for a certain design. This information, typically, can be found in the statement of estimation. DuboCalc consists of a database with items. For all these items, a complete LCA study is carried out. This study resulted in a shadow price per quantity. Compiling the design from the items enables the program to calculate the MKI. Furthermore, various variants can be compared. The following steps should be taken to model the design (D2.6; O2.1)):

1. Building the structure of the design
2. Adding the correct items from the database
3. Record the unit and quantity of the item
4. Checking information (especially life span)
5. Calculation MKI

In figure 14.36, these steps are visualized in a screenshot of DuboCalc.

Figure 14.36
Screenshot DuboCalc with model steps



Comparison of proposals

To determine the influence of the chosen tender method on the technical solutions, we compare the best- and worst scoring proposals. The assessment of the proposals is based on a fictive quotation. This quotation is determined by the following formula:

- Fictive quotation = Quotation – ((10.000.000 - MKI)* €2,-)

The implications of this method are analyzed in the institutional considerations. For now, the formula is only relevant to analyze the proposals. For convenience reasons, the contractors are anonymous. In table 14.39, the assessment of the proposals is given.

Table 14.39
Comparison of fictive quotations contractors (D2.10)

Contractor	Quotation	Subscribed MKI	Corrected MKI	Performance criteria	Fictive quotation
Contractor A	€14.200.000,00	6.470.000,00	6.460.000,00	16.080.000.00	- 1.800.000,00
Contractor B	€14.550.000,00	14.736.969,00	10.900.000,00	7.200.000,00	7.350.000,00
Contractor C	€11.860.000,00	6.279.800,00	8.600.000,00	11.800.000,00	60.000,00
Contractor D	€14.000.000,00	9.210.000,00	9.210.000,00	10.580.000,00	3.420.000,00

The best scoring proposal belongs to “contractors A” and even culminates a negative fictive quotation. It strikes, the proposal is €2.340.000 more expansive compared to the lowest bid. Furthermore, the contractor has the best MKI score.

The worst scoring proposal belongs to “contractor B” with a fictive quotation approximately 9 million higher than the winning contractor. “Contractor B”, also, has the worst MKI score. There is no doubt; there is distinctive character between the designs, based on the DuboCalc calculation.

Clearly, the difference between the best- and worst scoring proposal lies in the MKI score. Apparently, the design of contractor A is considered far more sustainable. To find the main differences between the two designs, both proposals are analyzed at Rijkswaterstaat (D2.7). In table 14.40, the items with serious impact on the MKI, as provided by the contractors, are compared. Because RWS did not make this comparison, we searched and found the items in the DuboCalc calculations (D2.7; O2.1).

Table 14.40
Comparison MKI best and worst scoring proposal

Aspect	Item	Quantity	MKI	Total MKI	
Road	IJselmeerzand (ophoog)	128.415 ton	1.2 E+06	4.44E+06	9.36E+06
	Awi Bodemas ①	286.139 m3	1.6 E+06	9.26E+06	
	Zand voor wegenbouw	143.546 ton	0.0 E+00		
	Grond	157.750 ton	2.4 E+06		
	Zand (gem)	73.149 m3	0.0 E+00		
	Grond (gem) ②	487.931 m3	2.0 E+06		
	Asfalt (STAB 50%)	45.768 ton	1.3 E+06		
	STAB 0%	72.333 ton	1.9 E+06		
	ZOAB	14.099 ton	1.0 E+06		
	ZOAB ③	18.093 ton	1.3 E+06		
Illumination	Energie	71.346 kWh	1.7 E+06	1.75E+06	4.59E+06
	Energie ④	58.000 kWh	1.4 E+06	1.42E+06	
Culverts	Verzinkt staal	66,67 ton	1.3 E+05	1.49E+05	7.74E+04
	Betonstaal (gem)	290 m3	6.6 E+04	6.60E+04	
Sound damping measures	Verzinkt staal	43 ton	8.2 E+04	1.16E+05	3.59E+05
	Verzinkt staal	75 ton	1.4 E+05	1.62E+05	
Contractor A (best overall scoring)				6.46E+06	1.44E+07
Contractor B (worst overall scoring)				1.09E+07	⑤
reference					

By comparing the data found in the, by contractors, provided DuboCalc models, five important differences became clear. These differences, highlighted in table 14.40, are (O2.1):

1. "Contractor B" decided to use AVI Bodemas (bottom ash) instead of sand. While the MKI score is higher, the contractor concluded this was compensated by the budgetary difference. He, thus, explicitly made a trade-off between costs and MKI score. However, he did not agree with the high MKI score, because AVI Bodemas has to be deposit anyhow, while sand has to be excavation on demand (D2.7).

2. Conspicuously, both sand for road construction, and sand (average) did not add to the MKI score of "contractor A". Although RWS noticed this fact, they did not adjust the MKI score (D2.8). This aspect completely determined the difference between the MKI score of both contractors. "Contractor B", who used soil, namely raised his score with 4.4 E+6, which is more than the total difference (3.63 E+6) between the two contractors (O2.1).

3. To minimize the MKI score, "contractor A" minimized the amount of materials. Especially the amount of asphalt used differs a lot from "contractor B". For the same road, "contractor A" needs 37 percent less asphalt and 22% less ZOAB than "contractor B". Partly this can be explained because only "contractor A" optimized the profile (D2.7). Nonetheless, the difference is remarkable big.

4. The only aspect on which "contractor B" scored much better is energy of illumination. While both contractors used exactly the same illumination method[21], contractor B used 74 instead of 115 lantern masts (D2.7). Apparently, "contractor B" optimized the location of the lanterns.

5. The difference between the reference MKI score and the proposals is remarkable. The worst scoring proposal scores a third better. The best scoring proposal scored, even, more than twice as good. The question remains, whether the reference was not valid, the contractors innovated during the project, or the contractors answered strategically.

Contractors evaluation

After the pilot, contractors are requested to evaluate the use of DuboCalc to sustainable procure a road infrastructure project. Hereby, they were asked to make a risk analysis and to fill in an evaluation form.

In table 14.13, we give the main risks. Here, we reproduce the risks identified by at least two contractors. Furthermore, the pretended chance of occurrence is visualized with the following values: ⚠ = small risk ⚠⚠ = medium risk ⚠⚠⚠ = big risk

Table 13.41
Risk identification contractors

Risk	Contractor A	Contractor B	Contractor C	Contractor D
Manipulation	⚠⚠	⚠⚠⚠		⚠⚠⚠
Changes after reward		⚠⚠	⚠⚠⚠	⚠⚠
Hindrance of innovation	⚠⚠⚠	⚠	⚠⚠⚠	
Delay of process	⚠⚠	⚠		⚠

[21] 15 meter high, steel lantern mast, with a double 0.2 meter persister, and SON-TP 150W armature (D1.7)

During the evaluation, the identified risks are clarified. First we will elaborate on these risks based on the (summery of) the remarks of the contractors. Furthermore, often mentioned feedback is analyzed (D2.11; O2.1).

Manipulation
Remarkable, the contractors conclude manipulation the greatest risk when using DuboCalc as part of the tender process. Hereby, the fact strategic behavior is lucrative, and testing the correctness of proposed DuboCalc models is hard for RWS, forms the basis for this conclusion.

Changes after reward
Somewhat in line with the previous risk, contractors identified the risk "changes to the design after the reward". However, next to intentional miscalculation, contractors point out, especially during innovative contracts, the design is not detailed enough during the tender phase to ensure a correct design, and thus MKI score.

Hinder of innovation
Although the intention of using DuboCalc is to sustainable procure, contractors identified an important risk towards sustainable innovation. The DuboCalc database consists of traditional items. Before a contractor can add an innovative product to the database, a complete life cycle analysis has to be carried out at the expense of the contractor. Therefore, the contractors will rather choose an existing item than to innovate.

Delay of process
Contractors assume there is a risk the length of the tender process (and its costs) will enlarge because both contractor and awarding authority have more work to do. The contractor has to fill in the DuboCalc database, while the awarding authority has to control the correctness of the models.

Remaining feedback
The contractors were, mainly, pleased RWS decided to invite them already in an early stage to test the beta version of DuboCalc. Furthermore, the intention of RWS to make sustainability measurable is considered positive. Three of the contractors believed the MKI score, after adjustments, could be used as an award criterion (D2.11).

On a critical note, the current calculation of the MKI score is considered a black box with unexpected outcomes. The contractors would like to know into more detail how the score is set up. Furthermore, contractors disliked the fact optimization of the process (e.g. minimize transport) did not influence the MKI score (D2.11; O2.1).

INSTITUTIONAL CONSIDERATIONS

The most relevant institutional aspects within the project are the actor network, the institutional environment, and the (institutional) agreements between actors. While analyzing the institutional needs and best practices, the center of excellence is the influence (in)formal institutional agreements and environment had on the behaviour of actors. Hereby, we will especially focus on the use of DuboCalc as part of the tender process.

Actors

During the project, several actors were involved. Based on the invitation of RWS, the contract proposals, the evaluation studies and interviews, the main actors are identified (D1.5; D1.7; D1.11; I1.3):

- Rijkswaterstaat
- Bouwend Nederland
- Contractors
- Advin

Rijkswaterstaat

As initiator of the pilot, Rijkswaterstaat had a great stake in the tender process. Under the responsible project leader, several members cooperated. Among these were, procurement, environment, and Dubocalc specialist. Because RWS consider DuboCalc an important tool towards sustainable procurement, the goal of the pilot was to test both the tool DuboCalc and the protocol "sustainable procurement with DuboCalc". Based on the pilot, input should be gained to improve both aspects.

Bouwend Nederland

With 5000 affiliated building companies, Bouwend Nederland is the biggest association of undertakings among construction industry. As such, it is looking after the interests of building companies. During the orientation phase of the pilot, Bouwend Nederland closely cooperated with RWS to select potential building contractors. Of these, four parties, indeed, were willing to co-operate with the pilot.

Contractors

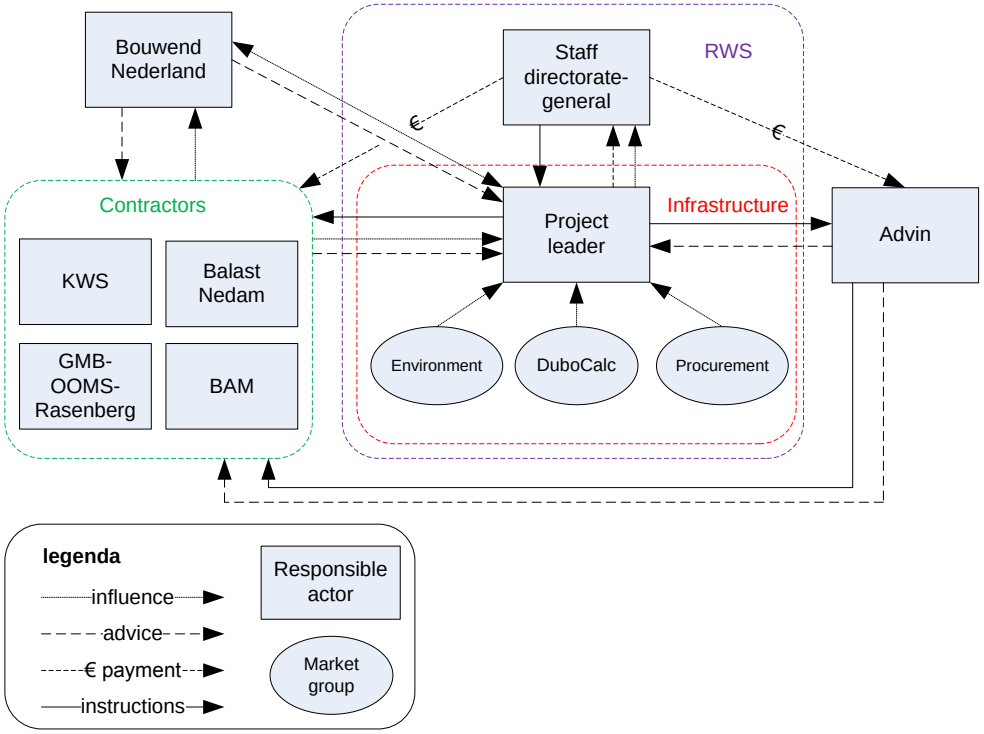
The contractors of the pilot were key players during the project. Four contractors made a fictive proposal, based on the program of requirements while using dubocalc. Furthermore, all parties evaluated the process, the protocol, and the program. In return, these contractors could influence the improvements of the tool, and be the first companies to get acquainted with DuboCalc.

Advin

The consultancy firm Advin played an assisting role during the pilot. Advin was responsible for setting up the pilot, technical support, and evaluation of the project.

In figure 14.37, on the next page, the actors and their interactions are visualized.

Figure 14.37
Actor network fictive pilot sustainable A3



Informal institutional environment

When analyzing the informal institutional environment, the orientation of Rijkswaterstaat and the culture at contractors are most relevant. For both parties, this environment has, somewhat, changed over the last years.

Orientation of Rijkswaterstaat

As awarding authority, Rijkswaterstaat has an enormous impact on the result of the project. DuboCalc originates in 2002, when RWS completely prescribed the design instead of specifying functional (I2.3). The last years, however, the liability of the design has changed from RWS to contractors. Now, the orientation of RWS is not on "lowest price" for a given design, but on "best value for money". This orientation changed DuboCalc from an "design optimisation tool" to an "assessment tool during tender process" (I2.3)

During the last years, Rijkswaterstaat attach more importance to sustainable development. The ambition of RWS exceeds the criteria of SenterNovem. Hereby the focus is on energy (CO2) and material use (exhaustion) (I2.1; I2.2; I2.3). Nonetheless, the orientation for costs is still present. All interviewees, who consider the high influence of the MKI score on awarding not realistic, underline this (I2.1; I2.2; I2.3).

Contractor's culture

While the culture of contractors is considerable conservative, four parties voluntarily contributed to apply to the pilot. These parties declare their interest of sustainable development. While this might not be pure environmental interest, at least they believe their future income will partly depend on the sustainability of their designs (I2.1; I2.3).

The parties were pleased to be invited for the fictive pilot project. This enabled them to evaluate DuboCalc and try to influence the development. Hereby, contractors accepted, RWS would not award a contract based, solely, on lowest price, but also on sustainable

quality. Nonetheless, the economic motives seem to be prominent among contractors. After all, the contractors do not believe in innovation if no financial reward is present (D2.11; D2.12). The lack of innovative encouragement was also the main accusation, in public, against DuboCalc (D2.13).

Formal institutional environment

When analyzing the formal institutional environment two elements are most relevant:

- Policy regarding sustainable procurement
- Legal environment of procurement / tender process

Policy sustainable procurement

The government set up the strategy "Duurzame Bedrijfvoering Overheid" (Sustainable governmental management) (DBO). The emphasis of the policy is to sustainable procuring 100 percent in 2010. To that end, DBO ascertained relevant sustainable criteria, set up by SenterNovem. RWS has to implement these criteria in 2010 in all contracts.

During the pilot, RWS did not add SenterNovem criteria to the contract. Nonetheless, RWS will prescribe these criteria from 2010. DuboCalc, however, should add to these criteria. This should help Rijkswaterstaat to attribute to the public ambition for 2020, to reduce CO2 emission with 30 percent compared to 1990 (I1.2; I1.3).

Legal environment of procurement

During the fictive tender process, Rijkswaterstaat used a D&C contract. Therefore, RWS used the regulatory requirements as described in the UAV-GC 2005. Furthermore, ARW 2005, and BAO were relevant.

In cooperation with Bouwend Nederland, RWS selected seven potential parties, of whom four parties make a proposal. The process, thus, can be concluded a restricted tender

Institutional arrangements

When analyzing the institutional arrangements, the formal (fictive) contract between Rijkswaterstaat and the contractors is most relevant. Furthermore, the informal relations between these parties play a significant role in the project.

Fictive Contract

The fictive tender is based on the principle of EMVI (economic most valuable proposal). Therefore, not only the price determines who wins the tender, but also the quality. In this case, the only award criterion was sustainable performance. This performance gives a fictional discount on the tender price. The discount is determined with the following formula (D2.1; D2.2):

(10,000,000 - MKI) * € 2.-.

Consequently, every cut point of the MKI (Environmental Cost Indicator) results in a fictional €2.- discount on the tender price. Therefore, the contractors are stimulated to minimize both quotation and MKI score as much as possible.

During the fictive tender, RWS used a Design & Construct contract. Therefore, contractors should use DuboCalc to optimize its design before proposing the best alternative. However,

the current design of contract will not be applied in a real project. Here, DuboCalc will rather be one of approximately four EMVI criteria (I1.2; I1.3)

Relations

The relation between RWS and contractors was, generally, good. The project team of RWS put a lot of effort into the communication during the pilot. Especially the response of contractors was an important aspect of testing DuboCalc (I2.2).

Overall, the cooperation of all contractors was very good. All parties put a lot of effort into the proposal and evaluation (I1.1; I1.2). Next to the learning process, contractors might have cooperated for relational reasons.

Unfortunately, inside information was used to write a negative reaction in Cobouw (D2.13). RWS did deeply regret this. This, of course, might have harmed the relation somewhat. However, one of the contractors replied to Rijkswaterstaat he did not at all agree with the article (I2.3).

PROCESS CONSIDERATIONS

The process of the fictive pilot has been executed in a relative short period of time. In table 14.14, a chronological overview of the events during the process is given. All these events are part of the contracting/tender phase.

Table 14.42
Chronologic reproduction of process events

Date	Event
2009, April 9	Kick-off meeting with selected parties
2009, April 9-20	Request for information
2009, April 14	Information notice
2009, May 7	Hand in tender
2009, May 7-19	Assessment tenders
2009, May 26	Evaluation, prize giving

The fictive pilot is carried out in two months. Therefore, the request was, somewhat, simplified. However, RWS concluded the process to be representative for a regular tender phase (I2.2).

While the pilot is carried out in 2009, DuboCalc originates in 2002 (I2.3). At that moment, RWS was accountable for making the design. The original goal of the tool was to support "own" designers to optimize the design, taken into account the environmental impact. Due to the transition from own design to functional request, the goal of the tool has changed to design assessment (I2.3).

The ambition before the pilot was, "to enable RWS to sustainable procure 100 percent with the help of environmental assessment tool DuboCalc" (D2.13). After the pilot, however, Rijkswaterstaat did realize the current beta version is not ready to use in a real life project (I2.2). Furthermore, DuboCalc only covers the intrinsic environmental impact of type of materials (I2.3). Other environmental aspect should be analyzed in the MER (Environmental Impact Analysis) (I2.1).

While the current version of DuboCalc is not concluded to be finale, the goal is to complete the tool before 2010. In 2010, the tool should be part of the tender process in a couple of real life projects. This might be either large or medium projects (I1.1). The advantage of a large

project is, the extra effort necessary is relatively low, compared to the complete project (I2.3). On the other hand, the risks run during a medium project are, generally, lower (I2.2).

CONCLUSIONS

Based on the analysis, we draw conclusion about both the best practices and the (remaining) needs of Rijkswaterstaat. Overall, the pilot project is, to a large extend, successful. The pilot brought to light several points of attention (needs), which are helpful for further development of DuboCalc. The only real disappointment is the negative publicity given to the pilot.

Best practices

In table 14.43, the best practices concerning sustainable procurement are given. Hereby, we made a distinction between the technical, institutional, and process elements.

Table 14.43
Best practices fictive pilot sustainable A3

Technical	Institutional	Process
Quantitative measuring of impact of used items	Innovative contract	Raising support among contractors
Contractor assess trade-off quotation and environmental performance	Fictive discount on quotation based on environmental score	Fictive pilot before introduction DuboCalc
Contractor optimize design to minimize material use	Good cooperation contractor	Transition to functional request
DuboCalc provides distinctive character between designs	Good communication	
Contractors score beyond expectations		

Technical

Because the pilot comprehends only a fictive road infrastructure project, we cannot evaluate the technical measures as provided in the proposals. Nonetheless, during the contract phase, the use of DuboCalc enabled quantitative measuring of the environmental impact of used technical items. Furthermore, contractors, explicitly, made the trade off between costs (quotation) and environmental performance of designs.

The pilot demonstrates the overall winner optimized the design to minimize necessary materials. Furthermore, the difference between the environmental scores shows DuboCalc provides distinctive character between designs based on environmental impact. All contractors scored beyond expectations, underlying the great ability of the market to adapt to sustainable ambitions of the awarding authority.

Institutional

During the project, Rijkswaterstaat used an (fictive) innovative contract. The chosen contract provides the advantage of both competition on price and environmental quality. Hereby, the DuboCalc score MKI (Environmental Costs Indicator) forms the basis to a fictive discount. This method obliges managers to translate quality into value.

During the project, there was good cooperation between the contractors and Rijkswaterstaat. Furthermore, the project team of RWS put a lot of effort into the communication during the pilot. As a result, the pilot provided both parties with much relevant information. For RWS, this information was indispensable to further develop DuboCalc.

Process

The contractors participating during the pilot were pleased to be invited to provide input to further development of DuboCalc. This is enabled by the decision to test the software tool in a fictive pilot before actually introducing it. Although not all contractors are eager to use DuboCalc in a real tender, the support for the tool raises.

On a broader perspective, the complete procurement process at Rijkswaterstaat made a transition towards functional request. This means, the contractors can come up with their own design to reach a certain performance. Hereby, the contractors are stimulated to come up with innovative products.

Needs of Rijkswaterstaat

In table 14.16, the encountered problems and (remaining) needs of Rijkswaterstaat are given. Hereby, we made a distinction between the technical, institutional, and process elements.

Table 14.44
Needs of Rijkswaterstaat

Technical	Institutional	Process
Knowledge of DuboCalc among employees RWS	Well chosen (formula for) fictive discount	Only during tender phase
Manipulation of MKI score	Negative publicity	Delay
Changes after reward		
Optimization process does not influence MKI score		
Hinder of innovation		

Technical

Knowledge of DuboCalc among employees of RWS is indisputable when DuboCalc is part of the tender process. RWS needs to be able to make a good forecast of the MKI score as well as be able to evaluate proposed DuboCalc models. Furthermore, both the program as the process should minimize potential manipulation of MKI scores.

Next to intentional miscalculation, especially during innovative contracts, the design is not accurate enough during the tender phase to ensure a correct design, and thus MKI score. This might result in changes after reward. Consequently, the actual design might not substantiate the modeled MKI score.

To enlarge both the transparency and ease of use of DuboCalc, contractors can only model the amount and type of fixed items. Hereby, for example, a fixed transport distance is set. Consequently, however, optimization of the process does not influence the MKI score. This might hinder process innovation.

The current database of DuboCalc consists of traditional items. Before a contractor can add an innovative product to the database, a complete life cycle analysis has to be carried out at the expense of the contractor. This encourages contractors to choose an existing solution instead of searching for innovation.

Institutional

It is important; the awarding authority chooses the formula for a fictive discount well. If the discount is not encouraging enough, contractors will not aim for sustainable solutions. On the other hand, if the discount is to large, the quotations might expand disproportionate.

After the pilot, a negative article is published in Cobouw. RWS should try to prevent, or at least contradict this publicity to avoid hindrance of the implementation process.

Process

During the design of DuboCalc, the procurement process at Rijkswaterstaat has changed. Therewith, the goal of the program has changed. First, RWS designer should use DuboCalc as optimisation tool. Now, procurers should assess designs of contractors with the tool during the tender phase. At his moment, many decisions cannot be influenced any more.

Using DuboCalc during the tender phase might delay the process. Both contractors and awarding authority have more work to do. The contractor has to fill in the DuboCalc database, while the awarding authority has to control the correctness of the models.

A3.3 CASE III: LEF SESSIONS SUSTAINABLE PROCUREMENT GWW

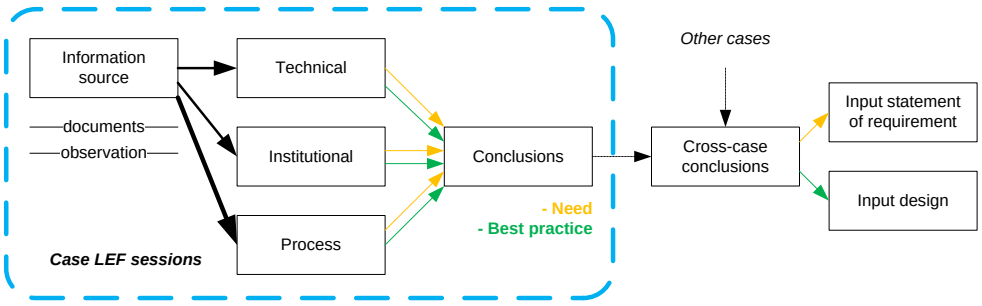
The third case describes the LEF[22] sessions "further development sustainable procurement GWW[23]". During two workshops, relevant actors had a brainstorm about improvements of current SenterNovem criteria. The main goal of these sessions, initiated by Rijkswaterstaat, is to start the process towards "functional and adequate criteria", optimal for the innovative tender method.

The case differs from the other cases because, here, no actual road infrastructure project is tendered. The ambition of participants was to improve the general process of sustainable procurement of civil engineering. Hereby, the aspired result of the project was rather an improved policy than one sustainable procured road infrastructure project.

Although it might be hard to compare this case with the other cases, the added value of the case is irrefutable. During the LEF session we became acquainted with thirty relevant actors. It was, thus a relative easy method to gain much inside information. Furthermore, Dutch politics consider this initiative of RWS to serve as an example. Consequently, this case might provide the basis for the further process of sustainable procurement.

In figure 14.38, a visualization of the position of this case study within the complete research thesis is given.

Figure 14.38
Location N221 case study



First, an overview will be given about the information sources used in this case study. This is based on some documents, and mainly observation. Second, the technical aspects of the project will be analysed. Here, the project is described, and the sustainable implications are analyses. Third, the institutional considerations of the project are analysed. These include the parties involved, their roles and interests, and intended institutional changes. After this, both the process up till now, and the intended progress from now is analysed. Finally, conclusions are drawn about both the (remaining) needs of the procuring parties and the best practices.

INFORMATION SOURCE

The information necessary to carry out the case study was relatively, easy accessible. Especially, due to the support of Paula Kuijpers who provide the invitation to the LEF sessions. During the sessions, my role was to guard the process and reflect on the progress. This role fully corresponds with the ambition to observe, and learn from, the sessions.

[22] Session at future center Utrecht, an informal place where people can jointly develop innovative ideas, strategies and projects (RWS, 2009)

[23] Grond Weg en Waterbouw (civil engineering)

Documents

As initiator, RWS deliver a report of both workshops. These documents form the main documented information source of this case study. In table 14.450, all documents used during this case study are given.

Table 14.45
Documents case study LEF

	Document	Source	Description
D3.1	Verslag LEF-sessie Duurzaam Inkopen 16 april	RWS	Report of the first LEF session
D3.2	Verslag LEF-sessie Duurzaam inkopen 30 juni	RWS	Report of second LEF session
D3.3	Presentatie Paula Kuijpers "Het waarom van de doorontwikkeling van DI van GWW"	RWS	Presentation of Paula Kuijpers (SDG RWS) about the necessity of further development of sustainable procurement of civil engineering
D3.4	Presentatie Wiana Partakusuma "Stand van zaken bij VROM m.b.t. DI"	VROM	Presentation of Wiana Partakusuma (program director sustainable procurement) about the intention, situation, and changes to the use of the SenterNovem criteria

Observation

While the reports give an account to the sessions, most information is discovered via observation. During both cases, several relevant actors[24] were present. Off course, this was an enormous change to speak to all of them. Furthermore, during the workshops, not only the outcome, but also the process is closely observed. Hereby, the demarcation for road infrastructure project is kept in mind. Observations made during the LEF sessions are referred to as O3.1.

TECHNICAL CONSIDERATIONS

In this paragraph, we reproduce the two LEF sessions. Hereby, the actions taken during both cases are described. Furthermore, we analyze the technical sustainable implications put forward during the sessions.

Project Description

The project at hand covers two workshops during which several actors had a brainstorm about improvements of current SenterNovem criteria. After these sessions, agreements are made to further cooperate to write an advice to the management about sustainable procurement (SP) of civil engineering.

First LEF session

The goal of the first session was to get acquainted with each other, determine the shared ambition, identify the interests and roles, and to take a first step towards further development of SP (D3.1).

As incentive towards a shared ambition, Paula Kuijpers of RWS, initiator of the sessions, presents the motivation of RWS to further develop SP of civil engineering (D3.3).

[24] RWS, SenterNovem, VROM, Prorail, Ministry of Defence, Water authority, Balance & Result, PRC, Bouwend Nederland, ONRI, VBWasfalt, SNM,

Afterwards, persons present are invited to write down, per couple, the challenge. The results are visualized in illustration 13.16

Illustration 13.16
Challenge LEF session

Based on this information, however, the ambitions seem very diverse. Nonetheless, it formed the basis for an extended discussion about the shared ambition of all parties. This sorted in a first step towards consensus (O3.1).

To determine the interests and roles, the actors are requested to take up a position. Hereby, the desired position of all present actors is discussed. Especially, the position of VROM in the further development was under discussion. This will be elaborated at the institutional considerations. An impression of the positioning is given in illustration 13.17

Illustration 13.17
Positioning of actors

To take a first step towards further development of SP, a brainstorm was set up. Hereby, the actors parallel discussed, in several rounds, the following questions at four tables:

1. What is Sustainble Procurement New Style?
2. How should the new criteriaconcept look like?
3. How do you measure it?

During the discussion, the results are written on table covers. After each discussion, the results are summarized. Subsequently, the actors were redistributed over the tables.

Illustration 13.18
Coffee table brainstorm

The initial intention of the first session was to collectively, draw up a plan for the further development of SP. Due to extension of the program, however, this is shift to the second session.

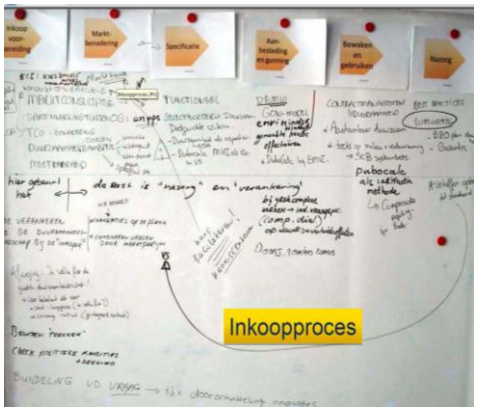
Second LEF session
The goal of the second session was to develop the concept "Sustainable Procurement New Style, and to draw up a plan together. Due to thorough political changes, however, Wiana Partakasuma, director of interdepartmental program Sustainable Procurement, first present the current situation (D3.4)

Illustration 13.19
Left: Presentation Wiana Partakasuma

Right: Intention to come op with joint focus

During the LEF sessions, the participants are requested to make a joint focus. However, this resulted in a list of 55 points of interest, divided over six themes. The lack of consensus on focus is an ever-recurring problem during the sessions (O3.1).

Illustration 13.20
Main activities to reach sustainability



The participants were requested to determine the main activities to reach sustainability in the procurement- and building process, and sustainable goals per theme. Even though the parties did not agree on the most important measures, the believe that sustainability should be taken into account during the early phases was broadly supported (O3.1)

The meeting ended with a list of actions to be taken by various participants (O3.1).

Actions:
1. Set up advice for management
2. Evaluation document implementation current criteria
3. Sustainability during exploration phase
4. Stocktaking of current innovative products civic engineering (non rail)
5. Stocktaking innovative product rail

INSTITUTIONAL CONSIDERATIONS

The institutional aspects within the projects are the (institutional) agreements between actors, the institutional environment, and the intended institutional changes. Hereby, much information is found in the "positioning game" played during the first LEF sessions. Furthermore, via dialogue and observation, the most important aspects became clear.

Actors

To determine the actors, we first take a look at the participants of the LEF sessions. In table 14.46, these participants are given.

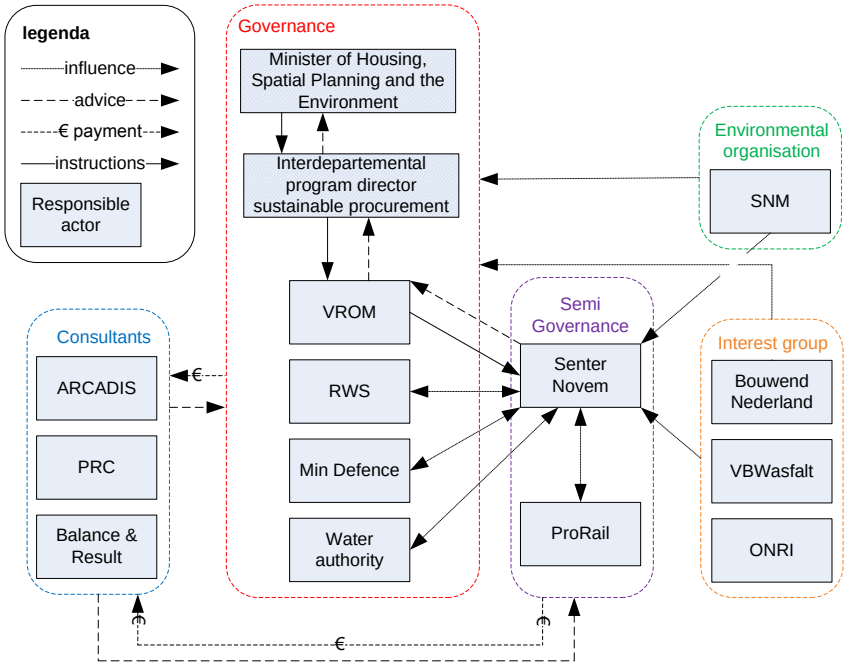
Table 14.46
Participants LEF sessions

Participant	First session	Second session
RWS	7	5
SenterNovem	5	3
ProRail	2	1
VROM	2	2
Ministry of Defence	1	1
Bouwend Nederland	1	1
Arcadis	1	1
Water authority	-	2
ONRI	-	2
Balance & Result	-	2
PRC	-	1
VBWasfalt	-	1
SNM	-	1

Rijkswaterstaat, as initiator of these sessions, consciously did not invite provinces and municipality. The reason for this is their unfamiliarity with innovative tendering.

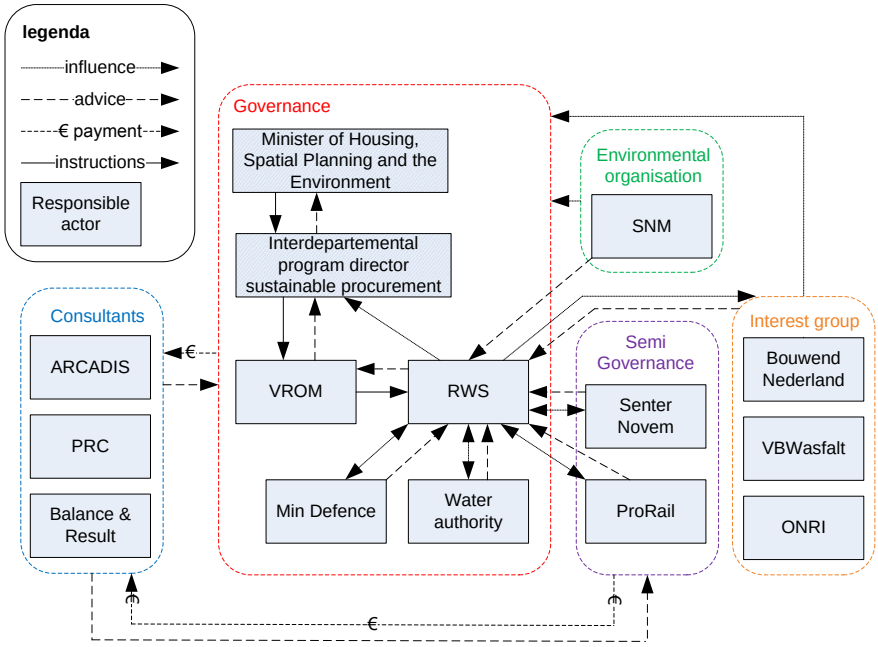
In figure 14.39, the current interaction between the actors is given. The minister of Housing, Spatial Planning and Environment and Interdepartmental program director sustainable procurement are interested in the process.

Figure 14.39
Actor network N221



In figure 14.40, the desired new interactions, as put forward by the participants, between the actors are given.

Figure 14.40
Actor network N221



The main difference is the role of RWS, who wants to lead the further development of the sustainable procurement of GWW. VROM, however, disliked the fact that they would lose their responsibility partly. However, RWS does carry the technical knowledge to improve the current criteria, while VROM does not (O3.1).

PROCESS CONSIDERATIONS

In table 14.47, we provide a chronological reproduction of the process events.

Table 14.47
Chronologic reproduction of process events

Date	Event
2005, June	Motion "Koopmans – De Krom" adopted to sustainable procure 100%
2006, November	Start development of SenterNovem criteria
2007, March	Monitor Sustainable procurement 2006
2007, April	Under the new cabinet, sustainable procurement becomes a priority.
2007, October	Start Interdepartmental director sustainable procurement
2009, February	Monitor Sustainable procurement 2008
2009, April	All SenterNovem criteria completed, 83 product groups
2009, April 16	First LEF session Sustainable procurement
2009, June	VROM decides to focus on 44 product groups, where most environmental impact can be reached. Stimulate innovation, focus on functionality and process.
2009, June 30	Second LEF sessions Sustainable procurement
2009, July 2	Progress report of Cramer in upper house
2010	Sustainable procurement via criteria of 44 product groups
2011	Sustainable procurement in civil engineering via new functional criteria

The process of sustainable procurement is not linear, and apparently, not all relevant information is carefully considered. The decision process regarding sustainable procurement is rather chaotic. As a result, after four years of designing, almost 30 criteria documents have been eliminated only 3 months after finishing.

CONCLUSIONS

Based on the analysis, we draw conclusion about both the best practices and the (remaining) needs of the participants of the LEF session. Overall, the brainstorm session are, to a large extend, successful. The brainstorm brought to light opportunities and points of attention (needs), which are helpful for further development of sustainable procurement.

Best practices

In table 14.48, the best practices concerning sustainable procurement are given. Hereby, we made a distinction between the technical, institutional, and process elements.

Table 14.48
Best practices LEF sessions

Technical	Institutional	Process
Budget for sustainable development	Cooperation of several parties	Raising support among participants
	Good communication	Take sustainable into account during the early phases of the project

Needs

In table 14.49, we state the encountered problems and (remaining) needs that became apparent during the LEF sessions. Hereby, we made a distinction between the technical, institutional, and process elements.

Table 14.49
Needs LEF session

Technical	Institutional	Process
Low ambition of criteria	Lack of consensus on focus	Chaotic decision process
	Municipalities and provinces not invited	

	VROM does not want to give away its leading position	

A3.4 CROSS CASE CONCLUSIONS

During all cases, the budget available for sustainable measures played a substantial role. The province of Utrecht used a ceiling price for sustainable measures, while Rijkswaterstaat provided a fictional discount. In both cases, the contractors scored beyond expectations after a budget was provided to sustainable measures. During the LEF sessions, it is recognized, the budget is an important consideration that should be taken already during the early phase of the project.

During all cases, a consensus on focus became a problem. The fact that Rijkswaterstaat focuses on materials use caused negative reactions of building contractors. During the LEF sessions, the participants are requested to make a joint focus. However, this resulted in a list of 55 points of interest, divided over six themes. The province of Utrecht get round to problem by prescribing some aspects, but mainly encouraging the building contractors to add sustainable measures themselves.

Another necessity to reach sustainable development is good communication. During all cases, this played an important role. At the province of Utrecht, good communication between the project leader and building contractor enabled quick adaptations to improve the result of the project. Because of the communication between Rijkswaterstaat and building contractors, RWS was able to learn much from the pilot. During the LEF sessions, good communication enabled two successful brainstorms.

While during the orientation phase, several alternatives are present, the possibility to change the project is reduced enormously after the project decision is made. Therefore, during all cases it was recognized, sustainability should be taken into account already during the orientation phase.

ANNEX 10 Expert meeting

The expert meeting is set up to carry out the verification and validation of the design. In this annex, we provide information about the form and output of this meeting. First we present the experts who were present during the meeting. Following this we will describe the form and output of the verification and validation of the framework. During the expert meeting we split up the assessment of the technical tool, institutional changes, and process plan.

PRESENT EXPERTS

During the expert meeting, 8 sustainability experts of engineering consultancy ARCADIS, and experts of the Directorate-General for Public Works and Water Management (Rijkswaterstaat), SenterNovem, building contractor KWS, and municipality of Amersfoort were present. Below all experts are presented.

Photo 13.9
Present experts

From left to right:
Raessen, M.B.A.G. (ARCADIS)
Smid-Verheul, T. (Amersfoort)
Claassen, F.W.J. (ARCADIS)
Creemer, F.B. (ARCADIS)
Geet van, C. (SenterNovem)
Buining, J.D. (ARCADIS)
Kroese, K.F. (ARCADIS)
Jacobs, A.C. (ARCADIS)
Kuijpers, P. (Rijkswaterstaat)

Heijink, E.B. (ARCADIS)
Jansen, R.C.M. (ARCADIS)
Hartog den, W. (KWS)
Spronsen van, J.C. (ARCADIS)

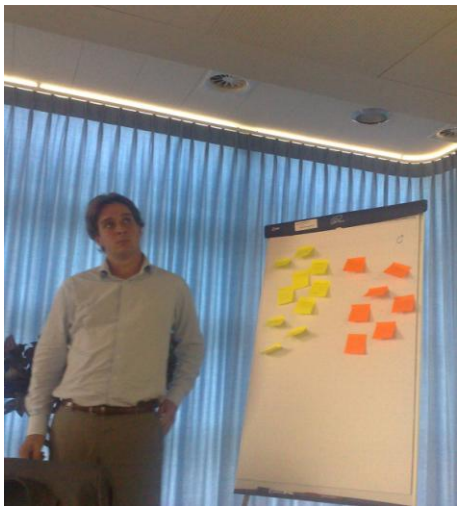
ASSESSMENT OF THE TECHNICAL TOOL

After presenting the goal of the expert meeting and some background information of the current policy of sustainable procurement of road infrastructure, we gave a live demonstration of the technical tool, described in chapter 7.

To gain insight in the practical usability and validity, we asked the expert to provide both positive and negative comments on the tool. Hereby, we also determined whether the tool did indeed answer the requirements of easy adoption and measurement of criteria. To

structure the feedback of the experts, we asked the experts to give positive comments on a yellow paper, and negative comments on a red paper.

Photo 13.10
Feedback on yellow and red paper

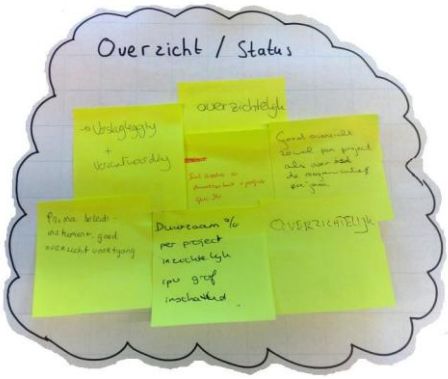


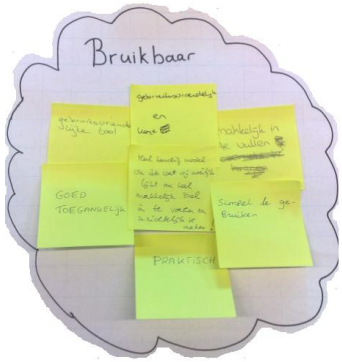
Rob Jansen, who took the role of manager during the expert meeting lead the experts to provide comments and interact.

After all experts provided their feedback, he made a first structure by clustering some of the comments.

Overall, the experts considered the tool very user friendly and complete. Several experts pointed out the ease of adapting and controlling the use of SenterNovem criteria. Hereby, the current method of monitoring is very distinctive and correct visualized. Consequently, the tool meets both the requirement of easy adaption and measuring of criteria.

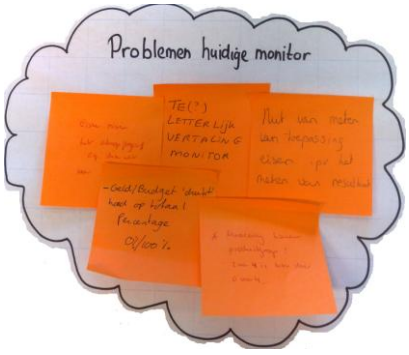
Photo 13.11
Positive feedback





Nonetheless, the experts also point out some pitfalls of the tool. Two of these stand out, because several experts brought them forward. Firstly, the tool uses the same measuring method as the current monitor, which is discrete, and might be reconsidered. Secondly, due to adaptations in the SenterNovem criteria, a lot of maintenance will be necessary to keep the tool up to date.

Photo 13.12
Negative feedback



Next to the overall assessment, the experts did make some suggestions, mainly to add to

the completeness of the tool. These suggestions were broadly supported:

- Add the possibility "voldoet niet"
- Provide an overview per product group
- Enable users to adopt own criteria

ASSESSMENT OF THE INSTITUTIONAL CHANGES

To assess the institutional changes as brought forward in chapter 8, we used a debate during which we determined who had to defend and who had to challenge a statement. First, we presented the pitfalls of the current institutional set up, after which we addressed potential improvements. Following this, two statement were given.

Photo 13.13
Debate on institutional changes

We provided the experts who had to defend the statement with green cards on which they could write down arguments in favor of the statement.

The experts who had to challenge the statement used red cards to write down arguments against the statement.

Assessment of policy project team

To assess the institutional design of the policy project team, as described in chapter 8, we used the following statement:

RWS will give better shape than VROM to leading the sustainable procurement policy of road infrastructure projects.

The main arguments for this statement where:

- RWS has more technical knowledge about procurement
- RWS has more technical knowledge of road infrastructure projects
- RWS could be part of an ongoing improvement process, while the current group from VROM will stop after the elections.
- RWS did already organise the LEF sessions

The main arguments against this statement where:

- RWS is an agency and should, thus, follow the advice of policy makers
- RWS does not have the complete overview
- RWS is not financed to improve the policy

At the end of the discussion, it became clear VROM should always have some role, because they do not want to lose their position. However, all experts believed it would be a very good idea if RWS would at least take more responsibility to improve the current criteria.

Assessment of organizational project team

To assess the institutional design of the organisational project team, as described in chapter 8, we used the following statement:

Procurers should be the liable for the sustainability of a project

The main arguments for this statement where:

- Procurers can guard the project

The main arguments against this statement where:

- Procurers do not have the technical knowledge of projects
- Procurers cannot be held liable for the actions of technicians
- Procures should only control the procurement process

Early during the discussion, it became clear all the present actors did not believe the procurers should be liable for the sustainability of projects. After a good discussion, however, consensus is reached on the position of procurers regarding sustainability. The experts broadly supported the idea that procurers should control the sustainable status of the organisation as well as the adoption of SenterNovem criteria during projects.

ASSESSMENT OF THE PROCESS PLAN

To assess the policy plan, as described in chapter 9, we presented the plan after which we set up a discussion.

Photo 13.14
Discussion on process plan

During the discussion, Rob Jansen, who led the discussion, wrote down the comments of the experts.

During the assessment of the process plan, there were not many discussions. All experts seemed to agree with each other. The experts agreed with the completeness, and correctness of the process recommendations. However, they did point out the complexity of making actual changes in the process.

The experts believe it is an important and good idea to consider sustainability already in the early phases of a project. However, they also concluded, all current norms, design principles, and traditions force back the design space for sustainable and innovative solutions. Therefore, courage and will power are necessary to make changes possible. Furthermore, it will take much time before taken into account sustainability during the orientation phase will be common.