

Sustainable Public Procurement:
Towards Procurement of Novel and
Innovative Products

UNIVERSITY OF TWENTE.

Master's thesis Gert Vos

March, 2010

On behalf of the interdepartmental programme sustainable public procurement, positioned at the Dutch Ministry of Housing, Spatial planning, and the Environment.

Graduating Master student:

Gert Vos, B.Sc.
University of Twente

First internal supervisor:

Prof. dr. Jan Telgen
University of Twente

Second internal supervisor:

Dr. Yoram Krozer
University of Twente

First external supervisor:

Ir. Willem Bruring
Dutch Ministry of Housing, Spatial planning, and the Environment
Director Interdepartmental Programme for Sustainable Procurement

Second external supervisor:

Drs. Wiana Partakusuma
Dutch Ministry of Housing, Spatial planning, and the Environment
Managing director Interdepartmental Programme for Sustainable Procurement

Document:	Master's thesis
Author:	G. Vos, B.Sc.
Student number:	0149128
Email:	G.Vos-1@student.utwente.nl Gert.Vos01@gmail.com
Address:	Assendelftstraat 12a 2512 VV The Hague
Phone:	+31614430891
Subject:	Sustainable and Innovative public procurement.
Submitted:	March 3 rd , 2010
Colloquium:	March 12 th , 2010
Version:	Final

Management summary

With annual expenditure of € 57.5 billion, public procurement accounts for a substantial part of the Dutch economy (IOO, 2009). As such, public procurement is an attractive policy instrument for effecting positive changes in the broader economy. In particular, public procurement could be used to stimulate the production of innovative and sustainable products. To this end, the current Dutch Cabinet has included two policy goals in its coalition agreement that affect public procurement (Ministry of AZ, 2007). These two policy goals are: using sustainability as a significant criterion in all of the Central Government's procurements from 2010 onwards; and strengthening the innovative capabilities of the Dutch economy (Ministry of AZ, 2007). In addition to the Central Government, other governments consider sustainability criteria in their procurement activities from 2010 onwards as well. The driving force behind using the sustainability criteria is the political commitment.

In order to support taking sustainability into account in all procurements, the Ministry of VROM and Agentschap NL¹ developed sustainability criteria for forty-seven product groups. These sustainability criteria consist of tenderer and tender criteria. For both tenders and tenderers there are obligatory criteria and discretionary criteria. Only obligatory tenderer and tender criteria have to be used in 100% of the procurements for the Central Government from 2010 onwards.

In order to strengthen the innovative capabilities of the Dutch economy, the coalition agreement states three specific aspects (Ministry of AZ, 2007). First, innovative companies will be stimulated by lowering tenderers' requirements with regard to experience and turnover. Second, innovative offers will be given a head start when awarding tenders. Third, the Government acts as the first user of innovative technologies with the aim of leapfrogging the introduction of new technologies (launching customer).

Around the spring of 2009, various sources in both the public and the private sector claimed that the sustainability criteria that had been developed were not stimulating innovation and were sometimes even hindering innovation. The alleged negative effects on innovation create significant risks for the success of sustainable public procurement in the Netherlands because the objective of sustainable public procurement is to stimulate new sustainable techniques. In addition to this, the scale of sustainable public procurement would directly frustrate employing the public procurement function to strengthen the innovative capabilities of the Dutch economy. As a result of these claims, the Interdepartmental Programme for Sustainable Procurement, situated at the Ministry of Housing, Spatial planning, and the Environment, wanted to research the alleged hindering effects of the sustainability criteria. In addition to researching the hindering effects, they expressed a desire for an approach that stimulated innovation. This desire led to the following research goal.

Modifying the existing sustainability stimulating instruments, in order to stimulate the procurement of products that are in addition to sustainable also innovative.

In response to the research goal of this master's thesis five research questions have been posed. In order to develop a theoretical foundation for the developed instruments and possible solution strategies this master's thesis starts by presenting a theoretical framework for public procurement.

The first two research questions start with a broad overview of theoretical drivers, barriers, and approaches for public procurement for sustainable products and for innovative products. Subsequently the existing Dutch approaches for public procurement for sustainable products and for innovative products are presented and compared to theoretical drivers, barriers, and approaches. In order to explore these issues in more depth, the existing sustainability criteria for office furniture and roads are analysed in detail. For public procurement for innovation, the initial broad focus narrowed down to direct public procurement of innovations applicable in basic tendering procedures. This has resulted in ten generic innovation stimulating elements applicable to all product groups.

The third research question focuses on the direct motivation for this Master's thesis; researching the alleged hindering effect of the sustainability criteria on innovation. In addition to this, the influence of the innovation stimulating instruments on sustainability has been researched. Both of these influences have been researched by means of a questionnaire among four key stakeholder

¹ Agentschap NL originated in the beginning of 2010 through the merger of SenterNovem, The Dutch patent centre and the EVD.

groups. These key stakeholder groups were purchasers, suppliers, policymakers accountable for developing policy for sustainable public procurement, and policymakers accountable for developing policy for public procurement for innovation. From the results of this questionnaire we conclude that none of the existing sustainability criteria for either office furniture or roads significantly hinders the procurement of innovative office furniture or roads. Moreover, we conclude that for office furniture three existing obligatory sustainability criteria significantly stimulate the procurement of innovative office furniture. Finally, all the existing discretionary award criteria were found to be significantly stimulating the procurement of innovative office furniture and roads. Nevertheless, we observed that there is sufficient room to increase the positive effects of the sustainability criteria on innovation.

The fourth research question focuses on modifying the existing sustainability criteria for office furniture and roads in order to stimulate procuring products that are at once sustainable and innovative. In order to generate a wide variety of possibilities two brainstorming sessions have been held with various key stakeholders. The suggestions from the brainstorming sessions served as a profitable foundation for the modifications of the existing sustainability instruments. Despite the dissimilarity of the two chosen product groups, the recommended modifications are equivalent. Combining the sustainability criteria into one single score for sustainability is the main recommendation. Combining the sustainability criteria has been executed in accordance with existing theory on selecting suppliers based on multiple selection criteria (Telgen, 2007).

The fifth research question focuses on generalising the results applicable to all forty-seven product groups, for which sustainability criteria have been developed. The modifications for office furniture and roads served as a foundation for the generalised modifications. In addition to this, a quick-scan among all forty-seven existing product groups supported the applicability of the modifications to all product groups. The generalisation of the recommendations for office furniture and roads resulted in the following general recommendations.

- Combine all the existing obligatory technical specifications and discretionary award criteria for product groups into one single score for sustainability.
- Use the presented modified weighted factor score model (a semi-compensatory method) to combine the sustainability criteria.
- Modify the existing sustainability criteria according the developed flowchart into semi-knockout-, knockout-, or scoring criteria (Figure 7.1).
- Determine weights for the sustainability criteria according to recommended approaches.
- Develop appropriate scoring methods for the sustainability criteria, bearing in mind the recommendations.
- Select the winner by applying the modified weighted factor score in the technical specifications or in the award criteria.

The generalised recommendations have been validated by applying these recommendations to two additional product groups; special transportation and working clothes. This validation could not falsify the applicability of the recommendations to all forty-seven product groups.

The recommended modifications have the following positive effects on innovations.

- Ascertaining the use of existing, innovation stimulating, discretionary award criteria.
- The existing sustainability criteria become more functional due to the semi-compensatory nature of the recommended model.
- Facilitating purchasing authorities to award on Most Economical Advantageous Tender (MEAT).
- One single score for sustainability provides prospect to lay down ambitious future goals for the total sustainability of products.
- Facilitating ambitious purchasing with a method that can be adapted to higher sustainability ambitions.
- One single score for sustainability creates an excellent parameter to create incentives for continuous sustainability improvement throughout long-lasting (framework) contracts.

Foreword

The Master's thesis is the final official part of the Master programme Industrial Engineering and Management (IEM) in which I specialised in Production and Logistics Management (PLM) at Twente University. Purchasing Management is one of the aspects highlighted in the specialisation direction of PLM.

During my Master's thesis, I got in touch with many cooperative people. I particularly want to thank my two internal supervisors J. Telgen and Y. Krozer, and my two external supervisors W. Bruring and W. Partakusuma for their continuous input and constructive feedback. I also want to thank them for all the things I learned that are not directly related to the outcome of this master's thesis but will prove of great benefit in my further career. In addition to my supervisors, various people at the Ministry of VROM have been of great assistance; in particular I like to mention J. Wildschut and D. Robben. Furthermore, I want to thank M. van Putten and R. Prins for their constructive advice and support. Special thanks to all the other people who participated in the interviews, questionnaires, brainstorming sessions, and reviewing committee. Finally, I want to thank my family and friends for their continuous (moral) support.

The Hague, March 3rd, 2010

Gert Vos

Table of contents

1	Introduction	1
2	Theoretical framework.....	4
2.1	Public procurement.....	4
2.2	Political context.....	9
2.3	Public procurement a policy instruments	10
3	Sustainable public procurement	11
3.1	Literature review	11
3.2	Development of sustainable public procurement in the Netherlands	14
3.3	Developed instruments	17
3.4	Focus on two product groups	19
3.5	Conclusion.....	22
4	Public procurement for innovation	23
4.1	Literature review	23
4.2	Procurement related innovation initiatives in the Netherlands.	26
4.3	Direct public procurement of innovation.....	27
4.4	Conclusion.....	29
5	Instrument interactions	31
5.1	Relation sustainable and innovative products.....	32
5.2	Instrument-instrument interaction.....	32
5.3	Instrument-goal interaction.....	33
5.4	Questionnaire results.....	35
5.5	Conclusion.....	39
6	Stimulating sustainable and innovation office furniture and roads.....	41
6.1	Combining sustainability criteria and innovation elements	41
6.2	Stimulating procurement of sustainable and innovative office furniture	42
6.3	Stimulating the procurement of sustainable and innovative roads.....	50
6.4	Conclusion.....	55
7	Stimulating the procurement of sustainable and innovative products.....	57
7.1	Generalised modification of the sustainability criteria.....	57
7.2	Positive effects of the modifications.....	62
7.3	Additional recommendations	63
7.4	Conclusion.....	64
8	Discussion	65
8.1	Evaluating the choice for office furniture and roads.	65
8.2	Key stakeholders reviewing committee.....	65
8.3	Implementation	66
9	Bibliography	67
10	Appendices.....	71

1 Introduction

Procurement is everything associated with an incoming invoice Telgen et al. (2007b). Public procurement is therefore everything that results in an incoming invoice for a public authority. For public procurement “everything” is categorised into goods services, and works. In this master's thesis, we will refer to these as products. With annual expenditure of € 57.5 billion, public procurement accounts for a substantial part of the Dutch economy (IOO, 2009). From this € 57.5 billion, € 14.8 billion is spent annually by the thirteen departments of the Central Government. This amount also makes public procurement an attractive policy instrument. The current Dutch Cabinet has included two policy goals in the coalition agreement that employ public procurement (Ministry of AZ, 2007).

The first policy goal that employs public procurement is using sustainability as a significant criterion in all procurements from 2010 onwards. In 2005 the Central Government agreed to take sustainability into account in 100% of its purchases from 2010 onwards. This motion was the basis for the coalition agreement of Prime Minister Balkenende's fourth Cabinet in 2007 (Ministry of AZ, 2007). This agreement states that the Central Government will use sustainability as a significant criterion in all purchases from 2010 onwards. This goal has been part of a broader ambition to develop markets for sustainable production and consumption. In addition to the Central Government, other governments will begin taking sustainability criteria into account in their procurement activities from 2010 onwards. Regional governments and water management boards will use sustainability criteria in 50% of their purchases from 2010 onwards. Municipalities will take sustainability criteria into account in 75% of their purchases in 2010 and for 100% by 2015. Finally, other semi-governmental organisations have been approached to join this initiative in order to expand the total expenditure for which sustainability is used as a significant criterion. The driving force behind using the sustainability criteria is a political commitment. None of the instruments has been translated into legislation. In addition to the political commitment, monitoring the proceedings is used as a stimulant for procurement authorities to realise the commitments they made to take sustainability into account in their procurements.

In order to support taking sustainability into account in all procurements, the ministry of VROM and Agentschap NL initially developed sustainability criteria for eighty-five product groups. The sustainability criteria for all eighty-five product groups were completed in the spring of 2010. However, the number of product groups was reduced to forty-seven during a meeting of parliament in June 2009 (Tweede Kamer, 2009b). The sustainability criteria that have been developed consist of tenderer and tender criteria. For tenderer as well as tender criteria there are obligatory knockout criteria and discretionary scoring criteria. Only obligatory tenderer and tender criteria have to be used in 100% of the procurements for the Central Government from 2010 onwards. The commitments of the other governments also only focus on the obligatory tenderer and tender criteria. The discretionary criteria have been developed for situations where the offers are awarded on more criteria than price, such as sustainability.

In addition to taking sustainability into account in all Central Government procurements', the coalition agreement of Prime Minister Balkenende's fourth Cabinet employs the public procurement function for a second policy goal. This goal is strengthening the innovative capabilities of the Dutch economy (Ministry of AZ, 2007). In order to strengthen the innovative capabilities three specific aspects were presented in the coalition agreement. First, Innovative companies will be stimulated by lowering tenderers' requirements with respect to experience and turnover. Second, innovative offers will be given a head start when awarding tenders. Finally, the Government acts as the first user of innovative technologies with the aim of leapfrogging the introduction of these new technologies (launching customer). However, for these goals no accompanying performance indicators or targets have been specified in the coalition agreement.

In 2009, the project team procurement for innovation developed twelve potential innovation-stimulating elements. In contrast to sustainability criteria, the instruments developed to stimulate the procurement of innovative goods, services, and works are applicable to all product groups. Using the innovation stimulating elements has been, up to now, completely discretionary.

Around the spring of 2009, the time the sustainability criteria for eighty-five product groups were completed, various sources in both the public and the private sector claimed that the existing sustainability criteria were hindering innovation. From the sources, the following two were most concrete in their criticism. The first source is a letter from the Confederation of Dutch Industries and Employees (VNO-NCW) and SME Netherlands (MKB Netherlands) to the Minister of Economic Affairs (Wientjes and Hermans, 2009). The second source is a publication from BECO consultancy (2008) on behalf of Nature and Environment (Natuur en Milieu), a Dutch NGO.

The alleged negative effects on innovation create significant risks for the success of sustainable public procurement in the Netherlands because the objective of sustainable public procurement is to stimulate new sustainable techniques. In addition to this, the scale of sustainable public procurement would directly frustrate the employment of public procurement to strengthen the innovative capabilities of the Dutch economy. The critique in the two identified sources was the following. In the first source, the employer organisations state that the approach of sustainable public procurement, in their opinion, is overly specific and uses too-detailed sustainability criteria. In their letter, they claim that the existing approach does not stimulate the market to innovate, but it only excludes/discriminates products or materials – sometimes without sound environmental rationale (Wientjes and Hermans, 2009). In the second source, BECO (2008) concludes the following with respect to the influence of sustainability criteria on innovation. First, according to the interviewed companies the sustainability criteria only modestly stimulate the development of sustainable products. It argues that sometimes the sustainability criteria even hinder the development of new sustainable products. Second, BECO (2008) concludes that innovative companies are not favoured by the sustainability criteria, as they cannot distinguish themselves by the, often non-ambitious, sustainability criteria. Finally, BECO (2008) concludes that the level of detail and static character of the sustainability criteria also fail to stimulate innovation. As a result of these claims the Interdepartmental Programme direction for Sustainable Procurement, situated at the Ministry of Housing, Spatial planning, and the Environment, wanted to research the alleged hindering effects of the existing sustainability instruments. In addition to researching the hindering effects, the desire for a more innovation stimulating approach raised. Altogether, this led to the following research goal.

1.1.1 Research goal

The goal of this thesis is to investigate how the existing instruments, to stimulate the procurement of sustainable products, can be modified to stimulate the procurement of products that are in addition to sustainable also innovative.

In response to the research goal of this thesis, the following research questions have been proposed.

1.1.2 Research questions

- 1) Which instruments have been developed to stimulate the Dutch public procurement function to procure sustainable products?
 - a. Which two product groups are suitable to acquire the level of detail needed for this thesis?
- 2) Which instruments have been developed to stimulate the Dutch public procurement function to procure innovative products?
- 3) Do the instruments developed to stimulate the procurement of sustainable and innovative products, for the two selected product groups, hinder each other?
- 4) How can existing hindering effects of the instruments, for the two selected product groups, be mitigated or surpassed in order to stimulate the procurement of both sustainable and innovative products?
- 5) How can the modifications, to mitigate or surpass the hindering effects for the two selected product groups, be generalised to recommendations for all existing product groups?

1.1.3 Research model

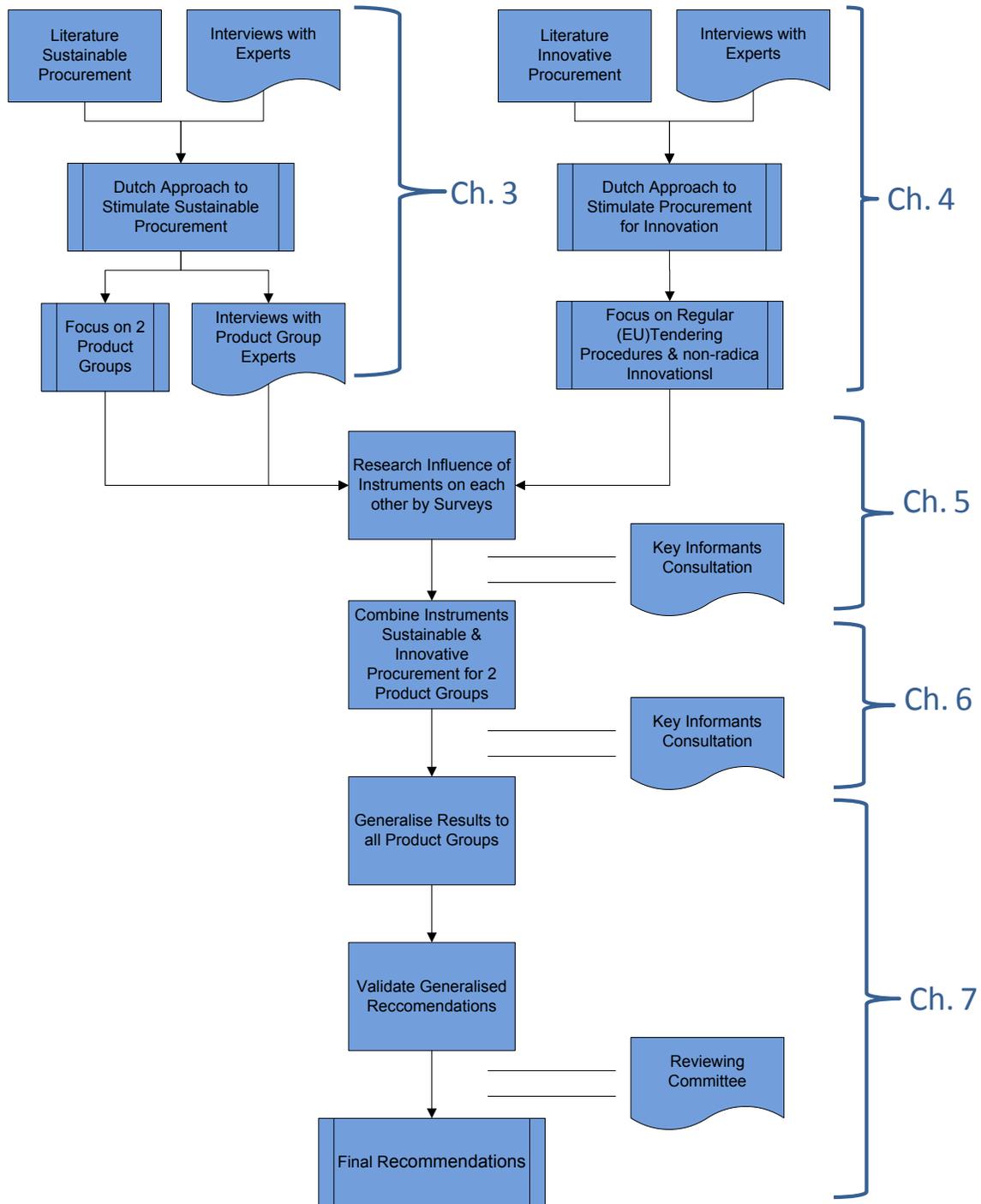


Figure 1.1 Research model

2 Theoretical framework

This chapter describes the theoretical aspects of public procurement. Section 2.1 explains what public procurement is, how public procurement differs from commercial procurement, and it describes the development of public procurement organisations. Subsection 2.1.1 describes procurement process and focuses on tenderer and tender criteria. Subsection 2.1.2 describes an approach for supplier selection based on multiple criteria. Subsection 2.1.3 describes the relevant European tendering procedures. Section 2.2 explains the political context arriving from the coalition agreement of the Dutch Administration (Ministry of AZ, 2007). Finally, section 2.3 explains the use of the public procurement function as a policy instrument for stimulating sustainability as well as innovation.

2.1 Public procurement

Procurement is everything associated with an incoming invoice Telgen et al. (2007b). This holds true for goods, services, and works. The distinction between these three will be explained by their definitions given in EU public sector procurement Directive (2004/18/EC, Article 1). The execution of works are contracts whose objectives are either the execution, or both the design and execution of works. A public work contract means the outcome of building or civil engineering works that taken as a whole, is self sufficient to fulfil an economic or technical function. A public supply contract of products is a contract whose objective is the purchase, lease, rental, or hire purchase, with or without option to buy products, other than meant for public work contracts. A public service contract is any contract other than a public work or supply contracts whose objective is the provision of services.

Public procurement versus for-profit procurement

Public procurement has characteristics that are distinct from commercial procurement. The characteristics of public procurement are summarised and gathered from various sources by Telgen et al. (2007b). Telgen et al. (2007b) recognise five main aspects in which public procurement differs from commercial procurement.

The first distinction concerns external demands. These are transparency, integrity, accountability, and exemplary behaviour. Transparency refers to openness and equal opportunities for all interested bidders. Integrity refers to avoiding improper, wasteful or corrupt and fraud practices. Accountability refers to the fact that public procurement authorities are responsible for effective, legal, and ethical way of procurements. Exemplary behaviour refers to the fact that the government is expected to set an example, not only in terms of ethical standards but also in terms of efficiency and effectiveness (Telgen et al., 2007b).

Second, public procurement is affected by distinct internal demands. The first is simultaneously serving multiple political goals. This complicates public procurement, because it is sometimes unclear to identify the influence of political goals on public procurements. The second internal demand is serving a large amount of stakeholders. These various stakeholders (e.g. citizens, taxpayers, and electorate) may have different objectives (Telgen et al., 2007b).

Third, public procurement demands originate from the surroundings. This is caused by the budget structure. As a result, the budget (partly) determines what is procured. The budget is known to the general public and the suppliers. This considerably changes the relation between the purchasing organisation and the supplier. In addition, budgets are often divided which causes difficulties in optimising purchasing and operating costs. Finally, the wide dispersed budgets result in many parties with interest and that causes risk adversity and tedious decision making processes (Telgen et al., 2007b).

Fourth, there are three extra demands on the procurement process. First, demands on the process from legal regulations. Second, public procurement is restricted from engaging into long-term relationships with their suppliers. Finally, the absence of competition between public procurement organisations provides them with opportunities for far going cooperation (Telgen et al., 2007b).

Finally, public procurement is characterised by its own multiple roles. This is expressed by the fact that public purchasers buy products for their own organisation, predominantly directly for the

citizens they are expected to serve. This relates to the well-known concept of reciprocity in purchasing, i.e. buying from a supplier that is buying from you. These multiple roles are also expressed by the fact that public procurement, up to a certain level, determines the rules and regulations according to which it has to operate (Telgen et al., 2007b).

Development of public procurement

Public procurement serves several goals simultaneously. Telgen et al. (2007b) point out that these goals change over time, corresponding to the maturity of the purchasing organisation. The goals in the different phases are: serving the organisation, appropriate use of public funding, efficient use of public funding, accountability, value for money, and ultimately policy delivery. Figure 2.1 displays the described development of public procurement, using van Weele's purchasing development model (2005) as a basis. All Public procurement departments, in the Netherlands, spend € 57.5 Billion annually (IOO, 2009). This amount of money attracts political interest in public procurement as an influential policy instrument. Suggested policy areas are: job creation and employment, strengthening of industries, stimulating-, Small and Medium size Enterprises (SMEs), local industries, diversity, innovation, sustainability and environment, and development aid (Telgen et al., 2007b). Section 2.2 describes the political influence on the public procurement function in the Netherlands.

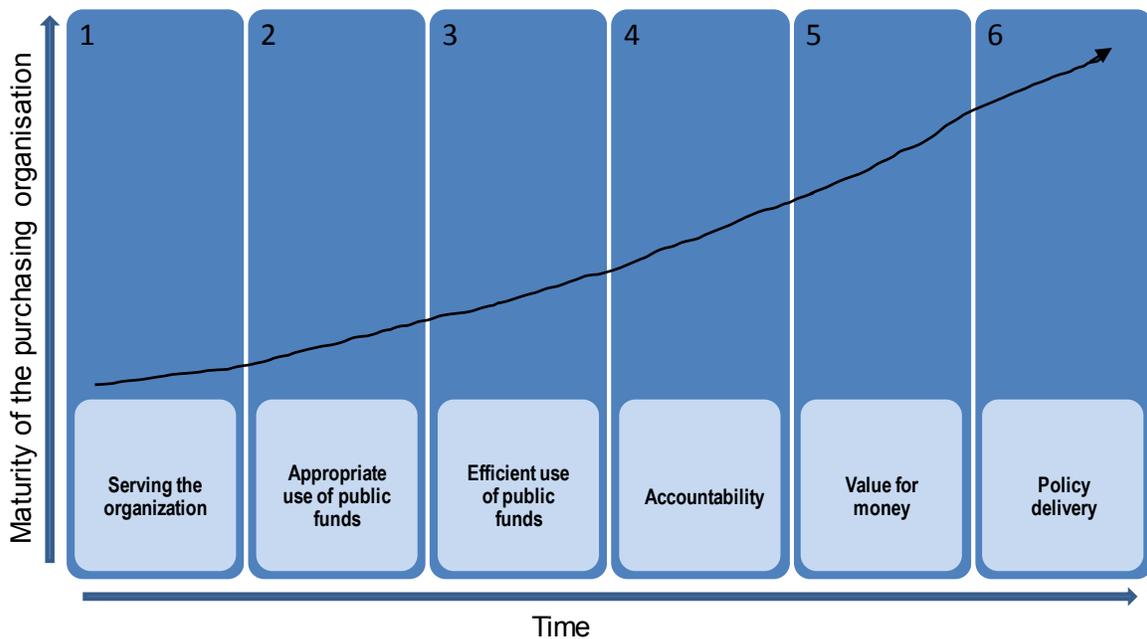


Figure 2.1 Public procurement development model Telgen (2007b), representation based on van Weele (2005)

2.1.1 Procurement process

The procurement process involves every step from the development of the need to the evaluation of the procured good, service or work. Van Weele's purchasing model (1997) is a widely accepted model to describe the purchasing process. This model contains six phases: specification, selection, contracting, ordering, monitor, and after-care. For this master's thesis the front-end of the model is extended including the preparation phase (Harink, 1999). This master's thesis focuses on the most influential phases on the final specifications of the product. These are the preparation phase, the specification phase, the selection phase, and the contracting phase.

The first phase, the preparation phase, is the strategic phase of the process (Harink, 1999). The specification, selection, and contracting phase are the tactical phases of the purchasing process (Harink, 1999). The last three phases: ordering, monitoring, and after-care are the operational phases of the purchasing process (Harink, 1999). The operational phases are outside the scope of this thesis. The extent to which the specifications of the final products are influenced declines in

every step from the preparation phase onwards. Figure 2.2 illustrates this declining effect in relation to the various phases of the purchasing process. Together with this declining effect also the influence on sustainability and innovation declines in every step from the preparation phase onwards. The subsequent paragraphs describe the characteristics of the two most influential phases; the preparation phase and the specification phase.

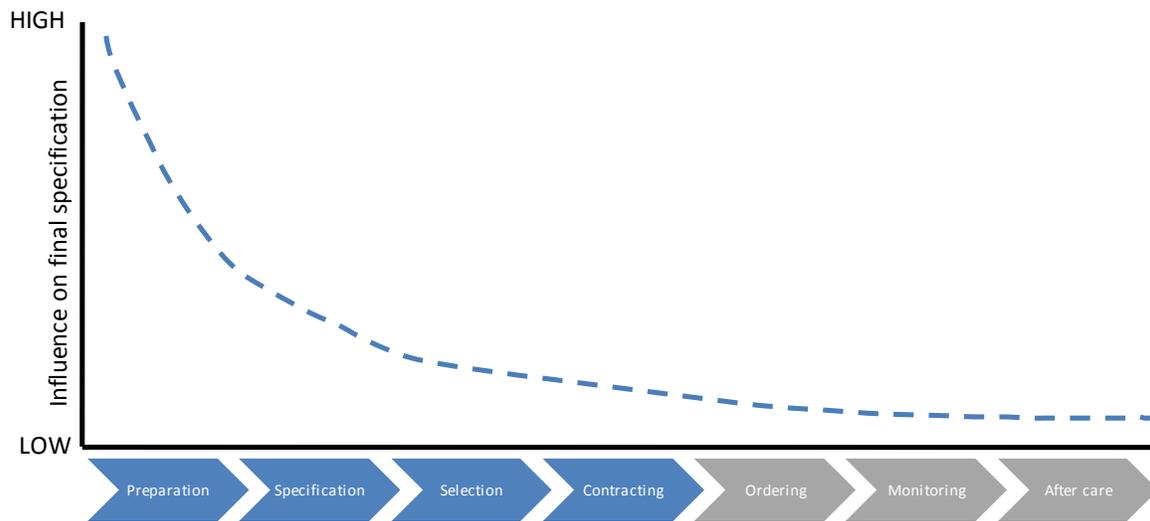


Figure 2.2 Purchasing process (SN, 2009a)

Preparation phase

In the preparation phase the questions about *what* will be procured and *how* this will be procured are answered (SN, 2009a). Buyer supplier interaction strongly influences *what* will be procured. In addition to this, a good understanding of the market and technical capabilities will provide a fundament for choosing a specific tendering procedure (subsection 2.1.3). Within these tendering procedures the use of criteria plays an important role. The choice for a specific tendering procedure also directly influences which criteria can be used. For example the open procedure (subsection 2.1.3) does not allow supplier selection criteria in a separate first step. The applied criteria have a significant influence on the steerability of the sustainability and innovativeness of the products.

Specification phase

In the specification phase the requirements for both the tenderer and the tender are drawn up. In the specification phase the intentions of the preparation phase on *what* and *how* should be procured are formulated. The first is achieved by designing requirements for the product in such a way that it is guaranteed that the specifications of the final product will meet the requirements. The latter is done by selecting the most appropriate tendering procedure (subsection 2.1.3). Selection and award criteria for the tender and the tenderer should be designed in the specification phase. These criteria are explained subsequently.

Tenderer and tender criteria

There are two options to choose the right supplier with the right product. The first option is using criteria with the objective to select tenderers based on the tenderers performances (tenderer criteria). The second option is to select tenderers based on tenderers' offer (tender criteria).

Within the various tenderer and tender criteria there are three types of criteria that can be used. First, knockout criteria, i.e. in case of non-compliance the tenderer is excluded from the process. Second, scoring criteria, i.e. this type is used to rank the tenders based on the criterion. Finally, semi-knockout criteria, i.e. semi-knockout criteria also ranks the tenderers, however, scores below a certain lower bound cannot be compensated by the other criteria.

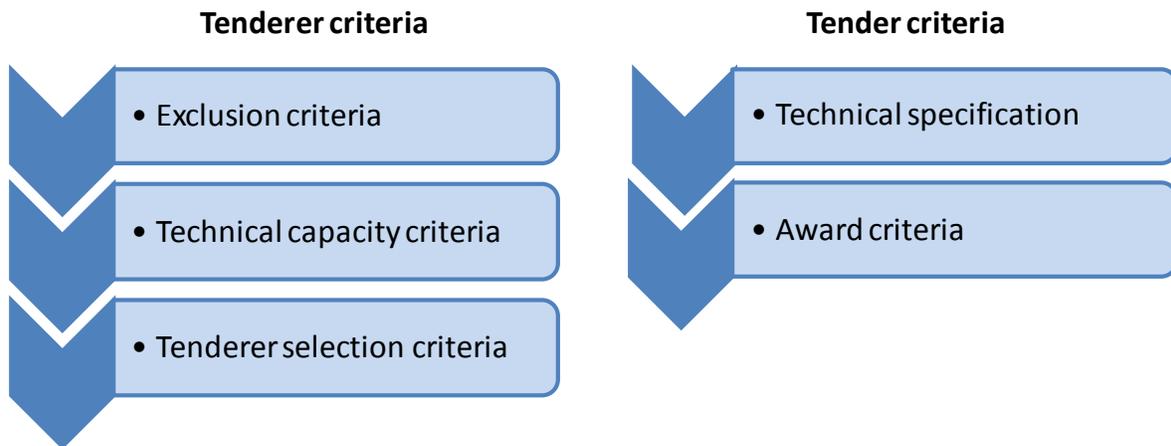


Figure 2.3 Tenderer & Tender criteria.

Tenderer criteria

For selecting tenderers there are three sets of criteria to place the tenderer criteria. These are illustrated on the left side in Figure 2.3 and described subsequently.

Exclusion criteria deal with circumstances in which a tenderer can find itself that normally causes a contracting authority not to do any business with the tenderer (SN, 2009a). Reasons to exclude suppliers are described in EU public sector procurement Directive 2004/18/EC. In addition to the common exclusion criteria, there are specific sustainability exclusion criteria focusing on violations of environmental regulations, social regulations, or human norms.

In general there are two different types of technical capacity criteria. The first focuses on financial economic capacity of the company (for works and services only). The second focuses on the technical and employer qualifications of the company.

Supplier selection criteria are used in restricted procedures, competitive dialogues, and in design contests. Tenderer selection criteria rank the applying tenderers after they passed the selection and technical capacity criteria. Criteria that can be used are of the same tenor as the technical capacity criteria, provided that they are not already used in the previous two steps (EU public sector procurement Directive, 2004/18/EC, Articles 47-52).

Tender criteria

For selecting tenders there are two sets of criteria to place the tender criteria. These criteria are presented on the right side in Figure 2.3 and described subsequently.

Technical specification criteria are minimal requirements focusing on the specifications of the product. Offers that do not comply with the minimal technical specifications are excluded from the tendering process, unless they are applied as variants (subsection 4.3.1).

The EU public sector procurement Directive 2004/18/EC, Article 53 describes two different award methods. The first method is awarding on price only. The second method allows awarding on additional criteria (the Most Economically Advantageous Tender, MEAT). Aspects that can be included are for example quality, sustainability, and innovation. When using MEAT, the award criteria should be made public upfront as well as how important the different criteria are and how the different criteria are combined.

2.1.2 Supplier selection based on multiple criteria

In order to select the right supplier with the right product, based on more criteria than just price, a more sophisticated criteria developing methodology is required. The possibilities to include other criteria than just price are stated in the EU public sector procurement Directive 2004/18/EC, Article 26. However, no methods are described how to include other criteria. This section explains how to develop the additional requirements in order to select the right supplier with the right product. For selecting suppliers based on multiple criteria Telgen (2007a) states that there are five steps to come to awarding the tender to the right supplier with the right product.

The following five steps should be decided upon when selecting suppliers on multiple criteria (Telgen, 2007a).

1. Which criteria are to be used?
2. How to combine the criteria?
3. The relative importance of the criteria.
4. How to score the criteria?
5. Who wins?

The first step, *which criteria are to be used*, is essential since this step determines which relevant aspects will be evaluated in the selection of the tender. Examples of criteria that can be included are price, quality, delivery time, warranties, sustainability criteria, and innovation criteria.

The second step, *how to combine the criteria*, primarily focuses on the consequences of bad scores on criteria. De Boer (1998, p. 64) argues there are three methods. First, compensatory methods, i.e. a poor score on one criterion can always be compensated by a good score on another criterion. Second, non-compensatory methods, i.e. a poor score on one criterion cannot be compensated by another criterion. Third, semi-compensatory methods, i.e. a combination of the previously described two methods. Bad scores on criteria can be partly compensated by good scores on other criteria.

The third step, *the relative importance of the criteria*, is usually done by determining and assigning weights to criteria. Here the real influence of criteria on the actual winning offer is considerable.

The fourth step, *how to score the criteria*, consist of two major issues that have to be determined correctly. This step is vital to let the importance of the criteria, indicated by the weight, correspond to the influence of the criteria, which is determined by multiplying the weight with the score. The first major issue is to determine when the minimum and maximum score will be assigned. The second issue is to determine intermediate scores. An important aspect in scoring is the use of relative scores, i.e. the score depends on other offers. Due to the fact that suppliers can influence the outcome with relative scoring, this is strongly discouraged (Telgen, 2007a).

The fifth and final step, *who wins*, is the step in which it is determined how many winners are selected, i.e. there can be multiple winners for different lots. Besides the winner(s), also the price the winner(s) gets for their/its offer should be determined, i.e. the average price of the winning tender(s) or the highest price of the winning tender.

2.1.3 Tendering procedures

For procurements above the European threshold² there are multiple tendering procedures to choose from (EU public sector procurement Directive 2004/18/EC). This thesis focuses on procurement above the European threshold. Above the European tendering threshold the following tendering procedures are allowed.

- Open procedure.
- Restricted procedure.
- Negotiated procedure with prior publication of a contract notice.
- Negotiated procedure without prior publication of a contract notice.
- Competitive dialogue.
- Design contest.

The open and restricted procedures are basic procedures that can be used in all situations. The other four methods can only be used in specific situations (EU public sector procurement Directive, 2004/18/EC, Article 1, paragraph 11). The procedures are described subsequently.

Open procedure

The open procedure is executed in one round where the tender is made public to everyone. All interested suppliers can submit offers. The offers will be selected based on predefined criteria. The tendering organisation is prohibited to negotiate with suppliers about the submitted offers. Typical application of the open procedure is found in apparent markets with a limited number of suppliers (EU public sector procurement Directive 2004/18/EC, article 28).

² The European threshold for central governments is: for goods and services € 125,000,- for works € 4,845,000,- (Amending Directive, 2004/18/EC).

Restricted procedure

The restricted procedure consists of two rounds. In the first round the tender is made public and interested suppliers can submit their tenders. A predefined number of tenderers will be selected (based on exclusion criteria, technical capacity criteria, and selection criteria, Figure 2.3). The second round of this procedure is awarding the actual tender. The tendering organisation is prohibited to negotiate with the selected suppliers about the applied offers (EU public sector procurement Directive 2004/18/EC, article 28).

Negotiated procedure with prior publication of a contract notice

The negotiated procedure with prior publication of a contract notice is allowed when offers from an open procedure, restricted procedure, or competitive dialogue are for some reason illegitimate or unacceptable according to the law. This procedure comes down to negotiating the previous offers with the suppliers. All the selected suppliers should be given the same information to guarantee that none is discriminated by the amount of information they receive (EU public sector procurement Directive 2004/18/EC, article 30).

Negotiated procedure without prior publication of a contract notice

The negotiated procedure without prior publication of a contract notice is the same as the previous described procedure. With the difference that no prior contract notice is required (EU public sector procurement Directive 2004/18/EC, article 31).

The Competitive dialogue

The competitive dialogue is legally recognised for exceptional tenders, for which an open or restricted procedure is unlikely to lead to a satisfactory solution. For the competitive dialogue, MEAT is the only legitimate awarding method. In the first phase, the purchasing organisation makes the problem description known to all interested suppliers. In cooperation with a selected part of the suppliers the purchasing organization identifies requirements to reach the described goal. It is important that all the attendees are given the same information and none is discriminated against. It should be guaranteed that confidential information, from participating suppliers, does not leak to other attendees. After the negotiation phase the attendees are requested to submit their final offers (EU public sector procurement Directive 2004/18/EC, article 29).

Design Contest

The design contest selects tenders based on design. An objective jury executes this selection. The number of tenderers can be limited by explicitly predefined criteria. The jury selects the final winner. Property rights should stay with the tenderers and their submitted tenders should remain confidential (EU public sector procurement Directive 2004/18/EC, article 66-74).

2.2 Political context

Balkenende's fourth coalition agreement (Ministry of AZ, 2007) consists of three levels: vision, mission, and goals. The relevant parts of these three levels provide insight into the overall ambitions for the procurement of sustainable and innovative products function.

The starting point is the "vision" of the coalition agreement. The vision statement is: "Working together and living together". Focus points in this vision are to becoming internationally proactive, creating an innovative economy, competitive economy, sustainable habitat, societal basis, safety and stability, and a providing government and public sector. This vision is translated into five missions. The two relevant missions for this Master thesis are the following.

- Creating an innovative and competitive Dutch economy.
- Developing a sustainable Dutch society.

In order to realise these missions the programme states the following two policy goals influencing the Dutch public procurement function.

- Strengthening the innovative capabilities of the Dutch economy (Ministry of AZ, 2007, goal 14).
- The Dutch Government uses sustainability as a significant criterion in all procurements in 2010 (Ministry of AZ, 2007, goal 21).

The twenty-first goal influences the public procurement function directly. For the fourteenth goal the explanation, given in the coalition agreement, is more comprehensive. The coalition agreement states the following: "The Government will also, as a procurer, stimulate innovation by lowering

tenderers' requirements considering experience and turnover. Innovative offers will be given a head start in procurements. The government will act as a launching customer." Launching customer is the first user to procure a product in quantities of this dimension with the aim of leapfrogging the introduction of new technologies.

2.3 Public procurement a policy instruments

Public procurement is one of several policy instruments to be used in order to realise political ambitions. Using the public procurement function is by no means a new phenomenon (McCrudden, 2004). In this paper McCrudden describes the various societal ambitions that have been achieved in the past by using the public procurement function. The Dutch Cabinet is currently using the public procurement function to achieve environmental, economic, and societal goals. In order to provide clearness for the various policy instruments we make use of the following taxonomy for policy instruments. Policy measures are divided into supply side measures and demand side measures (Edler, 2007). Supply side measures focus on pushing certain desired developments, such as fiscal measures, support of public sector research, and grants for industrial R&D. Demand side measures are measures focusing on pulling certain desired developments, such as systematic policies, regulations, public procurement, and support of private demand (Edler, 2007). The public procurement function is applied as a policy instrument to stimulate innovation and sustainability in the Dutch market (section 2.2). Policymakers are provided with a significant body of literature propagating the use of the public procurement function for these two policy goals. Section 3.1 and 4.1 describe this literature. In addition to extended literature acknowledging the potential of public procurement as a policy tool, the annual expenditure of governments in the range of 10% to 20% of the Gross Domestic Product (GDP) of most European Countries, creates an influential policy instrument (ICLEI, 2007).

Among others Edler and Georghiou, (2007) and Aschhoff and Sofka (2009) argue that demand side measures, in particular public procurement, are the best instruments to stimulate innovation. Nemet (2009) contends that this is most true for incremental change and that for non-incremental innovation supply side measures are a more effective approach.

In addition to these two policy goals, the ongoing professionalisation of the operational processes the Central Government is also influencing the public procurement function in the Netherlands. This ongoing professionalisation is embodied in the category management initiative.

Category management is a procurement initiative in the Netherlands to partly centralise the procurement function for the Central Governments (BZK, 2009). The responsibility for the product groups does not lie at one individual department but the responsibility lies with different departments for different product groups. For, product groups a commodity manager is appointed. In order to research whether a product groups should be included into category management a feasibility study is performed. When it is considered feasible to centralise a product group it is the choice of departments to use category management for future procurements or not. When a product group is included in the category management approach, other departments can use the contracts of that product group. Nevertheless, ordering and payment is still the responsibility of the procuring department. Currently, the following product groups are included in category management: postings, transportation, energy, vehicles, office furniture, office supplies, printed matters, digital desk supplies, literature and subscription, communication, and ERP-systems. In June 2009, the following product groups were under investigation: catering, cleaning, and temporary employees. A significant advantage of category management is that more focus, time, and energy are put into the sourcing phase (BZK, 2009).

3 Sustainable public procurement

This chapter focuses on presenting a broad outlook on the existing instruments stimulating the procurement of sustainable products in the Netherlands. Prerequisite is that instruments are applicable in the strategic or tactical phase of the purchasing process as described by Harink (1990, pp. 13-20). In order to go into more depth of the developed instruments the answering approach will focus on two product groups. The content of this chapter is corresponding to answering the following research question and research sub-question.

Which instruments have been developed to stimulate the Dutch public procurement function to procure sustainable products?

Which two product groups are most suited to acquire the level of detail, for these instruments, required for this thesis?

In order to answer the research question and sub-research question this chapter starts, in section 3.1, with a literature review on sustainable public procurement. From this literature review the main drivers, barriers, and suggested approaches for sustainable public procurement are extracted. Section 3.2 presents the development process of sustainable public procurement for the Central Government in the Netherlands. This information is gathered from the interdepartmental Programme for Sustainable Procurement (Interdepartementale Programmadirectie Duurzaam Inkopen, IPDI) coordinated by the Dutch Ministry of Housing, Spatial Planning, and the Environment (Volkshuisvesting, Ruimtelijke Ordening en Milieu, VROM) and Agentschap NL. Sources for this information are online available literature and interviews with policymakers of IPDI and Agentschap NL. To ascertain the quality of the interviews they followed the design of a semi-structured interview (Bardaa, 2007). In order to overcome recollection biases the interviews were recorded. Section 3.3 presents the existing instruments that have been developed in the Netherlands to stimulate the procurement of sustainable products. Subsection 3.3.1 presents a comparison between the developed instruments and the theoretical drivers and barriers. In addition to the existing instrument, subsection 3.3.2 presents the ongoing developments focusing on stimulating the procurement of more innovative sustainable products. Section 3.4 presents the answer to the research sub-question. The two product groups are selected based on prerequisites enhancing the representativeness and possibilities to generalise the conclusion to all forty-seven product groups. For the two product groups the obligatory and discretionary sustainability criteria are closely examined. Subsection 3.4.1 describes the sustainability criteria for office furniture and subsection 3.4.2 for roads. Additional information for these product groups is gathered in two ways. First, by interviews with specialist from Agentschap NL, who have been involved in the development of these instruments. Second, by evaluating information from stakeholder meetings which were held during the developing process of the instruments. However, to place the Dutch approach in perspective, we start with describing the existing literature concerning green and sustainable public procurement.

3.1 Literature review

The definition of sustainable is, according to the Oxford English Dictionary (OED) (2007), "Involving the use of natural products and energy in a way that does not harm the environment". Another widely accepted definition is: "Sustainable consumption is consumption that meets the needs of the present without compromising the ability of future generations to meet their own needs" (WCED, 1987). In the context of the Dutch public procurement programme, sustainability is defined as the right balance between People, Planet, and Profit (Elkington, 1999). Within the Dutch sustainable public procurement programme People represents social aspects such as labour conditions and exclusion of child labour. Planet represents environmental aspects, e.g. energy use, carbon dioxide emission, wastewater, and landfill. Profit represents a healthy economic situation, with realistic profit margins for all involved in the supply chain.

3.1.1 Public procurement to stimulate sustainability

Recognition for using the public procurement function to stimulate the procurement of sustainable products is emerging. Many reports have been written to promote the use of the public procurement function for stimulating sustainable production and consumption. (European Commission, 2004; ICLEI, 2007; OGC 2008; SN, 2009; PWC et al., 2009). In addition to these reports, various papers are published to support and analyse the public procurement of sustainable products (Noci, 1997; Handfield et al., 2001; Humphreys et al., 2003; Alhola, 2006; Lu et al., 2007; Nissinen et al., 2008; Walker et al., 2008; Varnäs et al., 2009; Carlsen and Callender, 2009; Hampson et al., 2009; Mienczyk et al., 2009). The content of this body of literature is extracted into drivers, barriers, and suggested approaches for sustainable public procurement.

Drivers for sustainable public procurement

Table 3.1 summarises the main drivers for sustainable public procurement identified through the existing body of literature.

Table 3.1 Drivers for sustainable public procurement

Drivers:	References:
The government's example function for society.	EC (2004), Nissinen et al. (2008)
Increasing the national competitiveness.	New at al., (2000) as cited in Walker et al., (2008).
Sustainable public procurement can create price reduction, considering life cycle costing (LCC) approach.	Lu et al. (2007), EC (2004), ICLEI (2007), PWC et al. (2009)
Sustainable public procurement can help to reach political environmental and social targets.	Lu et al. (2007), Handfield et al. (2001), ICLEI (2007), OGC (2008), Carlsen and Callender (2009).
Demanding sustainable products can stimulate innovation.	Lu et al. (2007), ICLEI (2007).
Climate change and depletion of resources.	Handfield et al. (2001), EC (2004), OGC (2008), Nissinen et al. (2008), Carlsen and Callender (2009).
Meeting customers' expectations.	Lu et al. (2007), ICLEI (2007), Hampson et al. (2009), New at al., (2000) as cited in Walker et al., (2008).
Reduce energy use.	Nissinen et al. (2008)

Barriers for sustainable public procurement

In addition to drivers, the body of literature indicates barriers for sustainable public procurement. Table 3.2 summarises these barriers. Table 3.2 does not include the barriers encountered in approaches for sustainable public procurement but rather barriers to use the public procurement function in general for this purpose.

Drivers versus barriers

From analysing the drivers and barriers for sustainable public procurement we observe that a number of barriers and drivers are contrary. From the body of literature we identified the lower overall price also to be a driver. On the other hand, we identified public procurement to be more expensive to be a barrier. In addition to this, one barrier indicating that a TCO approach requires a lower overall price is difficult to realise within the governmental budget structure. Finally, we identified that sustainable public procurement can help to reach political environmental and social targets. Whereas the exclusion of SMEs, which can also be considered a societal ambition, is identified as a barrier.

Table 3.2 Barriers for sustainable public procurement

Barriers:	References:
Sustainable public procurement is more expensive.	Handfield et al. (2003); Carlsen and Callender (2009)
Sustainable public procurement has an unknown influence on quality of products.	Handfield et al. (2009)
The supplier market of sustainable products is not large enough.	Walker et al. (2008)
It is hard to evaluate the real sustainability due to lack of information.	EC (2004); Walker et al. (2008)
SME's will be excluded from tenders.	Lu et al. (2007)
High fragmentation of public procurement position.	EC (2007b)
Limitations due to legal restrictions of EU public sector procurement Directive .	Walker et al. (2008),
High level of management support required.	Carlsen and Callender (2009)
TCO approach is difficult to realise in governmental financial structure.	ICLEI (2007)
General barriers encountered in "change management".	Hampson et al. (2009); Walker et al. (2008)

Suggested approach

Literature suggests concrete approaches how to simulate the procurement of sustainable products. These approaches aim at the strategic and tactical part of the purchasing process (Harink, 1999). This section adopts Harink's (1999) taxonomy of dividing the procurement process into strategic and tactical phases. Furthermore, this section describes the suggested approaches and explains the observed prerequisites and difficulties.

Preparation phase

In the preparation phase the influence on the sustainability of the final products is most significant (SN, 2009a). The first consideration in the preparation phase is rethinking the actual need, i.e. not buying can be a very sustainable solution (EC, 2004; SN, 2009a). After identifying the real need a market consultation should be performed to identify possible solutions (EC, 2004; SN, 2009a).

Specification phase

In this phase the specifications of the tender are constructed. Some reports and online available criteria documents³ provide ready to use sets of sustainability criteria (EC, 2004; SN, 2009). Other suggestions contain motivation for taking particular sustainability aspects into account in the various lifecycle phases (Lu et al. 2007). Phases in the lifecycle to distinguish are the following five. Pre-manufacturing, manufacturing, packaging and distribution, use and maintenance, and end of life. Aspects that should be taken into account in the various phases, according to Lu et al. (2007), are the following five: materials, energy using, solid residues, liquid residues, and gaseous residues.

Predetermined sustainability criteria and suggestions on how to design sustainability criteria have in common that they aim at criteria that can be used to select the supplier and the supplier's offer, based on environmental performance. The environmental performances can be placed in the various criteria (subsection 2.1.1).

The approaches describing predetermined sustainability criteria present two types of criteria, one type focusing on the tenderer and the other type focusing on the tender. For the tenderer there are obligatory sustainability criteria that should always be used and discretionary sustainability criteria that can be used by ambitious purchasing authorities. For the tender there are the same two

³ The Netherlands: <http://www.senternovem.nl/duurzaaminkopen/Criteria/index.asp>*
 Sweden: <http://www.msr.se/en/>*
 European Commission: http://ec.europa.eu/environment/gpp/toolkit_en.htm*

* last reviewed on January 16th 2010.

types of criteria. The objective of the obligatory and discretionary sustainability criteria is different. The obligatory sustainability criteria aim at excluding unsustainable products. Whereas, the goal of the discretionary sustainability criteria is providing sustainable leading suppliers with an advantage over suppliers that only compete on lowest price (DHV and Significant, 2009). Literature provides some important considerations and bottlenecks for sustainability criteria. The most important consideration is that sustainability criteria should always adhere to the basic principles of European tendering law: equal treatment, non-discrimination, proportionality, and transparency (EU public sector procurement Directive 2004/18/EC, p1). Furthermore, tenderers cannot be required to be registered to eco-labels. Nevertheless, under specified circumstances, the eco-label requirements can be requested (EU public sector procurement Directive 2004/18/EC). Situations where the European public procurement Directive explicitly allows using underlying specifications of eco-labels when developing performance based or functional sustainability criteria are:

- The specifications are appropriate for defining the characteristics of the supplies or services covered by the contract.
- The requirements of the contract are based on scientific information.
- The eco-labels are adopted with the participation of all stakeholders such as government bodies, consumers, manufacturers, distributors, and environmental organisations.
- The eco-labels are accessible to all interested parties.

Selection phase

In sustainable public procurement a few aspects are considered to be paramount in the selection phase. The first is using MEAT as an awarding method (EC, 2004; Alhola, 2006). The second is focusing on Life Cycle Cost (LCC) or Total Cost of Ownership (TCO) instead of focusing on direct purchasing price only (EC, 2004; Alhola, 2006; Hampson et al, 2009).

Contract phase

Literature concerning sustainable public procurement provides suggestions for including contract clauses ascertaining the performance of tenders during framework contracts or service contracts.

Approach barriers

For suggested approaches aiming at ready to use sets of sustainability criteria or suggestions on how to design sets of criteria, the following barriers have been observed in the identified body of literature.

- It is prohibited to request suppliers to be registered to eco-labels (ICLEI, 2007; EC, 2004).
- Public procurement officers are not experienced with sustainability aspects (EC, 2004).
- Accessing the real sustainability of offers is complicated due to a lack of information (EC, 2004; Walker et al., 2007).
- Historical data is a bad estimator for a dynamic aspect like sustainability (Lu et al., 2007).

3.2 Development of sustainable public procurement in the Netherlands

Policy delivery requires a mature public procurement organisation (Telgen, 2007b). One of the policy goals is to expand markets for sustainable products in the Netherlands (Ministry of CA, 2007). Expanding markets for sustainable products has been the main driver for the introduction of sustainable public procurement in the Netherlands. Plans for generic sustainable public procurement for the Central Government date from 1998 (Tweede Kamer, 1999). In 1998 the first sustainable procurement programme started at the Ministry of VROM. The existing interdepartmental approach for sustainable procurement started in 2005. In this year, a motion was accepted in Parliament (Tweede Kamer, 2005). This motion states that the Central Government should take sustainability into account in 100% of its purchases from 2010 onwards. With this motion as rationale to amplify sustainable public procurement, the existing barriers, as identified in section 3.1, Table 3.2, remained but needed to be managed. Furthermore, the political commitment became an important driver for sustainable public procurement. This motion was the basis for the coalition agreement of Prime Minister Balkenende's fourth cabinet in 2007 (Ministry of AZ, 2007). This coalition agreement states that the Central Government will use sustainability as a significant criterion in all purchases from 2010 onwards. This goal is part of a broader ambition to develop markets for sustainable production and consumption.

In addition to the Central Government, other governments will take sustainability criteria into account in their procurement activities from 2010 onwards. Regional governments and water management boards will use sustainability criteria in 50% of their purchases in 2010. Municipalities will take sustainability criteria into account in 75% of their purchases in 2010 and for 100% by 2015. Finally, other public entities are approached to join the existing initiative in order to expand the total expenditure for which sustainability is used as a significant criterion. The first public entities included are universities and schools. For these public entities, covenants are made in which the public entities pledge to take sustainability into account in public procurement. Approaches are currently aiming at police departments and the health care sector. The driving force behind using the sustainability criteria is purely based on political commitment. None of the developed instruments is translated into legislation. Whether governments are applying sustainability criteria is monitored every second year. These results are reported to Parliament. The political commitment in combination with monitoring is assumed sufficient to persuade purchasing organisations to use sustainability criteria.

In order to support taking sustainability into account in all procurements, instruments needed to be developed for purchasers. Rationale to develop instruments applicable for all purchasing authorities is that common barriers can be researched and managed centrally. The main barriers recognised in this approach have been the following.

- Lack of knowledge of procurement departments to choose for sustainable solutions.
- The sustainability of the products is difficult to evaluate.
- The supplier market of sustainable products is not large enough.
- Limitations due to legal restrictions by European tendering legislation.

The approach to reach the policy goal in 2010 is highly influenced by these barriers. To overcome these barriers a centralised approach was chosen. An interdepartmental programme for sustainable public procurement together with Agentschap NL (an agency of the Ministry of EZ) started developing sustainability criteria, to be used in the procurement process, for various products. In addition to the mentioned barriers, important considerations during this development were restrictions on creating extra administrative workload and implications that sustainable public procurement is more expensive. Before the start of the cooperation between the interdepartmental programme of sustainable procurement and Agentschap NL sustainability product sheets already existed for a limited number of product groups. In order to manage the various barriers the Ministry of VROM and Agentschap NL developed a process to design new sustainability criteria documents (subsection 3.2.2).

3.2.1 Sustainability in all purchases

This subsection describes how sustainability is used as a significant criterion in the various phases of the procurement process (subsection 2.1.1) in the Dutch approach.

The degree of sustainability can be strongly influenced in the preparation phase. In this phase a tendering organisation can still decide to: combine tenders, develop functional specifications, or not purchase at all (SN, 2009a). In the various criteria documents, these aspects appear as suggestions. Strong consideration should also be given to the tendering procedure of choice. The tendering procedure has a significant influence on the sustainability of the product.

In the specification phase there are still significant possibilities to include sustainability. These possibilities can be utilized by developing tenderer and tender criteria (subsection 2.1.1) focussing on sustainability. Technical capacity criteria and exclusion criteria (both tenderer criteria, subsection 2.1.1) can focus on environmental violations or social unacceptable grounds, such as employing illegal employees. In the criteria documents these exclusion grounds are omitted, since they are similar for all product groups (SN, 2009a). Tenderer selection criteria focus on financial grounds, such as the number of sustainable projects that the tenderer has executed compared to the total turnover. Technical specifications and award criteria (both tender criteria, subsection 2.1.1) have great potential to influence the sustainability of the product. These criteria are product specific and focus on aspects of the lifecycle that are most harmful for sustainability. Subsections 3.4.1 and 3.4.2 show examples of these criteria as well as award criteria. Contract clauses can be used to ascertain the sustainability of the tender, i.e. the tenderer is obligated to handover a maintenance plan for a work in order to elongate the lifetime of the work.

The phases after the specification phase have less influence on the sustainability of the carrying out of the tender, however, they contribute in ascertaining the earlier blueprints for sustainability. Specific criteria for the product groups “office furniture” and “roads” are presented in

section 3.4. However, subsection 3.2.2 first presents the process to come to tailored criteria for the various product groups.

3.2.2 Criteria development process

Criteria documents were initially developed for approximately eighty-five product groups. However, in June 2009 the amount of product groups was reduced to forty-five (Tweede Kamer, 2009b). The process to establish the final sustainability criteria in general was build up in the following six phases (VROM, 2006).

The first phase is the preparation phase. In this phase the Ministry of VROM and Agentschap NL determined the scope of the product group, the data for stakeholder groups and the invitation of these stakeholders. Before the stakeholder meetings took place a list of incorporated literature and consulted people and organisations was sent to all stakeholders. The most important aspect in the first phase was to determine the environmental impacts in the different phases of the lifecycle.

The main goals in the second phase were the stakeholder meetings and the analyses of the main input given by the stakeholders.

In the third phase the concept sustainability criteria were published and stakeholders were invited to comment on these concepts over a period of three to six weeks. In this phase a first legal check was performed based on the legal reference framework (section 3.2.3).

In the fourth phase, the input from stakeholders was used to develop the final concept of the sustainability criteria. This final concept was reviewed by a steering committee with participants from various governments. Thereafter, the Policy Advisory Group (Beleids Advies Groep, BAG) performed a final legal check. After the BAG gave its approval, the steering committee, with participants from various departments and local governments, gave her granting to the final concept sustainability criteria.

In the fifth phase the final sustainability criteria document was being published on the website and send to all key stakeholders.

The sixth phase is a continuous process of monitoring until the sustainability criteria documents need to be reviewed.

3.2.3 Framework for legally sound sustainability criteria

The sustainability criteria, developed by the Ministry of VROM and Agentschap NL, have to comply with EU public sector procurement Directive 2004/EC/18. To ensure compliance with European tendering law, a special commission was put into place; the BAG. In the criteria development process (subsection 3.2.2) there were two legal checks (VROM, 2006). First, checking whether the develop sustainability criteria comply with the legal reference framework. This reference framework was developed by the BAG, PIANOo (Professional and Innovative Tendering Network for governmental Procurement officers), the Central Government procurement committee, and Agentschap NL. Second, members of the BAG had to approve the sustainability criteria. In addition to this reference framework, several general legal challenges, shared among multiple product groups, were solved. The following legal checks have been performed for every criterion (SN, 2008).

- The criterion should directly relate to the object under consideration.
- The criterion should be transparent, meaning:
 - o the meaning of the criterion should be unambiguous,
 - o the criterion should be possible to prove by data, and
 - o it should be possible to objectively evaluate the sustainability criteria.
- The criterion should be objectively.
- The criterion should be non-discriminatory.
- The criterion should be proportional.
- The criterion should be the correctly positioned (selection, exclusion, etc.).
- The specific rules for tenderer and tender criteria should be adhered.

The following general legal challenges were researched and completed by the BAG (SN, 2008).

- International Labour Organisation (ILO) norms can be included to guarantee social behaviour of the supplier.

- In specific situations, for services and works, tenderers can be requested to have an environmental management system.
- Sustainability criteria originating from (eco) labels are allowed to be used provided that the (eco) label holds a direct relation to the product. However, other means of prove have to be accepted as well. It is prohibited to require a supplier to be registered to (eco) labels. If parts of (eco) labels or similar criteria are required, the content of the (eco) label must be explained.
- Requirements concerning production process are allowed, provided they are directly related to the product.
- There are possibilities to require sustainability in the whole supply chain, provided they are directly related to the product.
- It is unclear whether demands can be put on the transportation distance of a supplier. These demands might violate the single market principles in the EC Treaty of free trade, because only local or regional suppliers can fulfil these requirements.
- Sustainability demands can be put in the contract clauses provided they are: not hindering suppliers from foreign countries, the requirements are directly related to the product, contract clauses should be achievable for all suppliers, they cannot have the same function as exclusion criteria, and contract clauses should be made public together with the tender.

3.3 Developed instruments

After explaining the objective, the process, and a check for legally soundness of the sustainability criteria, this section provides an overview of the existing instruments available for public procurement authorities. As of the fall of 2009, there are forty-seven criteria documents for various product groups available⁴. For these product groups distinct criteria documents have been developed. These documents contain environmental criteria focusing on the tenderer and the tender. For the tenderer as well as the tender, two types of criteria have been developed. The first type is obligatory technical specification criteria. Committed governments are obliged to apply the first type in all their tenders. The second type is discretionary award criteria. Committed governments can voluntary use the second type. These sustainability criteria have been developed in accordance with the market. In addition to these sustainability criteria, several of the criteria documents also contain contract clauses. For now, these sustainability criteria and contract clauses are all aiming at environmental aspects. Social aspects are expected to be included in the beginning of 2010. The level of detail, desired to provide for this thesis, cannot be given for all product groups. For this reason, we focus on two products groups, office furniture and roads, to go into more depth of the developed instruments (section 3.4, Tables 3.3 and 3.4). In addition to developed criteria documents, a sustainable public procurement guide has been developed (SN, 2009a). This guide provides procurement officers with general information concerning sustainable public procurement in the various phases of the purchasing process. The guide provides information and suggestions concerning the following aspects.

- The legal framework of sustainable public procurement.
- The influence of the various phases of the purchasing process on sustainability.
- The possibilities concerning rethinking the actual need, in the preparation phase, together with the internal customer, i.e. location where the actual need originates.
- The choice for the right tendering procedure.
- The trade-off between awarding on price only or on MEAT.
- Splitting up the tender in lots in order to experiment or excel on sustainability for one or more of these lots.
- The various possibilities for selecting tenderers and the tenderers' offer.
- The possibilities to design contract clauses in such a way that they will stimulate tenderers to improve their sustainable performances during the contract.
- The suggestions ascertaining the specifications of the product.

⁴ <http://www.senternovem.nl/duurzaaminkopen/criteria> [last visited on February 22nd, 2010].

3.3.1 Comparison of developed instruments with theoretical drivers and barriers.

In this subsection we compare the developed instruments with the theoretical drivers (Table 3.1) and barriers (Table 3.2). The main driver is the political commitment to take sustainability into account in all of the Central Government's procurements. The rationale for this political commitment is closely related to all the drivers presented in Table 3.1. The following five barriers have been managed by the existing criteria development approach.

"Sustainable public procurement is more expensive." This barrier has been managed by keeping track of including sufficient suppliers in order to maintain competition among tenderers in markets. In addition to this, research has indicated that, for a selected group of product groups, sustainable public procurement is less expensive than traditional public procurement (PWC et al., 2009)

"It is hard to evaluate the real sustainability due to lack of information." This barrier has been managed by analysing the most paramount sustainability aspects during stakeholder meetings held for all the product groups. In addition to the paramount aspects, there are also methods describing how to verify these sustainability aspects.

"The high degree of fragmentation of public procurement makes it hard to change markets." This barrier has been managed by developing sustainability criteria that have to be used by the Central Government, regional governments, local governments, and water management boards. In addition to this, the category management initiatives manage the fragmented public demand.

"The limitations due to legal restrictions of the EU public sector procurement Directive." This barrier has been managed by analysing all the sustainability criteria on their legal reliability by a legal committee (subsection 3.2.3).

"The high level of management support required." Due to the political commitment, the maximum possible management support for sustainable public procurement has been assured. Nevertheless, this goal can be conflicting with other policy goals, especially when believes that sustainable public procurement is more expensive are still animate.

"SME's will be excluded." Due to the influence of interested stakeholders during the development process, the possible objectives of SME's are incorporated in the decision for the developed sustainability criteria.

3.3.2 Recent developments

In addition to the sustainable procurement guide and the criteria documents for forty-seven product groups, IPDI is working on the development of two other facets in sustainable public procurement. These two facets are both aiming to increase the stimulating effect on innovation (Tweede Kamer, 2009c).

The first initiative aims at developing future sustainability ambitions and expressing these ambitions in advance to the market. The future ambitions aim at creating incentives for potential suppliers to develop products that can comply with these future sustainability ambitions. The future ambitions will be developed in accordance with (academic) researchers, policymakers, and purchasing experts. Moreover, these future sustainability ambitions will relate to long-term policy goals, such as reduction of carbon dioxide emissions. These sustainability criteria have additional advantages. Ambitious purchasing authorities can award tenders that already comply with these criteria, or can create incentives for suppliers to work towards these future ambitions. The ambition to stimulate ambitious purchasing authorities is completely in line with recommendations from van SenterNovem (2009d). SenterNovem (2009d) analyses sustainable public procurement in the Netherlands and presents recommendations for future development.

The second initiative aims at supporting five innovative projects, these projects are supported to increase the introduction of innovative techniques in these specific markets. The following five projects were chosen.

- 1 Electric cars.
- 2 Construction project including interior, initiated by the Central Government.
- 3 "The road of the future"
- 4 Energy reducing investments for houses.
- 5 Energy reducing investments for school buildings.

3.4 Focus on two product groups

This section focuses on answering the following research sub-question.

Which two product groups are suitable to acquire the level of detail needed for this thesis?

This section presents a more in-depth analysis of the developed sustainability criteria for two product groups. The reason not to investigate all the product groups at a more abstract level was the following. In the explorative phase of this master's thesis, none of the interviewed could provide sound arguments about the general influence of the sustainability criteria on innovation. This was believed to be caused by the too abstract level. In addition, both sources BECO (2008) and Wientjes and Hermans (2009) focused on a general level on the hindering effect of the sustainability criteria on innovation. They also could not draw conclusions of the influence of sustainability criteria on innovation. Altogether, this has been reason to focus on a more specific analytic approach and research the influence of specific sustainability criteria on innovation. This to isolate the problem from disillusioned expectations, disappointments concerning the sustainability criteria development process, and possible influence of the sustainability criteria on the market. The rationale to focus on sustainability criteria of two product groups and not on sustainability criteria of all the product groups has been the following. The sustainability criteria of the various product groups are to a large extent comparable. The criteria documents all focus on sustainability criteria to be included in the specifications phase of the purchasing process (Van Weele, 1997). In addition to this, the sustainability criteria all focus on tenderer criteria, tender criteria, and contract clauses (subsection 2.1.1). Finally, the sustainability criteria have been developed following the same process and including similar, product groups specific, stakeholders (subsection 3.2.2). For these four reasons the approach in this master's thesis has been to analyse the sustainability criteria of two product groups and generalise these analysis to all product groups. However, this approach requires a well motivated choice for the two product groups. The motivation aims to maximise the chance of discovering possible hindering effects of the existing sustainability criteria on innovation. In addition to this, the chosen product groups should be good representatives of all the product groups. The rationale for this is that the conclusions, for these two product groups, will be generalised to all forty-seven product groups. These motivations led to the following seven prerequisites.

1. The existing sustainability criteria should be perceived to hinder innovation.
2. The Central Government should have a relatively large influence on the market of the product groups.
3. The product groups should have a relatively large influence of the purchasing portfolio of the Central Government.
4. The product group should not be removed in the revision of the product groups in the summer of 2009.
5. There should be obligatory as well as discretionary sustainability criteria for the product group.
6. There should be at least four sustainability criteria in total for each of the product groups.
7. The two product groups should not be of the same type (goods, service or works).

These prerequisites were discussed with several stakeholders. These stakeholders are: multiple experts from Agentschap NL, the author of the Beco (2008) report, experts from the interdepartmental sustainable public procurement programme, and project manager innovation procurement at PIANOo. From these analyses, the two product groups that were complying with the parameters are office furniture and roads. Subsections 3.4.1 and 3.4.2 present the existing sustainability criteria for these two product groups.

3.4.1 Office Furniture

The product group “office furniture” entails, besides office furniture, a wider range of equivalent products (see appendix III for a complete list of Common Procurement Vocabulary (CPV) codes). For office furniture, there are no obligatory criteria for purchasers to use in the preparation phase. However, the following seven obligatory technical specifications have been developed for office furniture (SN, 2009b).

- The office furniture should have a minimum guaranteed lifespan of five years.
- All cellular polyurethane in the office furniture should comply with NEN 3373.
- Spare parts of the office furniture have to be available for at least ten years after procurement.
- Particle boards from the office furniture should comply with formaldehyde class E1 as described in EN 120, EN 717-1, and EN 717-2.
- The fabrics in the equipment of the office furniture should not contain more than specified concentrations of a list of hazardous substances.
- Coatings on the office furniture should not contain more than specified concentrations of a list of hazardous substances.
- The office furniture should be separable using everyday tools.

Verification of compliance with the sustainability criteria concerning: lifespan, formaldehyde concentrations, hazardous materials in the fabrics, and hazardous materials in the coating should be proved by means of a test report (SN, 2009b).

For office furniture one discretionary award criterion has been developed.

- The percentage of the complete tender, accompanied with a composition indicating the applied materials in the equipment, earns the tenderer an advantage.

Verification of this award criterion does not require further prove.

All the developed instruments for office furniture are summarised in Table 3.3.

Table 3.3 Developed sustainability criteria for office furniture

Criterion:	Type of criterion:
The furniture should have a minimum guaranteed lifespan of five years.	Obligatory knockout criterion in the technical specifications.
All cellular polyurethane should comply with NEN 3373.	Obligatory knockout criterion in the technical specifications.
Spare parts have to be available for at least ten years after procurement.	Obligatory knockout criterion in the technical specifications.
Particle boards should comply with formaldehyde class E1.	Obligatory knockout criterion in the technical specifications.
The fabrics in the equipment should not contain more than specified concentrations of a list of hazardous substances.	Obligatory knockout criterion in the technical specifications.
Coatings on the furniture should not contain more than specified concentrations of a list of hazardous substances.	Obligatory knockout criterion in the technical specifications.
Equipment should be separable using everyday tools.	Obligatory knockout criterion in the technical specifications.
Which percentage of the total volume of the order has a composition label indicating the applied materials in the equipment.	Discretionary scoring criterion in the award criteria.

3.4.2 Road Construction

The product group “roads” entails, besides roads, a wider range of equivalent products (see appendix IV for a complete list of CPV codes). For roads, there are no obligatory criteria for purchasers to use in the preparation phase. However, there is a list of aspects to consider in the preparation phase (SN, 2009c). This list contains suggestions of how to consider sustainability in: the process, the design, during execution, during the use phase, and at the end of life (SN, 2009c). In the specification phase, there are three obligatory knockout criteria. However, the use of these sustainability criteria depends on the type of procurement. A distinction is made between three

tendering situations: a tender for a new road, a tender for the maintenance of an existing road, and the demolition of an existing road. The first two of these tendering situations are divided into three types: design contract, design and construction contract, and construction only contract. For demolition of roads only the obligatory are recommended to be used. The discretionary award criteria are not applicable for demolition only contracts. However, the distinction between the three types is not always as apparent as might be assumed from the criteria document (SN, 2009c). Situations where the three types are merged into one single contract are not seldom in this sector. The applicability of the sustainability criteria depends on the type of contract. However, the criteria should be evaluated individually to determine whether they are applicable for the contract at hand. For roads, the following obligatory technical specifications have been developed (SN, 2009c).

- Breaking down stone like materials should be done according to BRL 2506.
- Tar products should be assimilated and transported to a facility operating according to Dutch legislation for thermal assimilation of tar.
- For instances of temporary facilities, that do not have to comply with environmental legislations the following precautions should be taken. The location should install special facilities for separate collection and transportation of waste. For secondarily released raw materials, special facilities should be made on the location of the works.

For the knockout criteria a description is only required for the way in which the tar products are assimilated, to prove this a certificate by the party that is assimilating the tar products is sufficient.

In addition to these obligatory knockout criteria, there are three discretionary award criteria for roads (SN, 2009c).

- The environmental impact determined by a LCA according to NEN 8006 earns the tenderer and advantage.
- The more soil coming from the construction site, which is re-used in the same or surrounding construction site, the better the tender will be evaluated.
- The more the road infrastructure is used to yield energy, the better the tender will be evaluated.

The first award criterion needs to be proven by an LCA according to NEN 8006. The second award criterion should be proven by a ground balance proposal. The third award criterion should be proven by a clear description in the technical specifications of the tender.

Finally, for roads also one obligatory contract clause has been developed.

- At completion of the tender, a maintenance plan will be presented. The maintenance plan should describe the maintenance requirements to maintain the roads in its original status.

The plan also describes the ways to maintain the sustainable aspects of the road.

All the developed instruments for roads are summarised in Table 3.3.

Table 3.4 Developed sustainability criteria for roads

Criterion:	Type of criterion:
Breaking down stone like materials according to BRL 2506	Obligatory knockout criterion in the technical specifications.
Tar products should be assimilated and transported according to Dutch legislation.	Obligatory knockout criterion in the technical specifications.
For temporary facilities, special facilities have to be arranged to separately collect and transport waste.	Obligatory knockout criterion in the technical specifications.
The environmental impact determined by a LCA according to a NEN 8006 earns the tenderer and advantage.	Discretionary scoring criterion in the award criteria.
The more soil coming from the construction site, which is re-used in the same construction site, the better the tender will be evaluated.	Discretionary scoring criterion in the award criteria.
The more the road infrastructure is used to yield energy, the better the tender will be evaluated.	Discretionary scoring criterion in the award criteria.
At completion of the tender a maintenance plan has to be presented.	Contract clause.

3.5 Conclusion

This chapter started with a literature review, the results from this review were extracted into a list of drivers, barriers, and approaches for sustainable public procurement. We observed that some drivers and barriers are contrary. The main driver, for the Dutch approach, is the motion that was accepted in parliament. Nevertheless, we argue that the other drivers from Table 3.1 should be kept in mind and be applied in order to amplify enthusiasms for sustainable public procurement. The body of literature shows that the alleged higher costs of sustainable public procurement are a major barrier. Nevertheless, there is evidence that the overall expenses will decrease when sustainable public procurement is implemented (PWC et al., 2009). Furthermore, we observe that one of the drivers for sustainable public procurement is the potential to stimulate innovation. This is completely in line with the research goal of this thesis.

Returning to the research question of this chapter we conclude that the following instruments have been developed in the Netherlands. Sustainability criteria documents have been developed for forty-seven product groups. These documents contain environmental criteria focusing on the tenderer and the tender. For tenderer as well as the tender, two types of criteria have been developed. The first type is obligatory criteria. Committed governments are obliged to apply the first type in all their tenders. The second type is discretionary award criteria. Committed governments can voluntary apply the second type. In addition to tenderer and tender criteria, the contract clause should be applied. In addition to these product group specific sustainability criteria documents, also a procurement guide for sustainable public procurement has been developed. In order to increase the focus on the possibilities of innovative sustainable products, IPDI is developing two additional initiatives. The first aims at sending out the future sustainability ambitions for specific product groups. The second initiative aims at supporting innovative projects. We conclude that the existing approaches taken in the Netherlands are similar to the suggested approaches in literature. However, the upcoming social criteria are unobserved in this extent.

Returning to the research sub-question of this chapter we conclude that, based on the seven parameters in section 3.4, office furniture and roads are proper product groups to acquire the desired level of detail. The sustainability criteria presented in Table 3.3 and 3.4 will be further analysed in chapters 5 and 6.

4 *Public procurement for innovation*

This chapter presents the instruments that have been developed to stimulate the procurement of innovative products in the Netherlands. There are three prerequisites for instruments to be included in this chapter. First, the instruments should be applicable in basic tendering procedures. Second, the instruments are applicable in the strategic or tactical part of the purchasing process. Third, the instruments' main focus is on non-radical innovation (Narayanan, 2001, chapter 3). The reason to focus on non-radical innovations is that these are more likely to respond to demand side measures (Nemet, 2009). Whereas, radical innovations are more likely to originate from supply side measures (Nemet, 2009). Furthermore, the project outcome-, lead time-, unit cost-, and functionality risks related to radical innovation (Tatikonda and Rosenthal, 2000) are motivation not to combine sustainable public procurement with elements focussing on radical innovations. In order to go into more depth of the existing instruments, the analytical approach will be to focus on instruments that are applicable in regular tendering procedures, described in EU public sector procurement Directive (2004/18EC, article. 28-31). The content of this chapter is corresponding to answering the following research question.

Which instruments have been developed in order to stimulate the Dutch public procurement function to procure innovative products?

In order to answer this research question this chapter starts, in section 4.1, with a literature review on public procurement for innovation. This literature is extracted into main drivers, barriers, and suggested approaches of public procurement for innovation. Section 4.2 presents a broad outlook of initiatives focusing on procurement for innovation in the Netherlands. These initiatives are Small Business Innovation Research (SBIR), Lead market Initiative (LMI), and lead suppliers desk. Section 4.3 presents the initiatives aiming at direct procurement of innovative solutions. The information presented in section 4.2 and 4.3 is analysed by desk research and interviews. To ascertain the quality of the interviews they followed the design of a semi-structured interview (Bardaa, 2007). In order to avoid memory bias, the interviews were recorded. However, to place the Dutch approach in perspective, we start with describing the existing literature concerning public procurement for innovation.

4.1 Literature review

The definition of innovation is, according to the OED (2007), "A new idea, a new way of doing, or new things". The word innovation originates from the Latin word *innovare*, which means to make new. Another widely accepted definition of innovation is : "The introduction of a new good, the introduction of a new method, the opening of a new market, the conquest of a new source of supply of raw materials or half-manufactured goods, or the carrying out of the new organisation of any industry" Schumpeter (1943). This definition suggests five types of innovations. In this master's thesis, two different types of innovations are distinguished output innovation and process innovation. Hommen and Rolfstam (2007) refer to these as product innovation and process innovation respectively. The focus of this thesis is not on innovative procurement approaches but procurement of innovative products. To provide a description of the dynamics of innovation this is described in terms of drivers, the process, and the output. Drivers for innovation are market factors and input factors. In general, the first causes approximately 80% of innovations (Narayanan, 2001, pp. 69-75). The processes to come to innovations are market-pull and technology-push. Both methods are driven by technology factors and market needs. In the case of market-pull, the strongest motivation is evidently market demand, whereas for technology-push this is the technology factor. For the output of innovation, a distinction can be made between significant changes in processes and outputs and marginal changes in processes and outputs. Furthermore, to classify something as an innovation the output should also be made available on the market, otherwise it is still an invention (Narayanan, 2001, pp. 69-75). In addition to the type of innovation, it is important for a purchasing organisation to be able to identify at which stage the novel product is (i.e., between invention and fully market mature product). This strongly relates to the amount of risk involved for the procuring authority. The risks involved are the highest for a new idea and decrease until the lowest level of risk for fully market mature products (EC, 2006).

4.1.1 Public procurement for innovation

Literature on using the public procurement function to stimulate the procurement of products is widely available (EC, 2005; EC, 2006; Significant, 2007; OGC, 2007; EC, 2009a; EC, 2009b; ICLEI, 2009). In addition to these reports, there are numerous papers that support and analyse public procurement of innovative products (Geroski, 1990; Dalpé et al., 1992; Faucher and Fitzgibbons, 1993; Dalpé, 1994; Edler, 2006; Hommen and Rolfstam, 2007; Edler and Georghiou, 2007; Aschhoff and Sofka, 2009; Nemet, 2009; Rolfstam, 2009). The content of this body of literature is extracted into drivers, barriers, and suggested approaches for public procurement for innovation.

Drivers for public procurement for innovation

Table 4.1 summarises the main drivers for innovative public procurement identified through the existing body of literature.

Table 4.1 Drivers for public procurement of innovation

Drivers:	References:
Public procurement of innovations can stimulate economic development.	Significant (2007), EC (2009a)
Government's example function to stimulate innovation.	Edler (2006)
Public procurement of innovations can speed up markets for sustainable products.	Significant (2007), EC (2009b), Nemet (2009)
Public procurement for innovations can boost targeting societal goals.	Dalpé et al. (1992), Edler and Georghiou (2007), Significant (2007), EC (2009a), EC (2009b)
Innovations can generate better long term value for money.	Edler and Georghiou (2007), OGC (2007b), EC (2009a), ICLEI (2009)
Public procurement of innovations can help achieve multiple policy goals.	OGC (2007b), EC (2009b)
Public procurement for innovations can exploit synergy effects with other policy instruments to stimulate innovations.	Dalpé et al. (1992), Aschhoff and Sofka (2009)
Technological capacity of public sector users generates a large potential group of users of innovations.	Dalpé (1994), Edler (2006)
Governments are capable of bearing possible higher entry costs of innovative products.	Dalpé et al. (1992), Edler (2006)
Public procurement is the most effective policy instrument to stimulate innovation.	Edler and Georghiou (2007), Aschhoff and Sofka (2009)
High concentrations of public demand early in the life cycle acts as a potential catalyst for innovation activity.	Faucher and Fitzgibbons (1993)

Barriers for public procurement for innovation

In addition to drivers, the body of literature also points toward barriers for public procurement of innovation. Table 4.2 summarises these barriers.

Drivers versus barriers

By analysing the drivers and barriers for public procurement for innovation we observe that a number of barriers and drivers are contrary. We identified better long-term value for money to be a driver, on the other hand we identified the believe that public procurement for innovation will be more expensive to be a barrier. In addition to this, we identify drivers aiming at the procurement organisation focusing on bearing higher entry costs, and the technological capacity of the public sector users. Conversely, we also identified the following barriers focusing at the procurement organisation. Senior level buy-in is required, public procurement tends to over specify requirements, public procurement officers demonstrate a risk avoiding behaviour, and public procurement has insufficient buyer supplier interaction to become aware of innovative alternatives. Finally, focusing

on the policy instruments and other policy goals we observe the following drivers. Public procurement can boost targeting societal goals, can help achieve multiple policy goals, can exploits synergy effects with other policy instruments, and is the most effective policy instrument to stimulate incremental innovations. Conversely, we also identified the following barrier. Multiple conflicting policies seek to influence the public procurement function.

Table 4.2 Barriers for public procurement of innovation

Barriers:	References:
Procurement of innovative products is more expensive.	Edler (2006), OGC (2007), Edler and Georghiou (2007)
Procurement of innovative products increases risks.	Rolfstam (2009b), Valkenburg et al (2009)
Procurement of innovative products Increases the overall lead-time.	Dalpe (1994), Edler and Georghiou (2007), OGC (2007), EC (2009a)
The performance of the eventual outcome is not as specified for innovative products.	Edler (2006), Edler and Georghiou (2007), EC (2009a)
Public procurement of innovative products creates political risks.	Dalpe (1994), EC (2009a)
Public procurement of innovative products can result into supplier lock-in risks.	Edler (2006)
The EU public sector procurement Directive (2004/EC/18) restricts public procurement of innovative products.	EC (2006)
The location of Intellectual property rights are difficult to place in public procurement of innovations.	OGC (2007), EC (2009a)
Public procurement of innovations requires senior level buy-in.	OGC (2007)
Multiple conflicting policies seek to influence the public procurement function.	EC (2009a)
Public procurement officers demonstrate risk avoiding behaviour.	Dalpe (1994), EC (2009b), OGC (2007)
Public procurement of innovative products can result in overall losses for possible local gains.	Dalpe (1994)
Public procurement has insufficient buyer supplier interaction to become aware of innovative alternatives.	Edler (2006)

Approaches

There are various approaches for public procurement of innovations. The European Commission (2009a) developed the following taxonomy:

- direct procurement of innovations,
- pre-commercial procurement (PCP) of innovations,
- co-operative procurement of innovations, and
- catalytic procurement of innovations.

This taxonomy is supported to certain extents by Edler (2006), ICLEI (2009), EC (2009b), and OGC (2007). Direct procurement of innovations is the only approaches complying with the, earlier mentioned, three prerequisites. For this reason, we will only focus on theory concerning direct public procurement of innovations.

Direct procurement of innovations

Direct procurement is where the public procurement organisation procures an innovative product for its own needs. This can be done by using traditional procedures like the open and restricted procedure or by more advanced tendering procedures (subsection 2.1.3). A wide variety of possible

approaches is suggested. The list from EC (2005) is the most extensive found in literature. The EC (2005) recognises the following elements to stimulate the procurement of innovations.

- Make use of advanced tendering procedures such as the competitive dialogue.
- Use MEAT as award method at all times, combination should be sought with LCC or TCO.
- Perform technical dialogues before tenderers are sought.
- Specify functional or performance-based.
- Allow options to submit variants.
- Design contract conditions that allow for transfer of intellectual property to the supplier.
- Modify the size of the tender to the size at which innovative products are most likely to be submitted. This should be done by either aggregating (joint buying) or splitting up the tender (lots).
- Design procedures to deal with unsolicited proposals.
- Major suppliers should make sub-contracting more visible in order to enable innovations that overcome supply chain innovation problems.
- Express future needs and requirements as early as possible to the market.
- Educate procurement officers in order to make them familiar with public procurement for innovations.
- There should be extensive public private cooperation when Directives for public procurement are converted into national legislation.
- In order not to startle suppliers with innovative products, confidentiality clauses should not be too strict.

4.2 Procurement related innovation initiatives in the Netherlands.

This section provides a broad outlook over the initiatives focusing on public procurement for innovation in the Netherlands. These initiatives are not complying with the earlier prerequisites. Nevertheless, they are presented providing an overview of existing procurement related approaches aiming at procurement of innovations. The direct procurement of innovation, the main focus of this thesis, is described in section 4.3. Three prominent procurement initiatives identified in the Netherlands are: the SBIR programme, the lead supplier desk, and the Lead Market Initiative (LMI).

SBIR

SBIR is an initiative in the Netherlands for a pre-commercial design contest. The focus of SBIR projects is stimulating innovative ideas into innovations with the objective of solving societal problems (SN, 2009e). The Dutch programme distinguishes three phases. The first phase is a feasibility study. The second phase consists of applied research and development, and the final phase prepares the product for successful market penetration. However, only the first two phases are actually organised by the Dutch SBIR programme. For the last phase, the participants should find a (public) purchasing organisation themselves.

The result of the first phase is a report in which various topics have to be explained. Important aspects that should become apparent are the following. The technical feasibility of the project, the market potential for the product, and the required stakeholders for further development of the product. Furthermore, the solution should contribute to solving societal and ecological problems. Finally the project is evaluated on its financial feasibility. A predetermined number of projects are selected to participate in phase two as well. An independent committee, evaluating the projects in line with the previously described aspects, carries out the selection.

The result of the second phase is an operational prototype, model, or concept that is not yet ready for market penetration. In addition to this, a production plan for further market penetration is important in the evaluation of the projects. Ideally, there is already a first customer to start the market penetration. The third phase is not part of the SBIR project.

Lead suppliers desk

The Lead supplier desk is a specialised interdepartmental network of civil servants, who intensively assists lead suppliers with complex problems. The lead-suppliers desk aims primarily at SMEs. The hindering aspects that are encountered by the lead suppliers are among others, the supplier:

- has problems finding the right projects for arranging subsidiaries,
- has problems finding customers for their innovative products,
- lacks the business experience to successfully advertise their innovative ideas,
- is hindered by legislation.

The lead supplier desk uses its extensive network to help lead suppliers with their problems. The advantage of the lead supplier desk is that its network can assist in the, often wide dispersed, problems.

Lead Market Initiative

The LMI is a European initiative stimulating innovation in six markets. For these areas a policy mix is suggested in order to achieve maximum impact (EC, 2007a). The policy instruments aim at demand side measures. The demand side measures are regulations, procurement, and standardisation. LMI focuses on the following markets e-health, sustainable construction, protective textiles, bio-based products, recycling, and renewable energy (EC, 2007a). These markets are identified by focusing on upcoming societal or ecological problems such as the ageing of the population, depletion of water sources, and climate change.

4.3 Direct public procurement of innovation

The Central Government has started a project with the objective stimulating public procurement of innovations. The project public procurement of innovation is just like the SBIR program part of the approach Nederland Ondernemend Innovatieland (Netherlands entrepreneurial innovation country, NOI). Three approaches taken for this are the following.

- The development of an expertise network.
- Estimating the potential of public procurement of innovation.
- Stimulating projects in key areas of public procurement.

A motion in Parliament urged the Dutch Government to make public procurement for innovation more concrete. The motion requested the Central Government to design key performance indicators (KPI) to include in the national budget in 2010 and to provide Parliament with twenty examples of public procurement of innovative products (Tweede Kamer, 2008). In November 2009 the Dutch Parliament is informed on both issues (Tweede kamer, 2009).

4.3.1 Developed instruments

This section describes the elements that are analysed and selected to stimulate the procurement of innovative products. The following elements have been selected by the project team procurement for innovation (EZ, 2009).

Table 4.3 Developed innovation stimulating instruments fir direct public procurement of innovations

Elements:	
MEAT	Total cost of ownership
Market consultation	Variant bids
Lots	Rewarding innovative capabilities
80/20 rule	Norms for development in desired direction
Functional specifications	Incentives for continuous improvements

In this list of innovation stimulating elements “pilot projects” and “compensating for tendering costs” are excluded. The rationale to exclude “pilot projects” is that pilot projects are not applicable in basic tendering procedures. The rationale to exclude “compensating for tendering costs” is that compensation of tendering costs is not appropriate for the open tendering procedure (section 2.1.3).

Compensating for tendering costs can lead to excessive amounts of financial compensation in the event of numerous tendering parties.

Preparation phase

The following three innovation stimulating elements, if desired, should be decided on in the strategic phase of the purchasing process.

Market consultation is the systematic collection, classification, and analysing of relevant information for prices and availability of products (van Weele, 2007). Market consultation with the objective to stimulate innovation primarily focuses on searching for new solutions that are not known to the public procurement department. Market consultation also serves the goal to research the eagerness of potential suppliers to develop innovative solutions (Rijksoverheid, 2009). Market consultation can be completely disconnected from the purchasing process itself. The nature of market consultation strongly depends on the characteristics of the products. For products that are bought directly from stock an analysis among catalogues can be sufficient. Whereas products that are designed on order require more extensive information exchange.

Dividing the tender into lots is an exception explained in EU public sector procurement Directive (2004/18/EC). A tender can be divided into lots in order to stimulate SMEs to participate in the tender. Lots are, however, not a desired approach to stimulate innovation for all tenders. The tendering organisation should always bear in mind that dividing the tender into lots can also hinder innovative solutions (Ministry of EZ, 2009).

The 80/20 rule allows tendering parties to deviate, to a certain extent, from tendering regulations for a part of the tender. The EU public sector procurement Directive (2004/18/EC) explains this exception. In short, this exception allows the tendering organisation to diverge from the specific tendering regulations. However, the tendering organisation should bare the following aspects in mind.

- The basic principles of public procurement should still be adhered to (transparency, non-discriminatory behaviour, and equal treatment).
- The sum of the lots, excluded from specific tendering regulations, cannot exceed 20% of the total sum of the tender and cannot exceed € 80 000,- excluding taxes.

Specification phase

The following seven innovation stimulating elements should be decided upon in the specification phase of the purchasing process. Although some elements refer to other phases of the procurement process, they need to have already been decided upon in the specification phase. For instance, contract clauses should be mentioned in the specifications of the tender.

MEAT is an awarding method that allows the award of a tender based on various aspects in addition to price (EU public sector procurement Directive 2004/18/EC). Combining multiple criteria for supplier selection requires additional considerations, which are described in subsection 2.1.2.

Functional overall specification does not describe all technical details of how a tender should be carried out but instead describes the function of the desired product. For example, a bridge should be build connecting two riverbanks capable of handling daily 100 000 cars both ways. An even more abstract level can be to describe the performance of the desired output, i.e. the product should be capable of carrying 100 000 cars from one side of the riverbank to the other and vice versa (EC and Nordic Council of Ministries, 2007).

TCO is a cost approach where all direct procurement cost and costs occurring after the procurement are included. Direct procurement costs are the visible transaction costs. Indirect costs are all the other costs, such as usage, delivery, maintenance, and disposal (Ministry of EZ, 2009).

A variant bid is an alternative competitive bid from the same supplier. The bid can be a more challenging and more innovative bid. Variant bids are allowed, provided this is explicitly indicated in the tender. The exact minimal requirements of variant bids, concerning the presentation of variant bids, are described in the contract documents. Variant bids are described in EU public sector procurement Directive (2004/18/EC, article 24).

Reward innovative capability is an innovation stimulating elements suggesting to award suppliers based on historical data concerning the innovative capabilities of the firm. In addition to rewarding the innovative capabilities of the tenderer, the innovativeness of the product can also be rewarded (Ministry of EZ, 2009).

Norms for stimulating desired development is an innovation stimulating instrument that allows tendering organisation to include requirements in the tender in order to stimulate knowledge exchange. Knowledge exchange again stimulates innovation by creating a large enough potential market for innovative products (Ministry of EZ, 2009). Other motivations for norms are that, in the case of open-norms, they increase competitiveness and henceforth innovation (DTI, 2005). In addition to this, norms can provide suppliers grounds to show the superiority of their products (significant, 2007).

The final instrument applicable in the specification phase is creating incentives for continuous improvement. Incentives for continuous improvement are created by contract clauses containing agreements that focus on stimulation of continuous improvement of the products (goods, services, and works).

Up until now, public procurement authorities are not required to use any of these elements. In response (TweedeKamer, 2009) to the Motion Aprotroot and Besselink (Tweede Kamer, 2008), a KPI was proposed. The KPI is: "the amount of, by Central Government, procurements aimed at procuring innovative products." We argue that this is the first step towards appointing goals to the innovation stimulating elements. The KPI will be measured in order to identify the amount of procurements aimed at procuring innovative products in 2010. After this initial KPI measurement, this indicator can be used to describe future ambitions (TweedeKamer, 2009).

4.3.2 Comparison of developed instruments with theoretical drivers and barriers.

In this subsection, we compare the developed instruments (Table 4.3) with the theoretical drivers (Table 4.1) and barriers (Table 4.2). The main driver originating from the political context is creating an innovative and competitive economy. This is in line with drivers presented in Table 4.2. In addition to this, the potential of public procurement for innovations speeding up the development of markets for sustainable products is a paramount driver. Comparing the developed instruments with the theoretical barriers, we observe that these instruments are actually tools for procuring innovative products. These tools, however, are dealing with some of the theoretical barriers.

Performing market consultation assures that the theoretical barrier of insufficient supplier buyer interaction is dealt with.

Dividing the tender into lots stimulates multiple suppliers, which circumvents the risk of supplier lock-in.

The 80/20 rule provides opportunities to experiment partly outside the EU procurement Directive. This innovation element addresses the theoretical barrier that the EU public sector procurement Directive is restricting the procurement of innovative products.

A TCO approach addresses the theoretical barrier that procurement of innovative products is more expensive. Comparing the TCO of regular products with innovative products can demonstrate that innovative products are not more expensive.

Allowing variant bids addresses two theoretical barriers. Due to allowing variant bids, the theoretical barrier of insufficient supplier buyer interaction can be mitigated. In addition to this, variant bids partly deal with risk avoiding behaviour of public procurement officers. The tender can be presented in a traditional way but suppliers can also submit innovative alternative ideas.

4.4 Conclusion

This chapter started with a literature review. The results from the literature review are extracted into drivers, barriers, and approaches for public procurement for innovation. We observed that some drivers and barriers are contrary. In addition to this, we observe that many of the barriers focus on increasing risks. Furthermore, we observe that one of the drivers is that public procurement for innovation can speed up markets for sustainable products. This is completely in line with the research goal of this thesis.

Returning to the research question of this chapter, we identified the following three existing approaches aiming at stimulating the procurement of innovative products: co-operative procurement, direct public procurement, and catalytic procurement of innovations. We further analysed the existing approach aimed at stimulating direct public procurement of innovations. In order to stimulate the direct procurement of innovative products, twelve innovations stimulating

elements are identified. Comparing the twelve elements with the suggestions from the literature, we can conclude that the Dutch approach is corresponding to suggestions from literature (EC, 2005). Finally, we observed that the Dutch approach, hitherto, is entirely discretionary (Tweede Kamer, 2008).

5 Instrument interactions

This chapter focuses on analysing the alleged hindering effects of sustainability criteria on the procurement of innovative products. In addition, the influence of the innovation elements on the procurement of sustainable products will be presented. In order to research the possible interactions between the instruments developed for stimulating sustainability and innovation the following three interactions will be analysed. First, the direct instrument-instrument interactions will be analysed. Second, the influence of the existing instruments, developed to stimulate the procurement of sustainable products (chapter 3), on the procurement of innovative products will be analysed. Third, the influence of the existing instruments, developed to stimulate the procurement of innovative products (chapter 4), on the procurement of sustainable products will be analysed. The content of this chapter is corresponding to answering the following research question.

Do the instruments developed, for the two selected product groups, to stimulate the procurement of sustainable and innovative products hinder each other?

The structure of this chapter is the following. First, the relationship between sustainable and innovative products is described (section 5.1). Thereafter, the analyses of the three interactions are described. Section 5.2 presents the results of the analyses of the instrument-instrument interaction (indicated by the orange dotted arrow in Figure 5.1). The instrument-instrument interaction was analysed in accordance with public procurement professionals from two Dutch Ministries. Section 5.3 presents the settings of the instrument-goal analyses for sustainability stimulating instruments and innovation stimulating elements (indicated by the red dotted arrow in Figure 5.1). The sustainability criteria for the two product groups, identified in Table 3.3 and 3.4, will be used for these analyses. The following two instrument-goal interactions will be analysed for these two product groups. First, the influence of the existing sustainability criteria on the procurement of innovative products. Second, the influence of the existing innovation stimulating elements on the procurement of sustainable products. These interactions will be examined through questionnaires distributed amongst various stakeholders. Results of the questionnaires and the analysis of the results are presented in section 5.4.

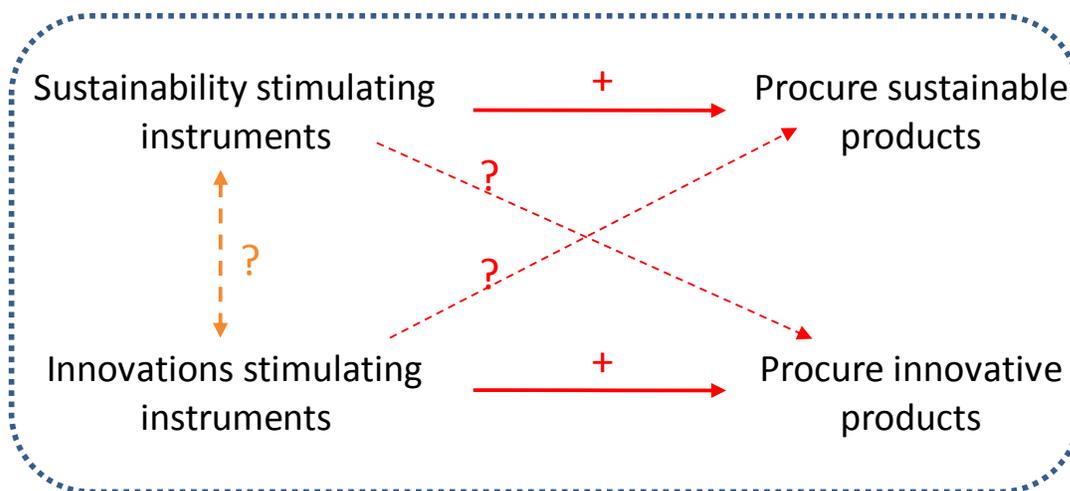


Figure 5.1 Interaction model for stimulating sustainable and innovative public procurement

5.1 Relation sustainable and innovative products

Section 5.4 presents the results of the analyses of the influence of the developed instruments in the Netherlands. However, before these results are presented, this section explains the context of merging public procurement for sustainability and innovation. From the previous two chapters, we observe the following relation between public procurement for sustainable and innovative products. Sustainable products D are a part of the whole solution space S ($D \in S$, indicated by the dark and light green surfaces in Figure 5.2). Innovative solutions I are also a part of the whole solution space S ($I \in S$, indicated by the yellow and light green surfaces in Figure 5.2). There is a sub part of the solution space D that is also part of the solution space I ($D \cap I$, the light green surface in Figure 5.2), this part is where public procurement for innovation and sustainable public procurement aim at the same solution space. However, sustainable public procurement seeks to exclude the part of sub solution space I that is not part of sub solution part B ($D \cap \bar{I}$, the yellow surface in Figure 5.2). The sizes of the solutions spaces have not been researched. Figure 5.2 presents where sustainable and innovative public procurement aim at similar products.

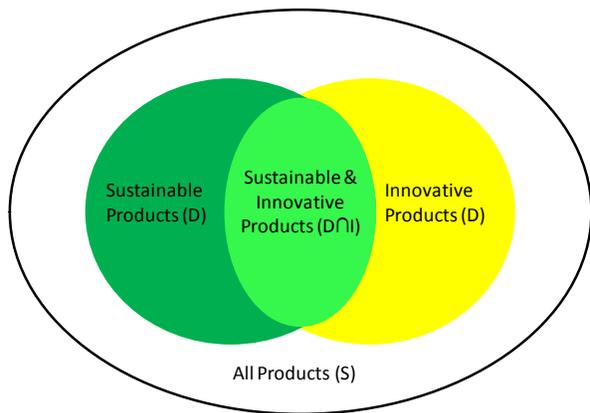


Figure 5.2 Relations sustainable and innovation products

5.2 Instrument-instrument interaction

The instruments that are analysed are the sustainability criteria presented in Tables 3.3 and 3.4, and the innovation elements presented in Table 4.3. The analyses consist of evaluating possible hindering instrument-instrument interactions. These interactions are analysed together with purchasing experts from the Ministry of VROM and the Ministry of Agriculture, Nature, and Food quality (Landbouw, Natuur en Voedselkwaliteit, LNV). However, not all the instruments are analysed as they do not, *prima facie*, appear to be interfering with each other. The omitted instruments, shown on the right in Table 5.1, are the three innovation elements applicable in the preparation phase, variant bids, and contract clauses. The instruments applicable in the preparation phase are considered to be nonrelated because they focus on another phase of the purchasing process. are for this reason assumed not to have a direct interaction with sustainability applicable in the specification phase. The rationale to omit variant bids from the analyses is that this instrument can be applied without changing the actual tender. The rationale to omit contract clauses from the analyses is that contract clauses are actually included in the existing sustainability criteria. Table 5.1 displays the instruments that, by the first analysis, are considered to be not hindering as well as the instruments that were possibly hindering.

Table 5.1 Innovation stimulating instruments

Potential hindering innovation elements	None hindering innovation elements
MEAT	Market consultation
Functional specifications	80/20 rule
TCO/LCC approach	Dividing tenders into lots
Award innovative capabilities	Allow variant bids
Norms for desired development	Contract clauses

The potentially hindering effect of the sustainability criteria (Table 3.3 and 3.4) and innovation stimulating elements (Table 4.3) were analysed together with purchasing experts from the Ministries of EZ and LNV.

For the innovation element MEAT we analysed that obligatory knockout criteria stimulate nor hinder to choose for awarding on multiple criteria (MEAT). We argue that using the obligatory knockout criteria can make purchasers trust that they included sufficient political policy in their tender specification. This can result in reluctant behaviour towards including higher sustainability ambitions. The discretionary award criteria, however, require the use of MEAT as an award method and are therefore directly stimulating the use of MEAT. However, using the discretionary award criteria depends strongly on the sustainability ambitions of the various purchasing organisations. The political commitment of taking sustainability criteria into account in all procurements does not cover discretionary award criteria.

The analyses of functional specification require some considerations. Various stakeholders indicated that the sustainability criteria are formulated too stringent, i.e. not functional. However, functional specifications of the overall tender are not necessarily influenced by including non-functional sustainability criteria. We identify that functional overall specifications of a tender are different from functional sustainability criteria. Therefore, we argue that non-functional sustainability criteria do not directly hinder overall functional specifications. We illustrate this by the following example. The tender specifications for a new transfer connection are very functional, the tender requires the transportation of 200,000 cars per day from riverbank y to riverbank x and vice versa. The non-functional sustainability criteria can still be applied alongside overall functional without directly influencing the overall functionality of the tender.

A TCO approach is supported by sustainability criteria focusing on lifetime and on maintenance. For office furniture these are three obligatory criteria facilitating taking into account other price aspects that just the direct purchasing price. We observe that a minimal guaranteed lifetime already provides a comparison for the products' lifetime after the initial purchase. In addition to this, the availability of spare parts for ten years, together with the criterion requiring the products to be separable with simple tools facilitates a longer lifetime of the products. We observed that for roads there are no hindering effects of the sustainability criteria for a TCO approach. Therefore, we argue that for these two product groups TCO and the sustainability criteria are not directly hindering each other.

Awarding innovative solutions can conflict with sustainability criteria. Figure 5.1 illustrates that not all innovations are necessary sustainable products. Therefore, stimulating innovation can interfere with stimulating the procurement of sustainable products. Sustainability criteria aiming at standardisation are also not awarding innovative solutions, such as breaking down stone like materials according to BRL 2506. However, the influence of awarding innovative solutions is better answered by the analysis of the instrument-goal interactions in section 5.3.

We argue that including norms to guide developments towards a desired direction are in fact comparable to several of the existing sustainability criteria.

5.3 Instrument-goal interaction

The second and third step, in researching the hindering effects focus on analysing the influence of the developed sustainability criteria on innovation elements and the influence of the innovation stimulating elements on sustainability. This is done by a questionnaires distributed to various key stakeholders. For choosing the most appropriate type of research method Yin (2009) identifies the following three parameters.

- The type of research question to which one seeks to find an answer.
- The controllability of behavioural events.
- The point in time of the events, either contemporary or historical.

Yin (2009) states that based on these three parameters a decision can be made for one of the following research methods: experiments, surveys, archival analysis, historical analysis, or case studies. Experiments are undesirable because for experiments the behaviour events should be controlled. The development and application of the sustainability criteria and the innovation elements cannot be controlled for the purpose of this master's thesis. Archival analysis and historical analysis focus on historical events. For this reason, these research methods are inappropriate for this research questions since sustainable public procurement and public procurement both are contemporary phenomena. Finally, case studies are a less favourable research method because the research question essentially posed here is: "How much are the

developed sustainability criteria hindering the procurement of innovative office furniture and roads?” According to Yin (2009) case studies are more suitable for research questions focussing on “How?” or “Why?” than for research questions focussing on “How much?” Having excluded these research methods we focus on surveys. All the three parameters are in favour of surveys as a research method (Yin, 2009). First, surveys are specifically well suited for research questions focussing on “How much?”. Second, surveys require no control over behavioural events. Finally, surveys are particularly well suited to research contemporary events.

The stakeholders for the survey were carefully selected based on their expertise. Policymakers represent the expertise for transferring policy goals into public procurement policy. Purchasers represent the expertise of using the developed instruments. Suppliers represent the expertise for the consequences of the changing requirements from public organisations of the developed instruments. Altogether we argue that the four stakeholder groups represent theoretical-, political-, and practical expertise on the consequences of the developed instruments.

The questionnaire

Two questionnaires were distributed, one for office furniture and one for roads. Both questionnaires consisted of two parts. The first part focussed, for office furniture, on the effect of the sustainability criteria from Table 3.3 and for roads on the sustainability criteria from Table 3.4 on innovation. The second part focused on the effect of the innovation stimulating elements from Table 4.3 on the possibility to procure sustainable office furniture and roads. The questions focussing on the sustainability criteria were posed in the following way: “Does sustainability criterion “-x-” stimulate, in addition to the procurement of sustainable office furniture/roads, the procurement of innovative office furniture/roads?” Stakeholders were asked to give an integer score, ranging from -3 to +3; -3 symbolising a maximal hindering effect on the procurement of innovative products and +3 symbolising a maximal stimulating effect on the procurement of innovative products. The questions regarding the influence of the innovation stimulating elements were posed differently. The rationale for this was that the elements to stimulate the procurement of innovative products (Table 4.3) are generic, i.e. not specific for any product group. Consequently, the questions were formulated in the following way: “Does element x have the potential to stimulate, in addition to the procurement of innovative office furniture/roads, the procurement of sustainable office furniture/roads?” Besides the scoring, the stakeholders were requested, where relevant, to provide further comment on their scores. The comments are presented in Appendix V. Appendix XII shows the complete distributed questionnaire for office furniture in Dutch. The following key stakeholders were identified and participated in the questionnaires.

- Policymakers from IPDI of both the Ministry of VROM as well as from Agentschap NL (indicated in the Tables by “IPDI”).
- Policymakers from the project team procurement for innovation of the Ministry of EZ (indicated in the Tables by “PI”).
- Purchasers who were involved in the procurement of the particular product groups.
- Suppliers operating in the markets of the particular product groups.

For the first two stakeholder groups the complete group of involved people participated. For innovation, this was the complete project team public procurement for innovation and for sustainable public procurement, these were all the people from IPDI and the product group chairperson from Agentschap NL. Purchasers for office furniture were located by reviewing an online tendering database⁵. Purchasers for roads were located at the purchasing department of the Ministry of transport, public works, and water management (Verkeer en Waterstaat, V&W). Suppliers were located by means of participant list of stakeholders from Agentschap NL. These suppliers participated in the development of the criteria documents. Appendix XII displays the complete questionnaires (in Dutch). Table 5.2 lists the suppliers who participated in the questionnaires.

⁵ <http://www.aanbestedingskalender.nl> [last visited on January 6th, 2010]

Table 5.2 Suppliers questionnaire office furniture and roads

Office furniture:	Roads:
Gispen International BV	Royal BAM group NV
Royal Ahrend NV	Heijmans NV
Aspa BV	van Gelder group
Office Depot Inc	Reef infra (part of the Strukton group NV)
BMA ergonomics	

5.4 Questionnaire results

This section presents the results of the questionnaire for the product groups office furniture and roads. The analysis of the results focus on the aggregated scores. The analysis is based on the assumption that the answers of the results follow a normal distribution. This assumption was verified by means of One-sample Kolmogorov-Smirnov tests for all individual questions (Appendix X). For a significance level $\alpha=0.05$, there was insufficient statistical evidence to exclude a normal distribution of the answers for thirty-two of the thirty-four questions. Moreover, for $\alpha=0.02$ there is not enough statistical evidence to exclude a normal distribution for the answers of any of the thirty-four questions.

For the reason that all the answers on the questions follow a normal distribution (for $\alpha =0.02$) the statistical significance was tested with the one sided Student's T-test. The results have initially been tested on two hypotheses. First, is there enough statistical evidence to assume that the respondents, on average, answered that the sustainability criterion is hindering innovation, i.e. is the average score significantly lower than zero (Appendix XI)? Second, is there enough statistical evidence to assume that the respondents, on average, answered that the sustainability criterion is stimulating innovation, i.e. is the average score significantly larger than zero (Appendix XI)? These two question result in three possible conclusions. First, the sustainability criterion is significantly hindering innovation. Second, the sustainability criterion is significantly stimulating innovation. Third, there is not enough statistical evidence to assume that the sustainability criterion has effect on innovation. For the first or latter case, it is desirable to further analyse how much the sustainability criterion is hindering or stimulating innovation. For this reason the hypothesis was also tested, in addition to < 0 and >0 , for < -1 , < -1.5 , >1 , and >1.5 for $\alpha=0.05$. These additional hypotheses have only been tested for the aggregated score of all the stakeholder groups, i.e. not for the scores of the individual stakeholder groups.

The same statistical analyses have been conducted for the influence of the innovation elements on the potential to stimulate or hinder sustainability.

The results were discussed at three platforms in a meeting with IPDI and during two brainstorming sessions (section 6.2.1 and 6.31) for both product groups, attended by several stakeholders. The main conclusions we draw from the results of the questionnaires for office furniture are presented in subsection 5.4.1. The main conclusions we draw from the results of the questionnaires for roads are presented in subsection 5.4.2.

5.4.1 Office furniture

This subsection presents the analyses of the influence of the sustainability criteria on the procurement of innovative office furniture. After that, the analysis of the influence of the innovation elements on the procurement of innovative office furniture is presented. These analyses are performed by focusing on the aggregated scores of all the stakeholder groups for each individual criterion. After focusing on the individual criteria and instruments, the average scores of the four stakeholder groups are analysed.

Sustainability criteria

Table 5.3 presents the average values of the four stakeholder groups for the respective sustainability criteria, the 95% confidence intervals are placed between brackets behind the average scores. The number of asterisks' indicates whether the average results are significantly larger than zero, one, or one-and-a-half.

By the analysis of the average scores of all the respondents, we observe the following. None of the sustainability criteria for office furniture hinder the procurement of innovative office furniture for significance level of $\alpha=0.05$ (Appendix XII). Moreover, from the results of the questionnaire we conclude that three of the seven sustainability criteria do stimulating the procurement of innovative office furniture for $\alpha=0.05$ (Appendix XII). The innovation stimulating sustainability criteria are: a minimal lifespan of five years, disassembly with simple tools, and concentration restrictions on hazardous materials in textiles.

Focusing on the single stakeholder groups we observe that the confidence intervals are large, which is mainly caused by the relatively small sample sizes of these stakeholder groups. However, one difference is evident. The stakeholder group PI indicated a significant hindering effect of the sustainability criterion focusing on the delivery of spare parts for ten years (for $\alpha=0.05$). Its hindering effect, as stated in the additional commentary, was articulated by the believes that SMEs can be hindered by this criterion (Appendix V, Table V.2).

In addition to significant differences, we observe the following two aspects. 1) The variation of the answers is the largest within the stakeholder group of suppliers. Comments from some suppliers suggested that the existing sustainability criteria are too easy to comply with for all suppliers. Lead suppliers are known to be pushing the lower bounds of norms to ascertain their competitive position (DTI, 2004). We argue that this is also true for sustainability criteria. Purchasers also stated that all the suppliers could comply with the existing sustainability criteria. Further analysis showed that two suppliers, who were involved in a project focusing on sustainable production chains, were most negative about the influence of the sustainability criteria on innovation. However, other suppliers were positive about the sustainability criteria. 2) We observe that average negative scores only occur at both policymakers groups. Nevertheless, these negative scores do not indicate a significant hindering effect, except for the previously described situation.

During the analyses of the results with key informants, we argued that the previous two observations are related. The suppliers, who consider the sustainability criteria to be hindering innovation, are involved in multiple initiatives related to sustainable public procurement. At these platforms, suppliers have the opportunity to express their discontentment with the existing sustainability criteria. These platforms are, in turn, frequently a source of information for policymakers.

Table 5.3 Results questionnaire per office furniture, sustainability criteria; average (95% confidence interval)

Stakeholders	Average score	IPDI/SN	PI	Purchasers	Suppliers
Criterion					
Minimal lifespan of 5 years (T)	1.0 (0.2-1.8)*	0.6 (-0.5-1.7)	1.5 (-0.6-3.0)	1.5 (-0.6-3.0)	0.6 (-2.6-3.0)
10 years delivery of spare parts (T)	0.1 (-0.9-1.1)	-0.3 (-2.0-1.4)	-1.0 (-2.3-0.3)⁰	1.3 (-2.5-3.0)	0.6 (-2.6-3.0)
Disassembly with simple tools (T)	1.2 (0.5-2.0)*	0.4 (-1.0-1.7)	1.8 (-0.6-3.0)	1.8 (0.2-3.0)*	1.8 (-0.2-3.0)*
Formaldehyde class E1 (T)	0.3 (-0.7-1.4)	-0.5 (-1.9-0.9)	0.0 (-3.0-3.0)	1.3 (-2.5-3.0)	0.8 (-2.5-3.0)
Conc. Hazardous materials in textiles (T)	0.7 (-0.1-1.5)*	0.1 (-1.3-1.6)	1.0 (-0.3-2.3)*	1.3 (-0.8-3.0)	0.8 (-2.5-3.0)
Conc. Hazardous materials in paints (T)	0.6 (-0.2-1.5)	-0.3 (-1.8-1.1)	1.0 (-0.8-2.8)	1.3 (-0.8-3.0)	1.0 (-2.5-3.0)
Composition label (A)	0.3 (-0.3-1.0)	-0.1 (-1.3-1.2)	-0.7 (-2.1-0.8)	0.3 (-0.5-1.0)	1.6 (-0.5-3.0)

(T) existing obligatory technical specification, (A) existing discretionary award criteria

*significantly larger than 0, **significantly larger than 1, ***significantly larger than 1.5, ⁰ significantly smaller than 0 for $\alpha=0.05$.

Innovation elements

Table 5.3 displays the results of the questionnaire for the innovation elements related to office furniture. We observe that all stakeholders consider the innovation stimulating elements to be significantly capable of stimulating the procurement of sustainable office furniture for a confidence level of $\alpha=0.05$. From these innovation stimulating instruments we observe that four are scored

significantly larger than one-and-a-half. We conclude that the following four elements have the most potential to stimulate the procurement of sustainable and innovative products.

- Apply MEAT as awarding method.
- Perform market consultation.
- Develop functional tender specifications.
- Award the tender based on total cost of ownership.

In addition to these four innovation stimulating element, we see that the policymakers from IPDI and Agentschap NL answered that continuous improvement is significantly stimulating ($> +1.5$ $\alpha=0.05$) the procurement of sustainable products. In addition to these four instruments, the potential of continuous improvement was recognised during the discussion of the results with policymakers of IPDI. In particular because for office furniture most of the contracts are long lasting (framework) contracts. If improvements during the contract period are rewarded, both supplier and purchaser can benefit from developments during the contract period.

Focusing on the stakeholder groups we only observe a negative average score for the 80/20 rule according to the purchasers. However, the results are statistically not strong enough to conclude that purchasers consider the 80/20 rule to be significantly hindering the procurement of sustainable office furniture. This result was discussed with a purchasing officer. Purchasers showed to be reluctant to apply the 80/20 rule due to (perceived) increasing risks of possible appeals from market parties. In addition to this, purchasers indicated that this procedure could result in a longer lead-time of the preparation phase of tendering procedure. A longer lead-time is out of line with request from internal customers for a speedy preparation phase.

Table 5.4 Results questionnaire office furniture, innovations stimulating elements; average (95% confidence interval)

Stakeholders Element	Average score	IPDI/SN	PI	Purchasers	Suppliers
Awarding method MEAT	1.9 (1.4-2.3)***	2.1 (1.2-3.0)**	1.8 (0.2-3.0)*	1.4 (-0.3-3.0)*	2.3 (1.5-3.0)***
Market consultation	1.9 (1.4-2.3)***	1.7 (0.7-2.7)*	1.8 (-0.3-3.0)*	1.8 (1.2-2.4)**	2.3 (0.7-3.0)*
80/20 rule	1.1 (0.2-1.9)*	1.6 (0.5-2.8)*	1.7 (-2.1-3.0)	-1.0 (-3.0-1.5)	2.0 (0.7-3.0) *
Lots	1.5 (1.0-2.0)**	1.5 (0.5-2.5)*	1.8 (0.2-3.0)*	1.6 (-0.3-3.0)*	1.3 (-0.3-2.8)*
Functional specifications	2.1 (1.7-2.5)***	2.2 (1.5-3.0)**	2.0 (0.7-3.0)*	1.6 (0.2-3.0)*	2.5 (1.6-3.0)***
TCO/LCC approach	1.9 (1.5-2.3)***	2.0 (1.1-2.9)**	2.0 (0.7-3.0) *	1.4 (0.3-2.5)*	2.0 (0.8-3.0)*
Allow for variants	1.7 (1.1-2.2)**	2.0 (0.7-3.0)*	1.3 (0.5-2.0)*	1.0 (-1.6-3.0)	2.3 (1.5-3.0)***
Award Innovative capabilities	1.5 (0.8-2.1)*	1.4 (0.4-2.4)*	1.5 (-0.6-3.0)	1.8 (0.4-3.0)*	1.2 (-1.5-3.0)
Norms directed at desired development	1.8 (1.3-2.3)**	2.1 (1.3-3.0)**	2.0 (2.0-2.0)***	2.0 (0.8-3.0) *	1.0 (-0.5-2.5)
Incentives for continuous improvement	1.5 (0.9-2.2)*	2.6 (1.8-3.0)**	1.8 (0.3-3.0)*	0.4 (-1.0-1.8)	1.0 (-1.3-3.0)

*significantly larger than 0, **significantly larger than 1, ***significantly larger than 1.5 for $\alpha=0.05$.

5.4.2 Roads.

This subsection presents the results of the questionnaires focusing on the influence of the sustainability criteria on the procurement of sustainable roads. In addition to that, this subsection presents the analysis of the influence of the innovation elements on the procurement of innovative roads. These analyses are performed similar to the analysis in section 5.4.1.

Sustainability criteria

Table 5.5 displays the results of the questionnaire for the sustainability criteria for roads. We observe that none of the sustainability criteria hinder the procurement of innovative roads for a significance level of $\alpha=0.05$ (Table 5.5). Furthermore, we observe that the three existing discretionary award criteria are all significantly stimulating the procurement of innovative roads. For

the three existing obligatory technical specifications, there is not enough statistical evidence to assume they have a significant influence on the procurement of innovative roads (Table 5.5). From purchasers' and suppliers' comments it shows that the Ministry of V&W has been using these sustainability criteria for many years and that they partly overlap with legislation (Appendix VI, Table VI.1).

Focusing on the four stakeholder groups individually we observe the following. Policymakers from the project team procurement for innovation are the only stakeholder group that considers two of the three obligatory technical specifications to be significantly stimulating the procurement of innovative roads.

Table 5.5 Results questionnaire roads, sustainability criteria; average (95% confidence interval)

Criterion \ Stakeholders	Average	IPDI/SN	PI	Purchasers	Suppliers
Breaking stone like materials BRL 2506 (T)	-0.4 (-1.4-0.6)	-0.5 (-2.3-1.3)	-0.5 (-3.0-3.0)	0.0 (0.0-0.0)	-0.5 (-3-2.5)
Assimilation of tar products (T)	0.2 (-0.7-1.1)	-0.3 (-1.7-1.2)	1.5 (-3.0-3.0)	0.0 (-3.0-3.0)	0.3 (-2.5-3.0)
Separate waste collection and transportation (T)	0.5 (-0.1-1.2)	-0.3 (-1.3-0.8)	1.8 (0.2-3.0)*	0.3 (-1.1-1.8)	1.0 (-1.3-3.0)
LCA according to NEN 8006 (A)	2.3 (1.9-2.7)***	2.4 (1.9-3.0)*	2.3 (1.5-3.0)*	1.7 (-2.1-3.0)	2.3 (0.7-3.0)*
Ground balance over the construction side (A)	1.6 (1.0-2.1)**	1.7 (0.9-2.4)*	2.7 (1.2-3.0)*	1.3 (-1.5-3.0)	0.3 (-1.1-1.8)
Road yields energy (A)	2.4 (1.9-2.8)***	2.6 (2.0-3.0)*	2.3 (0.7-3.0)*	1.3 (-1.5-3.0)	2.8 (2.0-3.0)*
Maintenance plan (C)	0.5 (-0.2-1.2)	0.4 (-0.6-1.5)	1.0 (-1.5-3.0)	0.3 (-3.0-3.0)	0.5 (-1.1-2.1)

(T) existing obligatory technical specification, (A) existing discretionary award criteria, (C) existing contract clause

*significantly larger than 0, **significantly larger than 1, ***significantly larger than 1.5 for $\alpha=0.05$.

Innovation elements

Table 5.6 displays the results of the questionnaire with regard to the influence of the innovation stimulating elements of roads. Comparing the results with the results for office furniture, we observe a similar pattern. The average scores of all stakeholder groups the following five elements appear to have a significant positive influence (>1.5 , for $\alpha=0.05$) on the procurement of sustainable roads (Table 5.6).

- Using MEAT as awarding method.
- Performing market consultation.
- Designing Functional specifications.
- Awarding the tender on TCO.
- Creating incentives for continuous improvement.

The first two elements are standard operating procedure for purchasers from the Ministry of V&W (Appendix VI, Table VI.1). The same holds true for functional specification, although, suppliers commented that this is not yet at the desired level for all tenders. We note that, according to the suppliers, dividing the tender into lots hinders the procurement of sustainable roads. However, this hindering effect is not significant. Suppliers and purchasers stated that in the road construction sector the scale of the tenders needs to be proportional in order for suppliers to create sufficient incentives to develop innovative sustainable solutions (Appendix VI, Table VI.1). Focusing on the stakeholder groups we observe no remarkable differences.

Table 5.7 Results questionnaire roads, innovation elements; average (confidence interval)

Stakeholder Element	Average	IPDI/SN	PI	Purchasers	Suppliers
Awarding method MEAT	2.0 (1.5-2.5)***	2.1 (1.3-2.9)**	2.0 (0.7-3.3)*	2.0 (-2.3-3.0)	1.8 (-0.6-3.0)
Market consultation	2.0 (1.5-2.4)***	1.8 (0.9-2.6)*	2.0 (0.7-3.3)*	2.8 (2.0-3.0)***	1.5 (-0.6-3.0)
80/20 rule	1.0 (0.2-1.8)*	1.4 (0.1-2.7)*	1.0 (-3.0-3.0)	0.3 (-3.0-3.0)	1.0 (-1.5-3.0)
Dividing into lots	0.8 (0.1-1.4)*	1.1 (0.2-2.1)*	1.8 (0.2-3.0)*	0.8 (-1.6-3.0)	-1.0 (-2.3-0.3)
Functional specifications	2.4 (2.1-2.8)***	2.3 (1.6-3.1)***	2.5 (1.6-3.0)***	2.3 (0.7-3.0)*	2.8 (2.0-3.0)***
TCO/LCC approach	2.1 (1.7-2.5)***	1.9 (1.0-2.8)**	2.5 (1.6-3.0)***	2.0 (0.7-3.0)*	2.3 (0.7-3.0)*
Allow for variants	1.6 (1.0-2.2)*	1.9 (0.7-3.0)*	1.5 (-0.1-3.0)*	0.8 (-2.0-3.0)	2.0 (0.7-3.0)*
Award Innovative capabilities	0.9 (0.2-1.6)*	1.4 (0.4-2.4)*	1.8 (-0.3-3.0)*	0.0 (-3.0-3.0)	0.0 (-2.3-2.3)
Norms directed at desired development	1.6 (1.1-2.2)**	2.1 (1.4-2.8)**	2.3 (0.9-3.0)*	1.0 (-1.3-3.0)	0.8 (-1.3-3.0)
Incentives for continuous improvement	2.1 (1.7-2.5)***	2.5 (1.9-3.0)***	1.5 (-0.6-3.0)	1.8 (1.0-2.5)**	2.3 (0.9-3.0)*

*significantly larger than 0, **significantly larger than 1, ***significantly larger than 1.5 for $\alpha=0.05$

5.5 Conclusion

From the analysis performed in section 5.2, we concluded that direct instrument-instrument interactions are not hindering both for sustainability criteria and for innovation stimulating instruments. Nevertheless, for an inclusive conclusion on the alleged hindering character of the sustainability criteria on innovation we focused on the instrument-goal interactions as well.

We conclude the following concerning the instrument-goal interaction for the sustainability criteria for office furniture. None of the sustainability criteria for office furniture is significantly hindering the procurement of innovative office furniture (Table 5.3). From the results of the questionnaires we conclude that three of the seven sustainability criteria are stimulating the procurement of innovative office furniture significantly (Table 5.3). These three sustainability criteria are: a minimal lifespan of 5 years, disassembly with simple tools, and concentration restrictions on hazardous materials in textiles. However, none of the existing sustainability criteria showed to have a significantly more positive influence higher than one. Without getting into psychological analysis about why respondents answered between zero and three, we conclude that there is still sufficient room for improvement. In addition to this, there is no obligation to apply the existing discretionary award criteria. The stakeholder groups PI indicated a significant hindering effect of the sustainability criterion focusing on the delivery of spare parts for ten years (Table 5.3). However, this opinion is not shared among the other stakeholder groups.

Focusing on the stakeholder groups we conclude that the internal variation for the suppliers of office furniture is the largest. We argue that the lead suppliers, well informed about the existing sustainability criteria, are trying to push the lower bounds of the sustainability criteria. We deduce this from the additional comments on the questionnaires. Whereas other suppliers might not be as well informed as the lead suppliers about the existing lower bounds, this can explain why they are more positive about the existing sustainability criteria. However, we also argue that a lower bound, that is easy to comply with, is not hindering innovation but merely does not stimulate innovation. That the sustainability criteria are easy to fulfil for all current suppliers was indicated by the suppliers as well as the purchasers. Finally, we argue that the opinion of policymakers might be influenced by lead suppliers. However, additional research is required to confirm this lead.

Concerning innovations stimulating elements applicable for office furniture, we draw the following conclusions. All stakeholders consider the innovation stimulating elements capable of significantly stimulating the procurement of sustainable products. However, we conclude that the following five elements have the most potential to stimulate the procurement of sustainable and innovative office furniture.

- Using MEAT as awarding method.
- Performing market consultation.
- Designing Functional specifications.
- Awarding the tender on TCO.
- Creating incentives for continuous improvement.

We conclude the following concerning the instrument-goal interactions for the sustainability criteria for roads. None of the sustainability criteria are significantly hindering the procurement of innovative office furniture (Table 5.3). In addition to this, we conclude that the three existing discretionary award criteria are all significantly stimulating the procurement of innovative roads. There is not enough statistical evidence to assume that the three existing obligatory technical specifications significantly influence the procurement of innovative roads (Table 5.5). However, there is sufficient room for improving the innovation stimulating effect of the existing sustainability criteria for roads. First, the existing obligatory technical specifications are not stimulating innovation. Second, the innovation stimulating discretionary award criteria are not forced to be used in any way.

Considering innovation stimulating elements for roads, we conclude that the same five innovation stimulating elements have the highest significant potential to stimulate the procurement of sustainable and innovative products. Furthermore, we observed that for purchasers of the Ministry of V&W the elements: MEAT, Market consultation, and Functional specifications are part of their procurement policy.

Returning to the research question, to which this chapter seeks to find an answer, we conclude the following. The sustainability criteria, developed for office furniture and roads, do not significantly hinder the procurement of innovative products. We conclude that all the discretionary award criteria for roads stimulate the procurement of innovative roads. However, procurement departments are not obliged to include the discretionary award criteria. We conclude that three obligatory sustainability criteria for office furniture significantly stimulate the procurement of innovative products. However, there is sufficient room to increase the innovation stimulating character of these obligatory sustainability criteria. Finally, all the innovation stimulating elements can significantly stimulate the procurement of sustainable products. There are, however, five innovation elements that have the most potential to stimulate in addition to innovation also sustainability.

Relating these conclusions to the motivation for this thesis, we conclude that arguments claiming that the existing sustainability criteria are not stimulating or even hindering innovation are not legitimate. From the analyses of the results we concluded that none of the existing sustainability criteria hinder innovation. In contrast, we conclude that for office furniture and roads some of the sustainability criteria are stimulating the procurement of innovative products. We argue that the differences between our findings and the statements in Wientjes and Hermans (2009) and Beco (2008) can be explained by the level of abstraction. Both sources focus on sustainability criteria in general whereas this thesis focuses on the specific sustainability criteria from two product groups. Nevertheless, the results from the questionnaires also point out that there is sufficient room for improvement of the innovation stimulating character for the sustainability criteria for office furniture and roads. Chapter 6 explores these possibilities.

6 *Stimulating sustainable and innovation office furniture and roads*

This chapter focuses on modifying the existing sustainability criteria in order to stimulate the procurement of sustainable and innovative office furniture and roads. We concluded in chapter 5 that the sustainability criteria, contradictory to our expectations, do not have a significant hindering effect on the procurement of innovative products. We also concluded that there is sufficient room to increase the innovation stimulating character for the sustainability criteria for office furniture and roads. The content of this chapter is corresponding to answering the following research question.

How can existing hindering effects of the instruments, for the two selected product groups, be mitigated or surpassed in order to stimulate the procurement of both sustainable and innovative products?

This chapter consists of three main parts. Section 6.1 compares the theoretical drivers and barriers for public procurement for sustainable and innovative products. These drivers and barriers will be considered when the existing sustainability criteria are modified. Section 6.2 focuses on modifying the existing sustainability criteria for office furniture. Section 6.3 focus on modifying the existing sustainability criteria for roads. Sections 6.2 and 6.3 are once more divided into two subsections.

Subsections 6.2.1 and 6.3.1 focus on exploring possibilities to increase the positive influence of the sustainability criteria on innovation. This was approached by means of brainstorming sessions with various stakeholders. Policymakers and product group experts were brought together enabling cross-fertilisation, which would be impossible when interviewing the stakeholders separately. Based on the results from the questionnaire (chapter 5) possible changes for the sustainability criteria were discussed. Boundaries for the propositions during the brainstorming sessions were that they should relate to the existing approach of sustainable public procurement (chapter 3). The approach for the brainstorming session is adapted from Reijniers and Gaspersz (2009). The objective of the brainstorming session was generating multiple propositions from participants in a relatively short period. The method, in short, was that the participants wrote down their propositions and after a few minutes forwarded their papers with their propositions to the next participant. The next participant read the propositions and, in doing so, new propositions sprouted. The most promising suggestions are included in this thesis and provide the basis for the recommendations for both product groups. The participating stakeholders are policymakers from IPDI, policymakers from the project team public procurement for innovations, experts from Agentschap NL for both product groups, and policymakers from the Ministry of V&W for roads.

Subsection 6.2.2 and 6.3.2 focus on modifying the existing sustainability criteria. As there are no existing tenderer criteria for the two analysed product groups, we will only focus on the existing tender criteria and contract clauses. The development of new tenderer criteria is not covered in this thesis for the reason that there are only two product groups for which tenderer criteria have been developed. In addition to this, policy aiming to stimulate innovation focuses on reducing the tenderer requirements (section 2.2). Focusing on the existing sustainability criteria, we recommend combining the obligatory and discretionary sustainability criteria into one single score for sustainability. In order to do this we follow the five steps described by Telgen (2007a) (subsection 2.1.2). In chapter 7 The recommendations in this chapter will be generalised to recommendations applicable to all existing product groups.

6.1 *Combining sustainability criteria and innovation elements*

This section compares the theoretical drivers and barriers for public procurement for sustainable and innovative products. The rationale to focus on these barriers and drivers is that in section 6.2 and 6.3 we explore possibilities to combine the existing approach of sustainable public procurement with innovation stimulating elements. Combining the two approaches could add drivers and barriers from public procurement for innovation to the existing drivers and barriers for sustainable public procurement. These additional barriers need to be taken into account when developing a new approach for the procurement of sustainable and innovative products. The main additional

theoretical barriers arriving from combining sustainability (Table 3.2) and innovation (Table 4.2) in public procurement are the following.

- All sorts of risks are increased (Rolfstam, 2009b; Valkenburg et al., 2009). In literature we distinctively identified political risks (Dalphé, 1994; EC, 2009a), supplier lock-in risks (Edler, 2006), and the risk of local gains versus overall losses (Dalphé, 1994).
- Procurement of innovative products increases the overall lead-time (Dalpé, 1994; Edler and Georghiou, 2007; OGC, 2007; EC, 2009a).
- Public procurement has insufficient buyer supplier interaction to become aware of innovative alternatives (Edler, 2006).
- The purchasing price of the product will increase. There is evidence that sustainable products are not more expensive (PWC et al., 2009). However, this is not yet researched for sustainable and innovative products.

The occurrence and degree of these additional barriers are influenced by the development stage of innovations. The occurrence as well as degree of barriers will be paramount for complete new ideas and will be less critical for fully market ready products (EC, 2006). The additional barriers are rationale to develop a sophisticated and comprehensible approach. We regard comprehensiveness paramount to generate support among stakeholders to merge public procurement for sustainable and innovative products. To ascertain non-increasing lead-times the possible approach should be applicable in basic tendering procedures (open or restricted procedure).

Next to barriers, there are additional drivers when public procurement for sustainable and innovative products. The main additional drivers arriving from merging sustainability and innovation in public procurement (Table 3.1 and 4.1) are the following.

- Stimulating economic development (significant, 2007; EC, 2009a).
- Speeding up markets for sustainable products ((significant, 2007; EC, 2009b; Nemet, 2009).
- Boosting targeting societal goals (Dalpé et al., 1992; Edler and Georghiou, 2007; Significant 2007; EC, 2009a; EC, 2009b).
- Exploiting synergy effects with other policy goals (Dalphé et al., 1992; Aschhoff and Sofka 2009).
- High concentrations of public demand, early in the life cycle, acts as a potential catalyst for innovation activity (Faucher and Fritzgibbons, 1993).

The additional drivers propagate merging public procurement for sustainable and innovative products

6.2 Stimulating procurement of sustainable and innovative office furniture

This section starts with the conclusions we made in Chapter 5. We concluded that none of the sustainability criteria significantly hinders the procurement of innovative office furniture. For this reason, none of the sustainability criteria need to be excluded. However, we observed that there is sufficient room for improvement for the innovation stimulating character for the sustainability criteria of office furniture. Furthermore, the possibility to combine the five most potential innovation stimulating elements, as concluded in chapter 5, are researched. In order to explore possibilities to increase the innovation stimulating character, a brainstorming session has been organised. The propositions for office furniture, which arose from the brainstorming session, are described in subsection 6.2.1. From these propositions we extract a strategy stimulating the procurement of sustainable and innovative office furniture (subsection 6.2.2).

6.2.1 Stakeholders' propositions

This subsection presents the results from the brainstorming session (Appendix II). During this brainstorming session, the sustainability criteria and the innovation stimulating elements were discussed separately.

Sustainability criteria

The modification of the existing sustainability criteria for office furniture should result in sustainability criteria that are, in addition to stimulating sustainability, also stimulating innovation. In the brainstorming session the existing sustainability criteria were divided into the following three groups.

- Award criterion requesting a composition label giving details about the applied materials in the office furniture.
- Technical specifications focussing on lifetime elongation of office furniture.
- Technical specifications focussing on maximum concentration of hazardous substances in office furniture (also the evaporation of hazardous substances).

Table 6.1 displays the propositions for modifying the existing sustainability criteria generated during the brainstorm session.

Table 6.1 Propositions for the modification of sustainability criteria for office furniture from the brainstorming session

Sustainability criterion:	Propositions:
Composition label	<ul style="list-style-type: none">• Introduce a collection system like the one that is in place for electronic equipment in the Netherlands.• Combine the label with percentage of Cradle to Cradle (C2C) parts in office furniture.
Lifetime elongation	<ul style="list-style-type: none">• Standardisation can improve reparability and lifetime.• Modular design would help to elongate the lifetime of the office furniture.• Stimulate lease contracts.• Make the requirements of lifespan and delivery of spare parts into steps, this allows lead suppliers to score point and SMEs to participate.• Design for refurbish or re-manufacture should be awarded.
Concentrations	<ul style="list-style-type: none">• An escape clause should provided to suppliers that strive towards improvement (similar to the upcoming social criteria).• Create a black list of materials like proposed in C2C.• Solve the problems at the end of the life of office furniture by implementing a collection system.• Increase the ambition level of the sustainability criteria.• Introduce the “Japanese model”, i.e. express the upcoming higher ambitions. This allows suppliers to change their products before the sustainability criteria are implemented.

Innovation elements

Table 6.2 displays the most promising propositions from the brainstorming session for combining the innovation stimulating elements with the existing approach for office furniture.

Table 6.2 Propositions for the modification of innovation elements for office furniture from the brainstorming session

Innovation element	Propositions
TCO	<ul style="list-style-type: none"> Explain one good example of a sustainable TCO method in the sustainable procurement manual of Agentschap NL, an example of such can be found in the Swedish sustainability criteria.
Functional specifications	<ul style="list-style-type: none"> The sustainability criteria need to be more functional, i.e. not the complete tender but the sustainability criteria.
Market orientation	<ul style="list-style-type: none"> Good practices of technical dialogues should be presented in the sustainable procurement manual of Agentschap NL. This should also entail the legal boundaries of such dialogues. It is possible to perform market research that will be published on the Agentschap NL website.
Incentives for continuous improvement.	<ul style="list-style-type: none"> For office furniture, it is very important that incentives for improvement are included in the contract. Contracts for office furniture are mostly long-lasting framework contracts.
MEAT	<ul style="list-style-type: none"> There should be good examples of sustainable procurement with MEAT in the procurement manual of Agentschap NL. Combine all the sustainability criteria into one tool and one score, like is done for DuboCalc (a sustainability calculation method from the Ministry of V&W). The obligatory knockout criteria should have an escape possibility. Other award methods should be considered. Interesting to investigate is the fixed price method, i.e. the price is fixed and the tenderer with the best score on non-financial criteria wins the project
Additional ideas	<ul style="list-style-type: none"> Do not urge only the suppliers to do and do not things, but urge purchasers to do for example market research, especially for framework contracts the purchaser should be more instructed. The sustainability criteria should focus on excluding aspects, this is less hindering for innovation compared to forcing to go for one solution. Too high restrictions on low concentrations of hazardous substances can really hinder innovation, whereas lower restrictions, only fail to stimulate innovation. Encourage innovation on the market through <ul style="list-style-type: none"> SBIR, formulate an ambition for a societal need (can also lead to a public purchase). This can stimulate the market to develop new solutions/prototypes. Stimulation of public procurement in an early stage of the development of a new solution that makes it possible to reach a higher ambition. Stimulation can be to fund investment costs. Request an Environmental Managements System. Demand chain responsibilities from suppliers, i.e. suppliers are responsible for their suppliers as well.

6.2.2 Modifying the existing sustainability criteria for office furniture

In this subsection we pose recommendations on modifying the existing tender sustainability criteria and contracts clauses of the criteria document for office furniture. Starting point for this are the propositions from Table 6.1 and 6.2. Furthermore, we clarify the positive effects of the modifications on innovation.

Tender sustainability criteria

Focusing on the existing tender sustainability criteria for office furniture we recommend combining all the seven obligatory and discretionary sustainability criteria into one single score for sustainability. This has been suggested during the brainstorming session and provides additional

opportunities for other propositions from the brainstorming session, such as criteria that are more functional, more ambitious criteria and creating incentives for continuous improvement. Furthermore, combining the sustainability criteria into one score also creates an opportunity to assure the use of the award criterion for office furniture. In order to create one score for sustainability a sophisticated approach should be followed to create a single score for sustainability. Furthermore, the additional drivers and barriers indicated in section 6.1 should be taken into consideration.

In order to combine the existing sustainability criteria into one single score for sustainability we recommend applying Telgen's (2007a) five step method (subsection 2.1.2). Telgen's model (2007a) consists of five steps resulting in a favourable combination of multiple criteria for the selection of suppliers. We advocate making the recommendations from the first two steps obligatory for general use in all tenders. The execution of step three to five is also necessary but we advise to provide tendering authorisations with autonomy to decide how to execute these steps. The rationale for this is that objectives possibly will vary among tendering circumstances. These circumstances are that several stakeholders, such as the internal customer, budget holders, and purchasers need to come to tender specifications satisfactory to all the stakeholders. Nonetheless, the five steps have to be completed at all time by tendering organisations. The subsequent paragraph presents the recommendations for the five steps for office furniture.

The five steps for office furniture

For the first step, *which criteria to use*, we recommend to use the existing obligatory technical specifications as well as the discretionary award criteria. We assume that the existing sustainability criteria cover the most important sustainability aspects. The rationale to assume these are the paramount sustainability aspects is that the criteria are assessed by Agentschap NL in accordance with suppliers and other stakeholders. However, combining the sustainability criteria into one score for sustainability leaves room for assessing supplementary sustainability criteria and re-examining discarded sustainability criteria at a later point in time. Ascertaining the use of the discretionary award criterion is motivated by the potential of the discretionary award criteria to stimulate innovation. This potential is particularly increased if this criterion is combined with aspects that are more ambitious. This also has been proposed during the brainstorming session (Table 6.2). In step two we work out the proposition from the brainstorming session.

The second step, *how to combine the criteria*, requires us to make a decision how to combine the existing obligatory technical specifications as well as the discretionary award criterion. Section 2.1.2 already touched upon the theoretical possibilities for selecting suppliers based on multiple criteria. In this paragraph we apply the possibilities described in section 2.1.1. For the reason to reduce the stringency of the individual sustainability criteria we focus on compensatory and semi-compensatory methods (de Boer, 1998). From these methods we chose the compensatory Weighted Factor Score (WFS) model, rationale for this is its comprehensiveness (de Boer, 1998). In section 6.1 we already indicated the latter as a success factor for the possible solution. Another advantage of the WFS-model is that it can be extended with knockout (Table 6.2) and semi-knockout criteria (Table 6.3) with absolute lower bounds. These modifications change the WFS-model into a semi-compensatory method. The fact that a bad score on some sustainability criteria can be compensated by good scores on other sustainability criteria provide tenderers with additional independence to comply with the requested total sustainability score. However, not all the individual sustainability criteria should be compensatory because the obligatory character should be maintained for various individual sustainability criteria.

In sum, the modified WFS-model contains three types of sustainability criteria: knockout criteria (Table 6.3), semi-knockout criteria (Table 6.4), and scoring criteria (Table 6.5). The rationale to recommend semi-knockout criteria is that several of the existing binary knockout criteria can be quantified and that better scores can provide tenderers with an advantage over other tenderers. The desire for semi-knockout criteria also originates from existing discretionary sustainability criteria that have need for a lower bound. In addition to semi-knockout criteria, we recommend using binary knockout criteria. The rationales to keep existing binary knockout criteria are that these criteria are not quantifiable or that the maximum scores can be easily fulfilled and consequently the quantified maximum scores are also a desired lower bound. The third type of criterion in the modified WFS-model is scoring criteria. Scoring criteria are the existing discretionary sustainability criteria for which the influence on, primarily, the price and the amount of potential suppliers, that can comply with possible lower bounds, are unforeseeable. The required modifications to the individual

sustainability criteria were from the brainstorming session (Table 6.1 and Table 6.2) and the results and comments of questionnaires (Table 5.3, Table 5.4, and Appendix V). The recommendations and the rationale for the recommendations for each individual sustainability criteria are presented in the subsequent paragraph.

For the first criterion, focusing on a minimal life span of five years, we recommend changing this criterion from a knockout criterion into a semi-knockout criterion. The lower bound of five years should be maintained. However, since the lower bound is easy to comply with (Appendix V, Table V.2), suppliers that guarantee a longer lifespan than five years should be awarded.

For the second criterion, focusing on the delivery of spare parts, we recommend changing this criterion from a knockout criterion into a semi-knockout criterion. The lower bound of ten years should be decreased to five years. The rationale for this is that the project team “procurement for innovation” indicated that this sustainability criterion was significantly hindering SMEs to submit innovative offers (Appendix V, Table V.2). However, every additional year, above the lower bound, should provide the supplier with an advantage. We emphasise that this criterion should be accompanied with precise description concerning delivery lead times and prices for spare parts. Both these two parameters are important to support the goal of spare parts, which is lifetime elongation.

For the third criterion, focusing on the disassembly with simple tools, we recommend keeping this criterion as a knockout criterion. The rationale for this is that the results from the questionnaire show that this criterion significantly stimulates the procurement of innovative office furniture. We do not recommend decreasing the lower bound, because suppliers and purchasers indicated that all suppliers can comply with the existing sustainability criteria (Appendix V, Table V.2).

For the fourth criterion, focusing on the evaporation of formaldehyde, we recommend keeping this criterion as a knockout criterion. The rationale for not decreasing the lower bound is that suppliers and purchasers indicated that all suppliers can comply with the existing sustainability criteria (Appendix V, Table V.2) and that the criterion is not hindering innovation (Table 5.4).

For the fifth criterion, focusing on the maximal concentration of hazardous materials in textiles, we recommend changing this criterion from a knockout criterion to a semi-knockout criterion. In that way, lead suppliers are provided with the possibility to distinguish themselves on the existing sustainability criterion. For this moment, we recommend keeping the lower bound at the existing level. The rationale for this is that during discussions of the questionnaire’s results, policymakers from IPDI argued that increasing the lower bound might result in hindering innovation because this would increase the stringency of the criterion.

For the sixth criterion, focusing on concentrations of hazardous materials in paint, we recommend changing this criterion from a knockout criterion to a semi-knockout criterion. The lower bond should be maintained. The rationale for this is the same as for the fifth criterion.

For the seventh criterion, focusing on a composition label, we recommend a scoring criterion without a lower bound. This indicates that a supplier cannot be excluded based on this criterion. The rationale for this is that a possible lower bound has an unforeseeable influence on the price and the amount of tenderers that can comply with a possible lower bound. In addition, we find rationale for a scoring criterion in the limited stimulating effect of this award criterion on the procurement of innovative office furniture (Table 5.3). In order to increase the innovation stimulating effect we advise combining this criterion with other sustainability elements. A proposition for this, originating from the brainstorm session (Table 6.1), is the following. Suppliers are provided with an advantage, based on the amount of parts that can be included, without downgrading, in a technical or biological life cycle (Braungart and McDonough, 2007). However, the idea of combining this criterion with other sustainability elements requires additional research. for this reason, we do not make recommendations concerning additional requirements in step three. The second column in Table 6.6 displays the result of the modifications of the existing sustainability criteria. Appendix VII shows an all-encompassing example of all the recommended modifications into a comprehensible modified WFS-model for office furniture.

Table 6.3 Knockout criteria

Delivering spare parts	<5 years	≥5 years
Score	Excluded	included

Table 6.4 Semi-knockout criteria

Delivering spare parts	<5 years	5 years	6 years	7 years	8 years	9 years	≥10 years
Score	Excluded	0.0	0.2	0.4	0.6	0.8	1.0

Table 6.5 Scoring criteria

Composition label (x %)	x=0	0< x <20	20≤ x <40	40≤ x <60	60≤ x <80	x ≥80
Score	0.0	0.2	0.4	0.6	0.8	1.0

The third step, *determining the relative importance of the sustainability criteria*, creates the setting for influence of the individual sustainability criteria on the total sustainability score. As a consequence of the modified WFS-model this has to be done by assigning weights to the individual sustainability criteria. In order to make recommendations concerning the weights, the sustainability criteria should be ranked according to their importance. The importance of the sustainability criteria may vary among tenders and stakeholders of the tendering authorisation. Important considerations are the possibility to stimulate sustainability and innovation. However, for the sake of continuing this example, we rank the sustainability criteria according to the sustainability criteria's possibility to stimulate the procurement of innovative office furniture (Table 5.3). The last column in Table 6.6 displays the weights derived from Table 5.3.

In the fourth step, *scoring the criteria*, the scoring method for the various sustainability criteria has to be determined. In scoring the sustainability criteria the first step is determining the values for which the minimum and maximum scores will be granted. For the minimum scores we use, if any, the suggested lower bounds recommended in step two. Sustainability criteria that have not been assigned a lower bound yet are assigned a minimum score for the lowest quantifiable value. We recommend maximum scores for the first two sustainability criteria of ten years, since the estimated maximum lifetime for office furniture is between five and ten years (Parikka-Alhola, 2008). For the two sustainability criteria, that we recommended to be knockout criteria, no scores or weights need to be determined. For the two sustainability criteria, focusing on concentrations of hazardous materials, we recommend keeping the existing concentrations as a lower bound, and award the maximum score of one if these materials are completely abandoned in the product. For the award criterion we recommend the minimum score to be zero for compliance of 0% and the maximum score to be one for compliance of 100%. Table 6.6 displays the type of sustainability criteria, minimum scores, and maximum scores. For the scores in between the minimum and maximum there are several options. We advise a linear scoring method with scores divided into five equally distributed steps. A linear scoring method indicates that the steps from 0% to 20% and from 60% to 80% are equally important. The rationale for this is that we argue that, for the sustainability criteria for office furniture, stimulating lagging suppliers to improve 20% is equally important as stimulating lead suppliers to improve 20%.

Table 6.6 Modified Weighted Factor Score (WFS) model for office furniture

Criterion	Characteristics	type	Minimum scorer	Maximum score	weight
Guaranteed lifespan (T)		semi-knockout	5 years	10 years	30
Delivery of spare parts (T)		semi-knockout	5 years	10 years	10
Disassembly with simple tools (T)		knockout	All parts	All parts	K.O.
Formaldehyde class E1 (T)		knockout	Class E1	Class E1	K.O.
Conc. Hazardous materials in textiles (T)		semi-knockout	Existing conc.	0 µg/L	25
Conc. Hazardous materials in paints (T)		semi-knockout	Existing conc.	0 µg/L	20
Composition label (A)		scoring	0 %	100%	15

(T) existing obligatory technical specification, (A) existing discretionary award criteria

For the fifth step, *selecting the winner*, there are two options. Awarding on lowest price or awarding on multiple criteria known as selecting the Most Economical Advantageous Tender (MEAT).

For the first option, awarding on lowest price, the modified WFS-model (Table 6.6/Appendix VII) should be placed in the **technical specifications** (subsection 2.1.1) of the tender. If the modified WFS model is used in the technical specifications, the purchasing organisation has to determine a minimal total sustainability score upfront. Suppliers failing to comply with the minimal

total sustainability score or an individual score below the absolute lower bound of one of the (semi)knockout criteria are excluded from the tendering procedure. Table 6.7 displays the offers of five fictional suppliers. For this example we presume that the purchasing authorisation decided that the minimal total sustainability score should be forty points. We observe that in this example supplier *A*, *B*, and *D* comply with all requirements. Supplier *C* is excluded since it fails to comply with the lower bound of the third individual criterion. Supplier *E* is excluded due to noncompliance with the minimal total sustainability score of forty points. In this example, Supplier *A* wins the tender because supplier *A* offers the lowest price.

For the second option, awarding on multiple criteria the modified WFS-model can be placed in the **award criteria** (subsection 2.1.1). For comprehensiveness of this simplified example we assume that there are no other criteria (e.g. quality and delivery time) influencing the decision. We recommend dividing the total sustainability score by the actual price. In order to obtain comprehensive numbers we multiply the score with hundred. The rationale to divide the sustainability score by the price is twofold. First, it makes the offer with the highest score win the tender. Second, the score for dividing the sustainability score by the price is linear. If the price is divided by the sustainability score, an increase of ten points just above the minimal threshold of forty points will have more influence on the outcome than an increase of ten points for a sustainability score of already eighty points. In line with the rationale to create equally incentives for lead suppliers as for lagging suppliers we argue that dividing the sustainability score by the price is the best method. Nevertheless, the ranking of the offers will not be influenced by interchanging these methods. Table 6.7 displays an example of five fictional suppliers. In this example, supplier *C*'s offer is excluded due to noncompliance with the knockout criteria considering disassembly with simple tools, although it would have won if the supplier had complied with criterion. From the remaining suppliers we observe that supplier *D* has the best offer and consequently wins the tender.

From these two examples we observe that a minimal threshold for the total sustainability score is possible regardless the position of the modified WFS-model. The difference is that if the modified WFS-model is placed in the technical specifications, suppliers will compete on lowest price while the tender complies with the required sustainability. However, if the modified WFS-model is placed in the award criteria suppliers will compete on the price relative to the total sustainability, providing more sustainable offers to also be the most competitive offer. Consequently, both methods result in different offers winning the tender.

These two positions of the modified WFS-model have distinct consequences for the estimation of the price of the winning offer. For the first method, awarding on lowest price with the modified WFS-model placed in the technical specifications, market consultation can provide a relative good estimate about the lowest price that will comply with the requested minimal sustainability score. For the second method, placing the modified WFS-model in the award criteria, the maximum influence on the direct purchasing price is more difficult to predict. Nonetheless, the price range of the winning tender is still predictable. Based on the expected price for an offer with the minimal sustainability score the maximal price of the best offer regarding price and sustainability can be calculated. In this situation the price can result in a 2.5 (100 points/ 40 points) times higher direct purchasing price. This can be limited by decreasing the total weights of the sustainability criteria or applying other mathematical operations.

In real life tendering situations, other criteria are most likely included in addition to price and sustainability criteria. The additional sustainability criteria can be included in several ways. Actually, these ways are similar to the possibilities we stipulated for combining the sustainability criteria into one score for sustainability (de Boer, 1998). We advocate giving sufficient weight to the total suitability score for tenderers to be encouraged to develop and offer more sustainable solutions.

Contract clauses

We recommend including contract clauses stimulating suppliers to improve their total sustainability score throughout long lasting (framework) contracts. We distinguish two approaches to create incentives for improving sustainability.

- Rewarding a better total sustainability score for office furniture throughout the contract.
- Penalising a static or declining total sustainability score for office furniture throughout the contract.

For creating these incentives, we recognise price and contract duration as steerable parameters. An example of such is that the contract duration is influenced by improving sustainability scores, e.g. if the contractor improves his score annually, the contract is elongated by one year (until the maximal duration of the contract has been reached), if not the contract is not continued at the end of that year.

Table 6.7 Example of MEAT awarding method with semi WFS model

Supplier:	A	B	C	D	E
Guaranteed lifespan	10	20	0	10	0
Delivery of spare parts	0	2	6	8	10
Disassembly with simple tools	ok	ok	not	ok	ok
Formaldehyde class E1	ok	ok	ok	ok	ok
Conc. Hazardous materials in textiles	20	20	20	15	0
Conc. Hazardous materials in paints	4	12	16	8	0
Composition label	6	12	15	15	15
Total sustainability score	40	66	52	56	25
Price in Euro's	550	800	600	620	600
Total sustainability score/Price*100	7.27	8.25	9.17	9.03	4.17

Equation 6.1 Total sustainability score for the modified WFS-model

$$\text{Total sustainability score supplier } j = \sum_{i=1}^n S_{ji} \times W_i$$

W_i = Weight sub-criterion i , $i = 1, 2, \dots, 7$

S_{ji} = Score of supplier j on sub-criterion i , $i = 1, 2, \dots, 7$

Positive effect of the modifications on stimulating the procurement of innovative office furniture.

We clarify the subsequent positive effects on innovation of the recommendations to combine the existing sustainability criteria into a modified WFS-model. In addition this, the modifications also facilitate recent developments, aiming at stimulating innovation, within the Dutch approach of sustainable public procurement (subsection 3.3.1).

Functional sustainability criteria

Even though the sustainability criteria aim at the same abstraction level, the sustainability criteria will become more functional. The stringency of the sustainability criteria will decrease due to the possibility to compensate bad scores on sustainability criteria with good scores on other sustainability criteria. This will provide tenderers with freedom to comply with the total sustainability score on sustainability criteria of their choice. For office furniture the decreased stringency is rather modest compared to the existing sustainability criteria. However, by introducing a minimum total sustainability score the total sustainability of the tender is increased while the stringency on individual sustainability criteria is reduced. We illustrate this phenomenon by focusing on fictional supplier D (Table 6.6). Supplier D 's offer does not comply with the existing lower bound of at least ten years of delivery of spare parts. However, due to the semi-compensatory character of the modified WFS-model supplier D can now compensate this with good scores on the other sustainability criteria.

Creating Incentives for continuous improvement

One single score for sustainability provides opportunities for creating incentives for continuous improvement throughout long lasting (framework) contracts. These incentives should be established in the contract clauses. The modifications provide suppliers with independence criteria to improve the total sustainability score on the scoring criteria as well as on the semi-knockout criteria.

Ascertaining the use of existing award criteria

The existing award criterion is included in the recommend single score for sustainability. Regardless the place of the modified WFS-model, suppliers will be capable of scoring on the existing discretionary award criterion. Even if purchasing authorities apply the modified WFS-model in the technical specifications, suppliers are still capable of scoring on the existing discretionary award criteria. This advantage is considerable since only half of the departments plan to apply existing discretionary award criteria in 2010 (Tweede Kamer, 2010).

Facilitating MEAT

The modified WFS-model facilitates the selection of suppliers on multiple sustainability criteria (MEAT). The existing approach neglects providing information on: how to combine the criteria, the relative importance of the criteria, how to score the criteria, and how to select the winner. We argue that due to the recommendation on these additional four steps, awarding on MEAT is more attractive and comprehensible. Furthermore, we recommend changing the existing knockout criteria into semi-knockout criteria. This creates additional opportunities to award suppliers' better performances on the existing knockout criteria above the lower bounds.

Facilitating future sustainability ambitions

One score for sustainability provides opportunity for future goals. First, the total sustainability score can be related to future ambition levels, such as in two years from now the minimal total sustainability will increase with 15 points. Second, the absolute lower bounds of individual sustainability criteria can be related to future ambitions levels, such as in two years from now 50% of the furniture within the contract should have a composition label. However, the latter was already possible in the existing approach. Nevertheless, the modification of the existing binary knockout criteria into semi-scoring criteria adds four sustainability criteria for which future lower bounds can be communicated to the potential suppliers.

Facilitate ambitious purchasing authorities

One score for sustainability also provides opportunity for purchasing organisations that want to procure more sustainable products already. First, the total sustainability score can be increased straightforwardly. Second, the absolute lower bounds of individual sustainability criteria can be increased. However, the latter was already possible in the existing approach. Nevertheless, we recommended modification of existing binary knockout criteria into semi-scoring criteria results in more individual criteria for which the absolute lower bounds can be increased.

In addition to positive effects on innovation, we observe that the modifications have almost only increasing positive effects on sustainability. Only the decreased lower bound for the delivery of spare parts can be interpreted as a decreasing influence on stimulating the procurement of sustainable office furniture. For all the other criteria the lower bounds assured that applying the recommendations assured a larger or similar requirement. Furthermore, the award criterion is also included in the modified WFS-model. Combining this with requirement for a total minimum score for sustainability we argue that the modifications also have a positive influence on stimulating the procurement of sustainable office furniture.

6.3 Stimulating the procurement of sustainable and innovative roads

This section starts with the conclusions we made in Chapter 5. We concluded that none of the sustainability criteria significantly hinder the procurement of innovative roads. For this reason, none of the sustainability criteria needs to be excluded. However, we observed that there is sufficient room for improvement for the innovation stimulating character for the sustainability criteria for roads. Furthermore, the possibility to combine the five most potential innovation stimulating elements, as concluded in chapter 5, will be discussed. In order to explore possibilities to increase the innovation stimulating character a brainstorming session has been organised. The propositions which arose from the brainstorming session are described in subsection 6.3.1. Subsection 6.3.2 extracts a strategy from these propositions stimulating the procurement of sustainable and innovative roads.

6.3.1 Stakeholders' propositions

This subsection presents the results from the brainstorming session (Appendix II). During this brainstorming session, the sustainability criteria and the innovation stimulating elements were discussed separately.

Sustainability criteria

The modifications of the existing sustainability criteria for roads should result in sustainability criteria that are in addition to stimulating sustainability, also stimulating innovation. Table 6.8 displays the propositions for modifying the existing sustainability criteria, generated during the brainstorming session. The three existing obligatory knockout criteria were grouped together during the brainstorming session. The rationale for this was that none of these criteria could be quantified into various ambition levels and that they contribute to standardisation of operations. The propositions from Table 6.8 are used as a starting point for the modifications we make to the existing sustainability criteria in subsection 6.3.2. During the analyses of the results, the propositions for the first three obligatory technical specifications were grouped because the propositions for these three sustainability criteria were similar.

Innovation elements

Table 6.9 displays the most promising propositions from the brainstorming session for combining the most potential innovation stimulating elements with the existing approach for sustainable roads. These propositions are used as a starting point for modifications we make to the existing sustainability criteria in subsection 6.3.2.

Table 6.8 Propositions for the modification of sustainability criteria for roads from the brainstorming session

Sustainability criterion:	Propositions:
Breaking down tar products, breaking down stone products BRL 2506, and separate waste collection	<ul style="list-style-type: none">• Allow alternative solutions, i.e. escape clause.• Frequently review the criteria.
Ground balance	<ul style="list-style-type: none">• Make clear that neighbouring locations can also be included in the ground balance.
Maintenance plan	<ul style="list-style-type: none">• DBFM contracts create genuine incentives for contractors to include sustainability in all the phases of the lifecycle.
Additional suggestions	<ul style="list-style-type: none">• Other legislation, appear to be more likely to hinder innovation, e.g. Environmental impact report was cited as innovation hindering legislation.• Successfully finished SBIR-projects can be included in the award criteria, i.e. hydrogen powered aggregates in road constructions.

Table 6.9 Propositions for the modification of innovations elements for roads from the brainstorming session

Innovation element:	Proposition:
MEAT	<ul style="list-style-type: none"> • The name of a method like this should better stipulate that a balance is required between People, Planet, and Profit. • Replace the criteria with one tool (DuboCalc); this should include all relevant criteria. • Knockout criteria should be turned into soft criteria, i.e. escape clauses if the supplier strives for the same goal using other methods.
Market orientation	<ul style="list-style-type: none"> • Combining market consultation with a database with information concerning patents, certificates of companies. • Good practices of market consultation, example of separate independent agency for the reconstruction of “de Afsluitdijk”.
TCO	<ul style="list-style-type: none"> • DFBO(O) contracts provide the tendering party with a excellent opportunity to incorporates all the costs in the different phases of the lifecycle.
Functional specifications	<ul style="list-style-type: none"> • Especially the sustainability criteria should be made more functional.
Additional suggestions	<ul style="list-style-type: none"> • Successfully finished SBIR projects should be added to the existing award criteria, i.e. the Hydrogen en fuel cells generators for road works. • A good combination of MEAT, Market orientation, and functional specifications is the existing approach for the Ministry of V&W to simulate the procurement of sustainable and innovative roads. • Fit should be made possible to postpone certain decisions in large GWW projects. Early restrictions often hinder the implementation of innovative and sustainable alternatives. Advanced tendering procedures like the competitive dialogue are more appropriate for these projects.

6.3.2 Modifying existing sustainability criteria for roads

In this subsection we pose recommendations on modifying the existing tender sustainability criteria for roads. Starting point for this are the propositions from Table 6.8 and 6.9. This section ends with a clarification of the positive effect of the modifications on innovation.

Tender Criteria

Focusing on the existing sustainability criteria for roads we recommend combining all the six obligatory and discretionary sustainability criteria into one single score for sustainability. This has been suggested during the brainstorming session and provides additional opportunities for other propositions from the brainstorming session such as criteria that are more functional, more ambitious criteria and creating incentives for continuous improvement. Furthermore, combining the sustainability criteria into one score also creates an opportunity to assure the use of the award criteria for roads. In order to create one score for sustainability a sophisticated approach should be followed to create a single score for sustainability. Furthermore, the additional drivers and barriers indicated in section 6.1 have to be taken into consideration.

In order to combine the existing sustainability criteria into one single score for sustainability we recommend applying Telgen’s (2007a) supplier selection model (subsection 2.1.2). Telgen’s (2007a) model consists of five steps resulting in a favourable combination of multiple criteria for the selection of suppliers. We advise to make the recommendations from step one and two obligatory to use in all tenders. The execution of step three to five is also obligatory but we advise to provide tendering authorisations with autonomy to decide how to execute these steps. The rationale for this is that objectives may vary among tendering circumstances. These circumstances are that several stakeholders, such as the internal customer, budget holders, and purchasers need to come to

tender specifications satisfactory to all the stakeholders. Nonetheless, the five steps have to be completed at all time by tendering organisations. The subsequent paragraph presents the recommendations for the five steps for roads.

The five steps for roads

For the first step, *which criteria to use*, we recommend using the existing obligatory technical specifications as well as the discretionary award criteria. We assume that the existing sustainability criteria cover the most important sustainability aspects. The rationale to assume that these are the paramount sustainability aspects is that Agentschap NL assessed the criteria in accordance with suppliers and other stakeholders. However, combining the sustainability criteria into one score for sustainability leaves room for assessing supplementary sustainability criteria and re-examining discarded sustainability criteria at a later point in time. Ascertaining the use of the discretionary award criterion is motivated by the potential to stimulate innovation (Table 5.6).

The second step, *how to combine the criteria*, requires us to make a decision how to combine the existing obligatory technical specifications as well as the discretionary award criteria. The recommendation is the same as for office furniture; combining the existing sustainability into a modified WFS-model (a semi-compensatory method). Though, the required modifications to the criteria for roads have been derived from the brainstorming session (Table 6.8 and Table 6.9) and the results and comments of questionnaires (Appendix VI). The recommendations and the rationale for the recommendations for each individual criterion are presented in the subsequent paragraph.

For the first criterion, breaking stone like materials according to BRL 2506, we recommend keeping this criterion as a knockout criterion. The rationale for this is that this criterion is not quantifiable and was not considered to have a hindering effect on the procurement of innovative roads (Table 5.5). Alternative solutions are not desirable for this criterion for the reason that it stimulates standardisation in recycling stone like materials.

For the second criterion, focusing on assimilation of tar products, we recommend keeping this criterion as a knockout criterion. The rationale for this is that this criterion is not quantifiable and was not considered to have a significant negative effect on the procurement of innovative roads (Table 5.5). In addition, policy makers from PI considered this criterion to be significantly stimulating the procurement of innovative roads (Table 5.5). Alternative solutions are not desirable for this criterion for the reason that it facilitates standardisation in recycling tar containing waste.

For the third criterion, focusing on separate waste collection and transportation at temporary locations, we suggest keeping this criterion as a knockout criterion. The rationale for this is that this criterion is not quantifiable and has no significantly negative effect on the procurement of innovative roads (Table 5.5). In addition to this, policy makers from PI considered this criterion to be significantly stimulating the procurement of innovative roads (Table 5.5). Furthermore, this criterion is partly legislation (Appendix VI, Table VI.2), which provides more rationale for keeping it as a knockout criterion.

For the fourth, fifth, and sixth criteria respectively performing an LCA according to NEN 8006, a ground balance over the construction side, and energy yield of roads we recommend the following modifications. The existing discretionary award criteria should be included in the modified WFS-model as scoring criteria without an absolute lower bound. This indicates that a supplier can score on these criteria but cannot be excluded based on a score below a absolute lower bound on this criterion. The rationale to omit a absolute lower bound is that these criteria are currently discretionary award criteria. Introducing a lower bound has an unknown influence on the amount of suppliers that can comply with the lower bound and the direct purchasing price. Furthermore, without a lower bound these three criteria remain fully compensatory, i.e. as functional as possible.

For the seventh “criterion”, a contract clause focusing on a maintenance plan, we suggest that this should not be included in the total sustainability score.

The third step, *determining the relative importance of the sustainability criteria* creates the setting for the influence of the individual sustainability criteria on the total sustainability score. As a consequence of the choice for the modified WFS-model, this has to be done by assigning weights to the individual sustainability criteria. In order to make recommendations concerning the weights, the criteria should be ranked according to their importance. The importance of these criteria may vary among tenders and stakeholders of the tendering organisation. Important considerations are the possibility to stimulate sustainability and innovation. However, in order to continue our example, we rank the criteria according to the criteria's possibility to stimulate the procurement of innovative

roads (Table 5.5). Table 6.10 displays the weights, applied to continue this example, in the last column.

In the fourth step, *scoring the criteria*, the scoring method for the various criteria has to be determined. The first step in scoring the criteria is determining the values for which the minimum and maximum scores will be granted. For the minimum scores we use, if any, the suggested lower bounds recommended in step two. Sustainability criteria that have not been assigned a lower bound are assigned a minimum score for the lowest quantifiable value. The first three criteria do not require scores or weights, since these criteria remain knockout criteria with their existing lower bounds. For the three existing discretionary award criteria we recommend applying no lower bound. For the maximum scores we suggest the best-known solution. This, however, requires frequent reviewing the intervals for the scores. For the ground balance, the maximum score of one will be assigned if the ground balance is 100%. In order to make scores on LCA's quantifiable they require uniformity. Uniformity is expected to be delivered by an upcoming new standardised LCA method; DuboCalc. DuboCalc delivers one value for the impact on the environment. The maximum score for the yielding of energy needs to be determined by market consultation. In order to complete this example we imply a maximum of 1 KWh/day/M² (estimated yield of an average photovoltaic solar cell). Table 6.10 displays the type of criteria, minimum scores, and maximum scores. For the scores in between the minimum and maximum there are several options. We recommended a linear scoring method with scores divided into five equally distributed steps. A linear scoring method indicates that the steps from 0% to 20% and step from 60% to 80% are equally important. The rationale for this is that we argue that, for roads, stimulating lagging suppliers to improve 20% is equally important as stimulating lead suppliers to improve 20%.

Table 6.10 Modified Weighted Factor Score (WFS) model for roads

Criterion	Characteristics	type	Min. score	Max. score	weight
Breaking stone like materials BRL 2506 (T)		knockout	comply	comply	K.O.
Assimilation of tar products (T)		knockout	comply	comply	K.O.
Separate waste collection and transportation (T)		knockout	comply	comply	K.O.
LCA according to NEN 8006 (A)		scoring	Min. Score	Max. Score	30
Ground balance over the construction side (A)		scoring	0%	100%	20
Road yields energy (T)		scoring	0 MWh/Y/M ²	1 KWh/day/M ²	50

(T) existing technical criteria, (A) existing award criteria,

The fifth step, *selecting the winner*, is similar to the explanation given for office furniture in section 6.2.2.

Contract clauses

There is a contract clause included in the existing sustainability criteria document for roads. However, this contract clause does not create incentives for the supplier to improve on sustainability throughout the contract period. In order to realise these kind of incentives we argue that the maintenance and operation of the road should be assigned to the same supplier.

Positive effect of the modifications on innovation stimulating elements

We clarify combining the sustainability criteria into a modified WFS-model has a positive effect on innovation. In addition, the modifications also facilitate recent developments, aiming at stimulating innovation, within the Dutch approach of sustainable public procurement (subsection 3.3.1).

Ascertaining the use of award criteria

The existing award criteria, that are considered to be stimulating the procurement of innovative roads (Table 5.5), are included in the single score for sustainability. Regardless the position of the modified WFS-model, suppliers will be capable of scoring on the existing discretionary award criteria. Even if purchasing authorities apply the modified WFS-model in the technical specifications, suppliers are still capable of scoring on the existing discretionary award criteria. This advantage is

significant since only half of the departments plan to apply existing discretionary award criteria in 2010 (Tweede Kamer, 2010).

Facilitating MEAT

The modified-WFS model facilitates the selection of suppliers on multiple sustainability criteria (MEAT). The existing approach neglects to provide information on: how to combine the criteria, the relative importance of the criteria, how to score the criteria, and how to select the winner. We argue that due to the recommendation for the additional four steps, awarding on MEAT is more attractive and comprehensible.

Facilitating future sustainability ambitions

One score for sustainability provides opportunity for future goals. First, the total sustainability score can be related to future ambition levels, such as in two years from now the minimal total sustainability will increase with 20 points. Second, the absolute lower bounds of individual sustainability criteria can be related to future ambitions levels, such as in two years from now offers should comply with a minimal ground balance within the same or neighbouring projects of at least 30%. However, the latter was already possible in the existing approach.

Facilitate ambitious purchasing authorities

One score for sustainability also provides opportunity for purchasing organisations that want to procure more sustainable products already. First, the total sustainability score can straightforwardly be increased. Second, the absolute lower bounds of individual sustainability criteria can be increased. However, the latter was already possible in the existing approach.

6.4 Conclusion

We started this chapter with a comparison of additional barriers and drivers for merging public procurement for sustainable and innovative products. This comparison urged for a sophisticated and comprehensible approach. To ascertain non-increasing lead times the possible approach should be applicable in basic tendering procedures. At the end of this section we go back to opportunities for supplier buyer interaction for office furniture and roads.

From the brainstorming sessions we conclude that bringing together various stakeholders, focusing on sustainability and innovation, generates constructive suggestions. The main suggestions were the following. First, several suggestions were posed focussing on the aggregation of the sustainability criteria into one single score for sustainability. Second, the sustainability criteria should be more functional, less stringent, and alternative, equally sustainable, solutions should be allowed. Third, future sustainability demands should be made public in order to stimulate suppliers to change/innovate. Fourth, the importance of creating incentives for continuous improvements has been stipulated. We also conclude that some of the suggestions from the brainstorm session are outside the scope of public procurement as a policy instrument, such as introducing a collection system.

Returning to the research question, to which this chapter seeks to find an answer, we conclude the following. We recommend aggregating the obligatory technical specifications and discretionary award criteria into one score for sustainability. In order to aggregate the multiple criteria the five-step model developed by Telgen (2007a). Telgen's model (2007a) consists of five steps resulting in a combination of multiple criteria to select the right product. We advocate making the recommendations we made for step one and two obligatory to use in all tenders. The execution of step three to five is also necessary but we advise to provide tendering authorisations with autonomy to decide how to execute these steps. The rationale for this is that objectives may vary among tendering situations and stakeholders. Nonetheless, all the five steps have to be completed at all time by tendering organisations. For the first step we conclude that the existing sustainability criteria are, because of the criteria development process described in subsection 3.2.2, the most important sustainability aspects. However, we suggest considering additional sustainability criteria at a later point in time. In the second step we recommend to combine the sustainability criteria into a modified WFS-model (a semi-compensatory method). This method is not fully compensatory due to absolute lower bounds of particular sustainability criteria. In order to determine the relative importance of the existing sustainability criteria, these require modification. We conclude that these modifications depended on the following characteristics.

- Is the existing sustainability criterion currently a technical specification or an award criterion?
- Is the existing sustainability criterion quantifiable into various levels?
- Is the existing lower bound of the criterion excluding the procurement of innovative solutions?

As a result from these three characteristics we recommended either knockout criteria, scoring criteria, or semi-knockout criteria. We acknowledge that other modifications are required when sustainability criteria are unquantifiable and the lower bound can exclude innovative solutions. We recommend to modify these sustainability criteria into knockout criteria that allow for alternative, similar sustainable, solutions. However, for office furniture and roads this situation did not present itself. In the third step we assigned weights to the sustainability criteria based on the possibility to stimulate innovation derived from the questionnaire's results (Table 5.5). In the fourth step we developed a linear scoring method for the sustainability criteria, the lower bounds were based on the questionnaire's results (Table 5.5). In step five we concluded that the modified WFS-model can be placed in the technical specifications or in the award criteria. The two positions of the modified WFS-model have distinct consequences for the estimation of the price of the winning offer. For the first method, awarding on lowest price with the modified WFS-model placed in the technical specifications, market consultation can provide a relative good estimation about the lowest price that will comply with the requested minimal sustainability score. For the second method, placing the modified WFS-model in the award criteria, the maximum influence on the direct purchasing price is more difficult to predict. Nonetheless, the price range of the winning tender is still predictable. Based on the expected price for an offer with the minimal sustainability score the maximal price of the best offer regarding price and sustainability can be calculated.

In addition to modifying the existing sustainability criteria, we recommended introducing contracts clauses that create incentives for continuous improvements during long lasting (framework) contracts for office furniture. We did not make suggestion of this type for roads. Nevertheless, this is of course possible in situations where the tender results in a long lasting contract of for instance a combination of DBFM(O) contracts.

We argue that the recommended modifications have a positive effect on the following innovation stimulating elements.

- Functional sustainability criteria
- Ascertaining the use of award criteria
- Creating incentives for continuous improvement
- Facilitating MEAT
- Facilitating future sustainability ambitions
- Facilitating ambitious purchasing authorities

Comparing the modifications for office furniture and roads we conclude that there are some differences regarding to the modifications of the existing sustainability criteria. For office furniture the primary change originates from modifying the existing obligatory binary knockout criteria into semi-knockout criteria. For roads the primary change originates from including the three existing discretionary criteria in all tenders.

7 *Stimulating the procurement of sustainable and innovative products*

This chapter focuses on generalising the recommendations from chapter 6. The approach to do so will be based on the differences between the recommendations for office furniture and roads. In addition to this, the sustainability criteria of all the remaining forty-five product groups will be analysed by means of a quick-scan. The objective is to come up with recommendations that are applicable to all existing product groups. The general applicability will be validated by applying the recommendations to two additional product groups. In addition, we present general recommendations for utilizing the possibilities of contract clauses to create incentives for continuous improvements throughout long-lasting (framework) contracts. The content of this chapter is corresponding to answering the following research question.

How can the modifications, to mitigate or surpass the hindering effects for the two selected product groups, be generalised to recommendations for all existing product groups?

This chapter starts, in section 7.1, with the generalisation of the recommendations from chapter 6. The approach taken is to first analyse the remaining forty-five product groups' sustainability criteria. Combining these results with the information from chapter 6 results in a generalised approach for combining the existing obligatory technical specifications and discretionary award criteria into one single score for sustainability. This approach is based on Telgen's (2007a) five step model. The recommendation to follow the five steps is based on the experience from chapter 6. The results from the quick-scan are used to develop a parameter dependent flowchart to modify all possible sustainability criteria (Figure 7.1). Section 7.1 presents generally applicable recommendations for utilising the contract clauses to create incentives for continuous improvements throughout long-lasting (framework) contracts. Section 7.2 presents the positive effects of the generalised modifications on innovation. Section 7.3 describes the observations with regard to the innovation stimulating instruments applying a TCO approach and market consultation.

7.1 *Generalised modification of the sustainability criteria*

This section generalises the recommendations we made in chapter 6. Subsection 7.1.1 presents the results from the analyses of the remaining sustainability criteria. Subsection 7.1.2 presents the generalised recommendations for the five step model (Telgen, 2007a). This section ends, in subsection 7.1.3, with general recommendation for utilising the possibilities of contract clauses to create incentives for continuous improvements throughout long-lasting (framework) contracts.

7.1.1 *Analyses of all the sustainability criteria*

In order to create a foundation for the analytical generalisation this section describes the results from the analysis of the remaining forty-five product groups' sustainability criteria. All the existing product groups have been analysed by means of a quick-scan. During the quick-scan (Appendix XII), the existing tenderer and tender criteria were analysed on the subsequent five aspects.

1. Does the criteria document recommend obligatory tenderer criteria? If so, where do the tenderer criteria focus on?
2. Does the criteria document recommend discretionary tenderer criteria? If so, where do the tenderer criteria focus on?
3. Does the criteria document recommend obligatory tender criteria? If so, where do the tender criteria focus on?
4. Does the criteria document recommend discretionary tender criteria? If so, where do the tender criteria focus on?
5. Does the criteria document recommend contracts clauses? If so, where do the contract clauses focus on?

From the quick-scan (Appendix VII) we make the following main observations.

- The product groups “demolition of office buildings” and “networks, phone services, and equipment” are the only two criteria documents that recommend tenderer criteria.
- There are no discretionary award criteria for nine product groups.
- Contract clauses are recommended in eighteen criteria documents.
- Contracts for fourteen of the product groups are currently managed, or are going to be managed, by category management.
- “Networks phone services and equipment” is the only product group with a contract clause focusing on continuous improvement throughout the contract.
- There are criteria documents where obligatory knockout criteria and discretionary award criteria focus on the same sustainability aspect.
- Ten of the product groups focus on ground-, road-, and water works (Grond, Weg, en Waterbouw, GWW).

7.1.2 Modifying the sustainability criteria

In chapter 6 we recommended, for office furniture as well as roads, combining the sustainability criteria into one single score for sustainability. In this chapter we generalise these recommendations in order to make them applicable for all existing sustainability criteria documents. In chapter 6 Telgen’s (2007a) five step model proved to be working well for office furniture and roads, therefore, we also recommend this model for the centralised approach. The centre of attention within the five steps is the recommendations we make for the first and second step. The recommendations for the first two steps will also be validated by applying them to two additional product groups. Analogous to chapter 6 the execution of step three to five is also necessary but we recommend providing tendering authorisations autonomy to decide how to execute these steps. The rationale for this is that objectives may vary among tendering situation. Nonetheless, tendering organisations have to complete the five steps at all time.

Step 1; which sustainability criteria

For the first step, *which criteria to use*, we recommend to use the existing obligatory technical specifications as well as the discretionary award criteria. We assume that the existing sustainability criteria cover the most important sustainability aspects. The rationale to assume these are the paramount sustainability aspects is that the sustainability criteria are assessed by Agentschap NL in accordance with suppliers and other stakeholders. Ascertaining the use of the discretionary award criteria is motivated by the potential of the discretionary award criteria to stimulate innovation.

However, combining the sustainability criteria into one score for sustainability leaves room for assessing supplementary sustainability criteria and re-examining discarded sustainability criteria at a later point in time. In addition, we recommend reviewing the ambition level of the existing individual sustainability criteria regularly. Because the sustainability criteria become semi-compensatory and less stringent we argue that more ambitious scoring criteria can be implemented. In this light, we propose a holistic view on possible innovative solutions. In particular, we recognise successfully finished SBIR projects as a valuable source of information for innovative possibilities and techniques.

Step 2; combining the sustainability criteria

For the second step, *how to combine the criteria*, we recommend using a modified weighted factor score (WFS) model as described in subsections 6.1.2 and 6.2.2. WFS-models are usually entirely compensatory. The modification to the WFS-model is the introduction of knockout (Table 6.3) and semi-knockout criteria (Table 6.3) with absolute lower bounds. This modifies the, normally completely compensatory, WFS-model into a semi-compensatory model. The rationale to recommend a semi-compensatory method is that this will decrease the stringency of the individual sustainability criteria. The fact that good scores on other sustainability criteria can compensate bad scores for some sustainability criteria provides tenderers with additional independence to comply with the requested total sustainability score. However, there are reasons to keep an absolute lower bound for individual sustainability criteria. These reasons are explained in the modification of the sustainability criteria for office furniture and roads in chapter 6. Furthermore, the positive effects of the modified WFS-model are rationale to also recommend the modified WFS-model in the generalised approach. The analysis of the remaining product groups did not present motivation to

focus on other models for combining the sustainability criteria into one single score for sustainability.

Alike the recommendations in chapter 6 we recommend to not to include the price into the modified WFS-model. The suggested way to relate the total sustainability to the price is presented in step five.

In Chapter 6 we concluded that modifying the existing sustainability criteria mainly depends on the answers the following three questions.

- Is the existing sustainability criterion a technical specification or an award criterion?
- Is the existing sustainability criterion quantifiable?
- Is the existing lower bound of the criterion hindering the procurement of innovative products?

We observed that the first two questions can be answered by analysing the existing criteria documents. The third question, however, requires additional research. We suggest researching this in a similar way as described for office furniture and roads in chapter 5. The rationale to include all the four stakeholder groups is that focusing on one or a few of these stakeholders can bias the results. The amount of suppliers included should represent the supplier market characteristics. However, other research methods should be reconsidered when more data about tenders that applied the sustainability criteria becomes available.

Depending on these three characteristics, we recommend either knockout criteria, semi-knockout criteria, or scoring criteria. However, we acknowledge specific situations where sustainability criteria are unquantifiable and where the lower bound can exclude innovative solutions. In this situation the criterion should be modified into a knockout criterion which allows for alternative, similar sustainable, solutions. However, alternative solutions are not desirable when the sustainability criteria are designed to stimulate standardisation or are part of legislation. Figure 7.1 displays how these characteristics and possible modifications have led to a parameter dependent sustainability criteria modification flowchart.

During the quick-scan among all the product groups' sustainability criteria situations showed were the recommendations made for office furniture and roads, require supplementary consideration. There are criteria documents where obligatory technical specifications and discretionary award criteria focus on the same sustainability aspect. An example of such is found in the sustainability criteria for the product group "transportation". The technical specification for transportation require minimally a Euro IV norm, whereas, the award criteria aim at awarding a Euro V norm. We recommend combining these two criteria into one semi-knockout criterion with a lower bound alike the existing ambition level of the obligatory technical specification.

Suggestions step 3; the relative importance of sustainability criteria

The third step, *determining the relative importance of the sustainability criteria*, creates the setting for the actual influence of the sustainability criteria on the final total sustainability score. As a consequence of the modified WFS-model this has to be done by assigning weights. In chapter 6 we ranked the sustainability criteria based on their potential to stimulate innovation. However, in order to make generally applicable recommendations concerning the weights, the sustainability criteria should be ranked according to their overall importance. The overall importance of the sustainability criteria may vary among tendering situations. For this reason, we recommend autonomy for tendering organisations to determine the scores for the various sustainability criteria in the modified WFS-model. In order to determine the weights we advise to include various, accountable stakeholders, such as the internal customer, budget holders, and the purchasing experts. During the ranking of the sustainability criteria, the focus should be on the possibility to stimulate sustainability as well as innovation. Nevertheless, the lower bound of the sustainability criteria assures that the threshold for individual sustainability criteria remains. For future situations where the number of sustainability criteria is possibly increasing there are more advanced methods for assigning weights to sustainability criteria. De Boer (1998), describes more advanced methods for assigning weights to (sustainability) criteria.

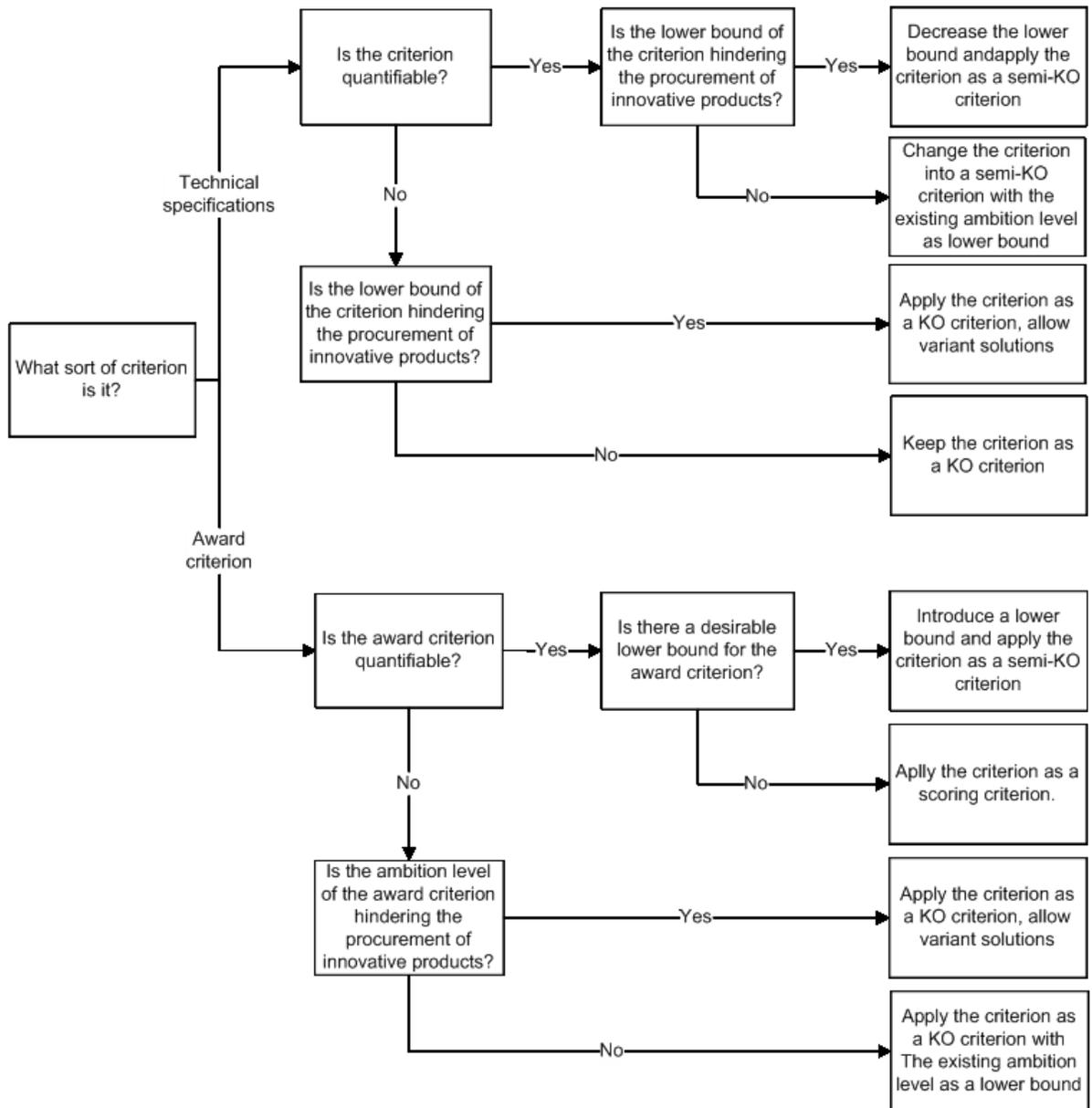


Figure 7.1 Parameter dependent flowchart for modifying the existing sustainability criteria

Suggestions step 4; scoring the criteria

In the fourth step, *scoring the criteria*, the scoring method for the various sustainability criteria has to be determined. The first step in this is assigning minimum and maximum scores for the sustainability criteria. The minimum scores we recommend to make obligatory are, if any, the suggested lower bounds recommended in step two. However, these lower bounds should not hinder the procurement of innovative products. For this reason, the influence of the existing lower bounds has to be researched, as was indicated in step two. The maximum scores need to be determined for all the individual sustainability criteria. Important consideration is that the maximum score does not discourage suppliers to develop innovative solutions that are outperforming existing techniques. For situations where the maximum score is related to existing standards such as energy labels, the maximum levels should be closely monitored and adjusted frequently. We also recommend making the maximum levels generally applicable and obligatory. For office furniture and roads we recommended linear scoring in between maximum and minimum scores. The reason to recommend linear scoring was that stimulating lagging suppliers to improve 20% was considered equally important as stimulating lead suppliers to improve 20%. However, we advise to give purchasing organisations autonomy to determine the type of scoring method in between the

minimum and maximum scores. Regardless the scoring method, the possible influence should be analysed upfront in order to prevent unwanted consequences on the selection of the winning tender.

Suggestions step 5; selecting the winner

For the fifth step, *selecting the winner*, there are two options. These two options are awarding on price only or awarding on multiple criteria (MEAT).

For the first option, awarding on price only, the modified WFS-model should be placed in the **technical specifications** (section 2.1.1) of the tender. When the modified WFS-model is used in the technical specifications, the purchasing organisation has to determine a minimal total sustainability score upfront. Suppliers that fail to comply with the minimal score, or with any absolute lower bound of an individual sustainability criterion, are excluded from the tendering procedure.

The second option is awarding on MEAT. When awarding on MEAT we recommend using the combined sustainability score in the **award criteria** (section 2.1.1). In order to relate the total sustainability score to the price we recommend dividing the first by the latter. The rationale to divide the sustainability score by the price is twofold. First, it makes the offer with the highest score win the tender. Second, the score for dividing the sustainability score by the price makes the influence the sustainability score has on the score (sustainability/price) linear. If for example the price is divided by the sustainability score an increase of 10 points just above the minimal threshold has more influence on the score than an increase of 10 points for a sustainability score near to the maximum total sustainability score. In line with the rationale to create equally incentives for lead suppliers as for lagging suppliers we argue that dividing the sustainability score by the price is the best method. However, the ranking of the offers will not be influenced by interchanging these methods. In addition to dividing the sustainability score by the price, we recommend also to determine a minimal total sustainability score. This assures that the solution is at least as sustainable as when the modified WFS-model is placed in the technical specifications of the tender.

From these two examples we observe the following. A minimal threshold for the total sustainability score is possible, regardless the position of the modified WFS-model. The difference between the two positions is that if the modified WFS-model is placed in the technical specifications, suppliers will compete on lowest price while the tender complies with the required total sustainability score. However, if the modified WFS-model is placed in the award criteria suppliers will compete on the price relative to the total sustainability score.

The two positions of the modified WFS-model have distinct consequences for the estimation of the price of the winning offer. For the first method, awarding on lowest price with the modified WFS-model placed in the technical specifications. In this situation, market consultation can provide a relative good idea about the lowest price that will comply with the requested minimal sustainability score. For the second method, placing the modified WFS-model in the award criteria, the maximum influence on the direct purchasing price is more difficult to predict. Nonetheless, the price-range of the winning tender is still predictable. Based on the expected price for an offer with the minimal sustainability score the maximal price of the best offer regarding price and sustainability can be calculated.

In real life tendering situations other criteria could included as well in addition to price and sustainability criteria. The additional criteria can be included in several ways. In fact, these ways are similar to the possibilities we stipulated for combining the sustainability criteria into one score for sustainability (de Boer, 1998). Important consideration is that when the sustainability score is related to other criteria, the influence of the sustainability score is large enough to encourage suppliers to develop and offer more sustainable solutions.

Validating the recommendations for the first two steps

In order to validate these recommendations, they were applied to two additional product groups. From the remaining forty-five product groups that have not been analysed we chose two product groups that contain obligatory as well as discretionary tender criteria. The objective of the validation was to test whether the general applicability of recommendations could be proven untrue (Popper, 1963). Testing the recommendations was performed by applying the recommendations from this section to “special transportation” and “working clothes”. The results of applying the recommendation from step one and two for both product groups are shown in Appendix IX. However, no additional questionnaires have been distributed to research the effect of the sustainability criteria on innovation for the validation. For this reason, information about the

hindering effect of the lower bounds of the sustainability criteria was not available. Nevertheless, we concluded that testing the generalised recommendations on these two additional product groups did not falsify that the recommendations we made for the first two steps are applicable to all existing product groups.

7.1.3 Modifying the contract clauses

In addition to modifying the tender sustainability criteria, we make recommendation how to modify the existing contract clauses. Combining the sustainability criteria into one single score for sustainability provides opportunities to stimulate continuous improvement throughout long-lasting (framework) contracts. We recognise two approaches to create incentives for improvements on sustainability. These are rewarding an improved total sustainability score or penalising a decreased or static total sustainability score.

There are two steerable parameters for these approaches, these are price and contract duration. An example of such was used in a tender for cleaning of office buildings. In this tender the supplier were allowed to submit a more effective offer at the end of each contracting year. If the new, more effective offer resulted in costs reduction, the additional profit was shared amid the contracting organisation and the supplier. Another example was found in the existing contract clause for networks phone services and equipment. In this contract clause it is recommended to challenge the contractor by means of a bonus. The bonus is handed out if the supplier improves the efficiency in its data centres (SN, 2009h).

7.2 Positive effects of the modifications

We clarify that combining the sustainability criteria into a modified WFS-model has a positive effect on innovation. In addition, the modifications also facilitate recent developments, aiming at stimulating innovation, within the Dutch approach of sustainable public procurement (subsection 3.3.1).

Ascertaining the use of existing award criteria

The existing award criteria are included in the recommended single score for sustainability. Regardless the place of the modified WFS-model, suppliers will be capable of scoring on the existing discretionary award criterion. Even if purchasing authorities apply the modified WFS-model in the technical specifications, suppliers are still capable of scoring on the existing discretionary award criteria. This advantage is considerable since only half of the departments of the Central Government plan to apply existing discretionary award criteria in 2010 (Tweede Kamer, 2010).

Functional specifications

Even though the sustainability criteria aim at the same abstraction level, the sustainability criteria will become more functional. The stringency of the sustainability criteria will decrease due to the possibility to compensate bad scores on sustainability criteria with good scores on other sustainability criteria. This will provide tenderers with freedom to comply with the total sustainability score by scoring on sustainability criteria of their choice.

Facilitating MEAT

The modified WFS-model facilitates the selection of suppliers on multiple sustainability criteria (MEAT). The existing approach neglects to provide information on: how to combine the sustainability criteria, the relative importance of the sustainability criteria, how to score the sustainability criteria, and how to select the winner. We argue that due to the recommendation on these additional four steps, even less mature tendering organisations can award on MEAT. Furthermore, we recommend changing the existing knockout criteria into semi-knockout criteria. This creates additional opportunities to award suppliers' better performances on the existing knockout criteria.

Facilitating future sustainability ambitions

One score for sustainability provides opportunity for future goals. First, the total sustainability score can be related to future ambition levels, such as in two years from now the minimal total sustainability will increase with 15 points. Second, the absolute lower bounds of individual

sustainability criteria can be related to future ambition levels, such as in two years from now 50% of the furniture within the contract should have a composition label. However, the latter is already possible in the existing approach. Nevertheless, creating additional sustainability criteria, on which suppliers can score, results in more sustainability criteria for which the absolute lower bounds can be increased in the future.

Facilitate ambitious purchasing authorities

One score for sustainability also provides opportunity for purchasing organisations that wish to procure more sustainable products already. First, the total sustainability score can be increased straightforwardly. Second, the absolute lower bounds of individual sustainability criteria can be increased. However, the latter is already possible in the existing approach. Nevertheless, creating additional sustainability criteria, on which suppliers can score, results in more sustainability criteria for which the absolute lower bounds can be increased by ambitious purchasing organisations.

Creating Incentives for continuous improvement

One single score for sustainability provides opportunities for creating incentives for continuous improvement throughout long lasting (framework) contracts. The recommended modification of existing binary knockout criteria into semi-knockout criteria results in additional sustainability criteria on which suppliers can improve the total sustainability.

7.3 Additional recommendations

In chapter 6 the main focus has been on modifying the existing instruments of sustainable public procurement. However, in chapter 5 we identified five innovation stimulating elements that showed to be most potential to positively influence the procurement of sustainable products. These five elements are: using MEAT, functional specifications, incentives for continuous improvement, performing market consultation, and a TCO approach. The latter two innovation stimulating elements are not directly stimulated by the modifications of the existing sustainability criteria (section 7.1). Nevertheless, market consultation and a TCO approach showed to be significant stimulant for both innovation (Dalpé et al, 1992; EC, 2005; EZ, 2009) as well as sustainability (section 5.4). In addition to this, Edler (2006) states that insufficient buyer supplier interaction is a significant barrier for public procurement for innovation. For this reason, the subsequent paragraph discusses the observations throughout this thesis with regard to a TCO approach and market consultation.

TCO

We already observed in section 5.2 that some existing sustainability criteria are aiming to minimise the costs during the whole lifetime of office furniture as well as for roads. During the quick-scan, we observed that several product groups aim to reduce the costs throughout the lifetime of the products. Examples of such are Energy star and energy labels for cars and buildings. In the GWW sector another trend supporting a TCO approach is integrated contracts for design, build, finance, maintain, and operate of works. Integrating these phases generates incentives for tenderers to minimise the cost over all these phases.

Market consultation

First, we observed that, due to their departmental procurement policy, the Ministry of V&W precedes most purchases by market consultation. During the brainstorm session two attractive, GWW specific, propositions stimulating market consultation were posed.

- Introducing a database at the Ministry of V&W where novel solutions and patents are gathered for GWW related products.
- Gather and present best practices of technical market consultations. A potential example is the introduction of an independent separate institute that guarantees the confidentiality of information exchanged during the tendering procedure. An example of such was applied during the tendering procedure of the “Afsluitdijk” (Brainstorm session roads Table 6.9).

In addition to GWW specific suggestions, we summarise suggestions for market consultation for products for which the contracts are managed by category management (section 2.3).

For contracts managed by category management, market consultation has more impact than for regular contracts. The explanation for this is that because contracts are available for all departments, the total expenditure becomes larger. In addition to this, category management is part of professionalisation of the public procurement function for the Central Government. According to Telgen (2007b) a mature public procurement organisation, aims to deliver policy (subsection 2.1). Relating this to the political context of this thesis, described in section 2.2 we come to the following recommendation. Category management, as a leading professional procurement initiative, should perform market consultations with a strong focus on policy goals such as stimulating sustainability and innovation. We recommend cooperation between category management and (interdepartmental) programmes, working on the development and implementation of public procurement policies.

7.4 Conclusion

In this chapter we generalised the recommendations for office furniture and roads from chapter 6. The generalisations were based on the differences between the recommendations for office furniture and roads and the analysis of the sustainability criteria of all the other products groups. Returning to the research question, to which this chapter seeks to find an answer, we conclude the following. The analysis of the sustainability criteria of all other product groups showed that the recommendations for office furniture and roads are almost entirely applicable to all the sustainability criteria. However, we observed that for some product groups the obligatory technical specifications and discretionary criteria should be combined into one semi-knockout criterion. Based on these observations we made recommendation how to modify the existing obligatory and discretionary sustainability criteria applicable for all product groups. In order to do this we recommended the five step model developed by Telgen (2007a). The first two steps are obligatory and can be generally applied. In order to modify the existing sustainability criteria we developed a parameter dependent flowchart (Figure 7.1). Determining the lower bounds for other sustainability criteria that will not hinder the procurement of innovative products requires additional research. We recommend a similar approach as taken in chapter 5. However, when more data becomes available about tenders containing sustainability criteria, other research methods should be reconsidered. For steps three to five we suggested autonomy for tendering organisations. However, we recommend making the minimum and maximum score, that have to be determined in step three, obligatory and generally applicable. Although we recommend autonomy for tendering organisations we stipulate that all five steps have to be completed at all times.

The recommendations for step one and two have been validated by testing them on two additional product groups. In addition to the single score for sustainability, we recommended to develop contract clauses creating incentives for continuous improvement on sustainability throughout long-lasting (framework) contracts. During the reviewing of the recommendations concerns arose among key informants about the legal soundness of the recommendations. The recommendations have been examined with the chairperson of the legal advisory committee for sustainable public procurement (B.A.G., section 3.2.3). From the discussion it showed that, *prima facie*, the recommendations are not in disagreement with European public Tendering legislation.

8 Discussion

The answer to the final research question in chapter 7 directly relates to the goal of this Master's thesis, which has been the following.

Modify the existing sustainability stimulating instruments, in order to stimulate the procurement of products that are in addition to sustainable also innovative

In order to reach this research goal, we posed five research questions (subsection 1.2.3). These research questions have been answered throughout chapters 2 through 7. For this reason, this chapter does not discuss these answers again but presents the subsequent three aspects. Subsection 8.1 presents the evaluation of the choice for office furniture and roads. Subsection 8.2 presents the construction validation that has been performed for this Master's thesis by means of a reviewing committee (Yin, 2009). Finally, subsection 8.3 describes a stepwise implementation route for the recommendations from chapter 7.

8.1 Evaluating the choice for office furniture and roads.

Although the choice for office furniture and roads has been motivated in section 4.3, this section tries to look back on the influence of the selection throughout this thesis.

The first restriction, the existing sustainability criteria should be perceived to hinder innovation, had the following consequences throughout this thesis. We argue, that due to the perceived hindering effect of these sustainability criteria the conclusion in chapter 5, that the existing obligatory sustainability criteria do not hinder the procurement of innovative products, is more valuable.

The second restriction, the Central Government should have a significant influence on the market of the product groups, resulted in interested suppliers participating in the questionnaires as presented in section 5.3. We argue that if the Central Government would not be a large potential customer, the suppliers would be less cooperative in the questionnaires and would be less informed about the existing sustainability criteria.

The third restriction, the product groups should have a significant influence of the purchasing portfolio of the Central Government, provided the setting for well informed, cooperative, purchasers.

The fourth restriction, the product group should not be removed in the revision of the product groups in the summer of 2009, provided examples that remain within the focus of the existing approach for sustainable public procurement.

The fifth restriction, there should be obligatory as well as discretionary criteria for the product group, provided the right settings for combining existing obligatory and discretionary sustainability criteria into on single score for sustainability. If product groups without discretionary award criteria would have been chosen, the discretionary award criteria would not have been included in the recommendation in chapter 6.

The sixth restriction, there should be at least four sustainability criteria in total for each of the product groups, contributed to analysing various types of sustainability criteria. These various types of sustainability criteria provided a solid ground for the generalisation of the recommendations applicable to all product groups. However, the impact of the modifications can be less visible for product groups for which only one or two sustainability criteria exist.

The seventh restriction, the two product groups should not be of the same type (goods, service or works), provided a first comparison between possible differences between contracts for goods and contracts for works. Despite the fact that no product group entailing a service has been included the potential of contract clauses during long lasting (framework) contracts appeared during the questionnaires and brainstorming sessions.

8.2 Key stakeholders reviewing committee

A group of heterogeneous key informants has reviewed the draft version of this thesis. The rationale for a reviewing committee has been to increase the construct validity of this Master's thesis (Yin, 2009). The following key informants participated in the reviewing committee.

- Ir. M.A.G. van Putten MBA, Project manager innovation procurement at PIANOo.

- Drs. R.J.D. Prins, consultant at Agentschap NL.
- Drs. P. Kuijpers, Procurement advisor at the Ministry of transport, public works, and water management (no feedback received within the requested time limits).
- Drs. K. Maan, senior policy advisor at interdepartmental programme direction sustainable procurement.
- Drs. ing. D.F.B. Robben, Coordinator procurement advisor & category management at the Ministry of VROM.

The feedback from the reviewing committee is presented in Appendix XIII. The feedback of the reviewing committee has been employed for the subsequent aspects.

- The conclusions of chapters 4, 5, 6, and 7 were augmented.
- The statistical analysis of the questionnaires (section 5.4) have been reconsidered.
- Additional recommendations for step four and five of the five step model and for implementation (subsection 7.1.1)
- Input for the whole of chapter eight.

8.3 Implementation

The ultimate goal of this Masters' thesis is to provide recommendation for modifying the existing sustainability criteria documents for all product groups. However, we recommend arriving there by means of an implementation route in three steps. The first step is to test the practical effectiveness of the modified WFS-model on individual tenders. These tenders should be sought within the sphere of influence of IPDI or the project team public procurement for innovation. In order to fully demonstrate the advantages of the modifications the potential tender should comply as much as possible of the requirements from section 3.4. The recommendations from chapter 6 and 7 require additional input. First, the absolute lower bounds individual sustainability criteria have to be determined in order not to hinder innovative products. Second, the weights for the individual sustainability criteria have to be determined. Third, the approach for scores in between the minimum (absolute lower bound) and the maximum score need to be determined. Fourth, the position of the WFS-model has to be determined. The recommendation from chapter 7 show the important aspects and provides advice for these decisions. In addition to this, we recommend creating incentives for continuous improvement of the total sustainability score throughout the contract period (subsection 7.1.2). After the evaluation of the results and alteration of the recommendations, the next step is to modify one product groups' criteria document. This second step requires extensive facilitating and informing purchasing authorities about the incentives and possibilities of the recommended approach. Examples generated during the first step can serve as examples. The second step should also be extensively monitored. The analyses of the second step should provide information about the authentic advantages compared to the clarified advantages in section 7.2. The final step is expanding the recommendations to other product groups.

9 Bibliography

1. Amending Directive 2004/18/EC of the European Parliament and of the council of 04 December 2007 in respect of their application thresholds for the procedure for the award of contracts.
2. Aschoff, B. And Sofka, W. (2009) 'Innovation on demand- Can public procurement drive market success of innovations?' *Research Policy* Vol. 38, pp. 1235-1247.
3. Audretsch, D.B. (2003) 'Standing on the shoulders of midgets: The U.S. Small Business Innovations Research Program (SBIR)' *Small Business Economics*, Vol. 20, pp. 129-135.
4. Baarda D.B. et al. (2007) 'Basisboek interviewen, Handleiding voor het afnemen van interviews' Groningen/Houten: Wolters-Noordhoff.
5. BECO Groep (2008) 'Quick-scan naar impact van de criteria voor duurzaam inkopen op de markt en op innovatie' In opdracht van Natuur en Milieu.
6. Braungart, M. and McDonough, W. (2007) 'Cradle to Cradle' North Point Press, a division of Farrar, Straus & Giroux, New York.
7. Carlsen, J. And Callender, G. (2009) 'Sustainable procurement – A guide for research and practice' *Proceedings of the 18th Annual International IPSE Conference*, Wiesbaden.
8. Dalphé, R. et al. (1992) 'The public sector as a first user of innovations', *Research policy* 21 (1992) pp 251-263.
9. Dalphé, R. (1994) 'Effects of government procurement on industrial innovation', *Technology in society*, Vol. 16 No.1 pp 65-83
10. De Boer, L. (1998) 'Operations research in support of purchasing: design of a toolbox for supplier selection' Enschede: Twente University Press.
11. DGOBR, (2009) 'Categoriemanagement voor de rijksoverheid' Information sheet from the Dutch Ministry of Internal affairs and Royalty relations.
12. DHV & Significant (2009) 'De impact van duurzaam inkopen: Verkenning van effecten op markt en milieu' In opdracht van het Ministerie van Volkshuisvesting, Ruimtelijke Ordening en Milieu (VROM).
13. DTI (2005) 'The Empirical economics of standards' DTI Economics paper no.12. <http://www.bsigroup.com/upload/Standards%20&%20Publications/Government/Empirical Economics.pdf> [last reviewed on January 4th, 2010].
14. Edler, J. (2006) 'Demand oriented innovation policy' Paper presented at the ProACT Conference, Tampere, Finland March 15-17 2006.
15. Edler, J. And Georghiou, L. (2007) 'Public procurement and innovation – Resurrecting the demand side', *Research policy* 36 (2007) pp 949-963.
16. Elkington, J. (1999) 'Cannibals with forks: Triple bottom line of the 21st century Business' Oxford: Capstone Publishing Limited.
17. European Commission (2003) 'Integrated product policy. Communication from the Commission to the Council and the European Parliament, COM (2003) 302 final.
18. European commission (2004) 'Buying green! A handbook on environmental public procurement' http://ec.europa.eu/environment/gpp/pdf/buying_green_handbook_en.pdf [last reviewed on January 4th, 2010].
19. European Commission (2005) 'Public procurement for research and innovation, Expert Group Report: Developing procurement practices favourable to R&D and innovation' Directorate-General for research.
20. European Commission (2006) 'Pre-Commercial procurement of Innovations: A missing link in the European innovation cycle'.
21. European Commission (2007a) 'A lead Market initiative for Europe' <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2007:0860:FIN:en:PDF> [last reviewed on January 4th, 2010].
22. European Commission (2007b) 'Public procurement for the promotion of R&D and innovation in ICT', <http://ftp.jrc.es/EURdoc/eur22671en.pdf> [last reviewed on January 10th, 2010].
23. European Commission, DG Environment (2009a) 'Bridging the valley of death: public support for commercialisation of eco-innovation' http://ec.europa.eu/environment/enveco/innovation_technology/pdf/bridging_valley_report.pdf [last reviewed on January 4th, 2010].

24. European Commission, Project OMC PTP (2009b) 'Exploring public procurement as a strategic innovation policy mix instrument' http://www.omc-ftp.eu/media/Public%20Procurement%20as%20Innovation%20Policy%20Mix%20Instrument_small.pdf [last reviewed on January 4th, 2010].
25. European Commission services (DG ENV) and the Nordic Council of Ministries (2007) 'Environment and public procurement: Guidance on criteria development' draft version 23 May 2007. http://www.grip.no/Innkjop/Nedlastningsdokumenter/2007-05-23_Guidance_on_criteria_development.pdf [last reviewed on January 3rd, 2010].
26. European Union public sector procurement Directive 2004/18/EC of the European Parliament and of the council of 31 March 2004 on the coordination of procedures for the award of public works contracts, public supply contracts and public service contracts.
27. Faucher, P. and Fitzgibbons, K. (1993) 'Public demand and the management of technological risk in large scale projects', *Science and Public policy*, Vol. 20(3), pp. 173-185.
28. Geroski, P.A. (1990) 'Procurement policy as a tool of industrial policy' *International Review of Applied Economics*, Vol. 4, no.2, pp. 182-198.
29. Gross, R. and Foxon, T. (2003) 'Policy support for innovation to secure improvements in resource productivity', *Int. J. Environmental Technology and Management*, Vol. 3, No. 2, pp. 118-130.
30. Hampson, J. et al. (2009) 'Case studies in sustainable and responsible procurement' *Proceedings of the 18th Annual International IPSERA Conference*, Wiesbaden, pp. 1112-1119.
31. Handfield, R. et al. (2002) 'Applying environmental criteria to supplier assessment: A study in the application of the Analytical Hierarchy Process' *European Journal of Operations Research*, Vol. 141, pp. 70-87.
32. Harink, J.H.A. (1999) 'Excelleren met elektronisch inkopen' Alphen aan den Rijn: Samson
33. Heijboer G.J. (2003) 'Quantitative analyses of strategic and tactical purchasing decisions' Enschede: Twente University Press.
34. Hommen, L. And Rolfstam, M. (2007) 'Public procurement and innovation – towards a taxonomy' Forthcoming in *Journal of Public Procurement*, <http://www.kalder.org/genel/16kongre/LEIF%20HOMMEN.pdf> [last reviewed on January 4th, 2010].
35. Humphreys, P.K. et al. (2003) 'Integrating environmental criteria into the supplier selection process' *Journal of Materials Processing Technology*, Vol. 138, pp. 349-356.
36. ICLEI – Local Governments for Sustainability (2007) 'The Procura+ Manual 2nd edition, A guide to cost-effective sustainable public procurement'.
37. Instituut voor Onderzoek van Overheidsuitgaven (2009) 'Het totale inkoopvolume van de Nederlandse overheden' Instituut voor Onderzoek van Overheidsuitgaven.
38. Lu, L.Y.Y. et al. (2007) 'Environmental principles applicable to green supplier evaluation by using multi-objective decision analyses' *International Journal of Production Research*, Vol. 45, No. 18-19, pp. 4317-4331.
39. McCrudden, C. (2004) 'Using procurement to achieve social outcomes' *Natural Resources Forum*, Vol. 28, pp. 257-267.
40. Miemczyk, J. et al. (2009) 'Developing a green supplier maturity model: Concepts, applications and limits' *Proceedings of the 18th Annual International IPSERA Conference*, Wiesbaden, pp. 1392-1401.
41. Ministerie van Algemene Zaken (2007) 'Coalitieakkoord tussen de Tweede Kamerfracties van CDA, PvdA en ChristenUnie: Samen Werken samen leven'.
42. Ministerie van Binnenlandse Zaken en Koninkrijksrelaties (2009) 'Categorie management voor de rijksoverheid' http://www.pianoo.nl/pv_obj_cache/pv_obj_id_D9A6A74AE14860C312ACAE7FB2AE92AA86C50200 [last revied on February 22nd, 2010].
43. Ministerie van Economische Zaken (2009) 'Overheid als opdrachtgever voor innovatie: Invullend motie Aptroot, Besselink' [internal working paper].
44. Ministerie van VROM (2006) 'Protocol voor ontwikkeling en onderhoud van de criteria voor duurzaam inkopen voor de Nederlandse overheden' [internal working paper].
45. Narayanan, V.K. (2001) 'Managing Technology and innovation for competitive advantage' New Jersey: Prentice Hall.

46. Nemet, G. (2009) 'Demand-pull, technology-push, and government-led incentives for non-incremental technical change'. *Research policy* Vol. 38, pp. 700-709.
47. Nissinen, A. (2009) 'Environmental criteria in the public purchase above the EU threshold values by three Nordic countries: 2003 and 2005' *Ecological Economics*, Vol. 68, pp. 1838-1849.
48. Noci, G. (1997) 'Designing 'green' vendor rating systems for assessment of a supplier's environmental performance' *European Journal of purchasing & Supply Management*, Vol. 3, No. 2, pp. 102-114.
49. Office of Government Commerce (2007) 'Finding and procuring innovative solutions: Evidence-based practical approaches'
50. Office of Government Commerce (2008) 'Buy green and make a difference: How to address environmental issues in public procurement'
51. Parikka-Alhola, K. (2008) 'Promoting environmentally sound furniture by green public procurement', *Ecological Economics*, Vol. 68, pp 472-485.
52. Popper, K. (1963) 'Conjectures and Refutations' London: Routledge.
53. PricewaterhouseCoopers et al. (2009) 'Collection of statistical information on Green Public Procurement in the EU: Report on data collection results' http://ec.europa.eu/environment/gpp/pdf/statistical_information.pdf [last reviewed on January 4th, 2010].
54. PricewaterhouseCoopers (2009) ' Monitor duurzaam inkopen 2008; Meting van het niveau van duurzaam inkopen bij overheden'. <http://www.vrom.nl/pagina.html?id=2706&sp=2&dn=w1271> [last reviewed on January 13th, 2010].
55. Reijniers, J. And Gaspersz, J. (2009) ' Inkoper innoveer' Pearson Education publishers, Amsterdam.
56. Rijksoverheid (2009) 'De concurrentie gerichte dialoog; Een handreiking op basis van de ervaring tot nu toe van de Rijksgebouwendienst, Rijkswaterstaat en Defensie' http://www.pianoo.nl/pv_obj_cache/pv_obj_id_6776BE8A77FEC37195FF3C97217061D60CBB0600 [last reviewed on January 4th, 2010].
57. Rolfstam, M. (2009) 'Public procurement as an innovation policy tool: the role of institutions' *Science and Public policy*, Vol. 36 No. 5, pp. 349-360.
58. Schumpeter, J. (1934) 'The theory of economics' Boston: Harvard University Press.
59. SenterNovem (2008) 'Concept Notitie Beleidsadviesgroep (BAG)' Internal working paper.
60. SenterNovem (2009a) 'Handleiding duurzaam inkopen voor overheidsinkopers'. In opdracht van het Ministerie van Volkshuisvesting, Ruimtelijke Ordening en Milieu.
61. SenterNovem (2009b) ' Criteria voor duurzaam inkopen van: Kantoormeubilair, versie 1.3' http://www.senternovem.nl/mmfiles/Criteriadocument_Kantoormeubilair_tcm24-283206.pdf [last reviewed on January 4th, 2010].
62. SenterNovem (2009c) 'Criteria voor duurzaam inkopen van: Wegen, versie 1.2' http://www.senternovem.nl/mmfiles/Criteriadocument_Wegen_tcm24-306708.pdf [last reviewed on January 4th, 2010].
63. SenterNovem, Kennis Netwerk Duurzame Productketens (2009d) ' Duurzaam inkopen versie 2.0: een model voor MVO-gedreven inkoopbeleid' De Vries, J. 2Eco. http://www.senternovem.nl/mmfiles/Rapport_20091105_Duurzaam_inkopen_tcm24-317313.pdf [last reviewed on January 12th, 2010].
64. SenterNovem (2009e) 'SBIR Programma: Het Nederlandse programma voor pre-commercieel aanbesteden: Handleiding SBIR voor bedrijven SBIR fase 1 en 2' http://www.senternovem.nl/sbir/documentatie/sbir_handleiding.asp [last reviewed on January 11th, 2010].
65. SenterNovem (2009f) 'Criteria voor duurzaam inkopen van: Aangepast vervoer, versie 1.3' http://www.senternovem.nl/mmfiles/Criteriadocument_Aangepast_vervoer_tcm24-273551.pdf [last reviewed on January 11th, 2010].
66. SenterNovem (2009g) 'Criteria voor duurzaam inkopen van: Bedrijfskleding, versie 1.1' http://www.senternovem.nl/mmfiles/Criteriadocument_Bedrijfskleding_tcm24-298952.pdf [last reviewed on January 11th, 2010].
67. SenterNovem (2009h) 'Criteria voor duurzaam inkopen van: Netwerken/infrastructuur, Telefoondiensten en Telefoonapparatuur' <http://www.senternovem.nl/mmfiles/tcm24-298952.pdf> [last reviewed on January 11th, 2010].

68. Significant (2007) 'Overheid als motor voor innovatie: stimulering van innovatie door de toepassing van normen in het inkooptraject van de Rijksoverheid' Barneveld: Significant. In opdracht van het Ministerie van Economische Zaken – Directie Innovatie.
69. SMART SPP (2009) 'Existing approaches to encourage innovation through procurement: Review of early market engagement, risk management, LCC, and CO2eq monitoring tools and approaches' The SMART SPP consortium, c/o ICLEI – Local Governments for Sustainability.
70. Tatikonda, M.V. and Rosenthal, S.R. (2000) 'Technology novelty, project complexity, and product development project execution success: A deeper look at task uncertainty in product innovation' IEEE transactions on engineering management, Vol. 47, No.1, pp 74-87.
71. Telgen, J. (2007a) 'Framework contracts and supplier selection' Lecture notes University of Twente, September 17th, 2007.
72. Telgen, J. et al. (2007b) 'Reader: Purchasing Management' Lecture supplements, course code 182016, University of Twente 2007/2008.
73. Tweede Kamer, (1999) 'Milieuprogramma 2000 – 2003', Tweede Kamer, vergaderjaar 1999- 2000, 26 804, nr. 2.
74. Tweede Kamer (2005) 'Motie van de Leden Koopmans en de Krom', Tweede Kamer, vergaderjaar 2005-2006, 29 800-XI, nr. 130.
75. Tweede Kamer (2006) 'Rapportage Duurzame bedrijfsvoering Overheden 2006 ' Tweede Kamer, vergaderjaar 2006-2007, 26 485, nr. 42.
76. Tweede Kamer (2008) 'Motie van de Leden Aptroot en Besselink', Tweede Kamer, vergaderjaar 2008-2009, 27 406, nr. 127.
77. Tweede Kamer, (2009) 'Beantwoording Motie van de Leden Aptroot en Besselink' Tweede Kamer, vergaderjaar 2009-2010, brief aan de Tweede Kamer.
78. Tweede Kamer, (2009b) 'Duurzame ontwikkeling en beleid' Tweede Kamer, vergaderjaar 2008-2009, 30 196, nr. 64.
79. Tweede Kamer, (2009c) 'Duurzame ontwikkeling en beleid' Tweede Kamer, vergaderjaar 2008-2009, 30 196, nr. 95.
80. Varnäs, A. et al. (2009) 'Environmental considerations in procurement of constructions contracts: current practices, problems and opportunities in green procurement in the Swedish Construction industry' Journal of Cleaner Production, Vol. 17, pp. 1214-1222.
81. Walker , H. et al. (2008) 'Drivers and barriers to environmental supply chain management practices: Lessons from public and private sectors' Journal of Purchasing and Supply Management, Vol. 14, pp. 69-85.
82. Weele, A.J. van (1997) 'Inkoop in strategisch perspectief' 3rd release Alphen aan den Rijn/Diegem: Samson bedrijfsinformatie.
83. Weele A.J. van (2005) 'Purchasing & Supply Chain Management: Analysis, Strategy, Planning and Practise', Andover, Hampshire: Thomson Learning.
84. Wientjes and Hermans (2009) 'Letter without title' Directed at Minster M.J.A. van der Hoeven of Economic Affairs', date April 7 2009, nr. 09/10.616/Bre/Dey.
85. World Commission on Environment and Development (WCED) (1987) 'Our common future'.
86. World Economic Forum (2009) 'The global competitive report 2009-2010' Geneva: SRO-Kundig.
87. Yin R.K. (2009) 'Case study research, Design and methods' fourth edition, California: Thousand Oaks Sage Inc.

10 Appendices

- I. Acronyms
- II. Interviewed and brainstorming sessions attendees
- III. Criteria document: office furniture
- IV. Criteria document: roads
- V. Comments questionnaires: office furniture
- VI. Comments questionnaires: roads
- VII. Modified Weighted Factor Score model: office furniture
- VIII. Quick scan all product groups
- IX. Validating the recommendations
- X. One-sample Kolmogorov-Smirnov test
- XI. One-sample T-test for significant difference from zero
- XII. Questionnaire for office furniture
- XIII. Reviewing committees' feedback

Appendix I Acronyms

AZ	Algemene Zaken (Common Affairs)
BAG	Beleidsadviesgroep (Policy Advisory Group)
BRL	Beoordelingsrichtlijn (Norm)
C2C	Cradle 2 Cradle
CPV	Common Procurement Vocabulary
DBFMO	Design, Build, Finance, Maintain, and Operate.
DGOBR	Directoraat Generaal Organisatie en Bedrijfsvoering Rijk (General Governmental Managing Organisation)
EC	European Commission
EN	European Norm
ERP	Enterprise Resource Planning
EZ	Economische Zaken (Economic Affairs)
ECTS	European Credits Transfer System
GDP	Gross Domestic Product
GPP	Green Public Procurement
GWW	Grond, Weg, en Waterbouw (ground-, road-, and water works)
VROM	Volkshuisvesting Ruimtelijke Ordening en Milieu (Housing, Spatial Planning, and the Environment)
ICLEI	International association of Local Governments for Sustainability
IEM	Industrial Engineering & Management
ILO	International Labour Organisation
IPKI	Interdepartementale programmadirectie Kennis en Innovatie (Interdepartmental Programme of Knowledge and Innovation)
IPDI	Interdepartementale programmadirectie Duurzaam Inkopen (Interdepartmental Programme for Sustainable Procurement)
KPI	Key Performance Indicator
LC	Launching Customer
LCA	Life Cycle Analysis
LCC	Life Cycle Costing
LMI	Lead Market Initiative
MEAT	Most Economical Advantageous Tender (Economisch Meest Voordelige Inschrijving, EMVI)
NCM	Nordic Council of Ministries
NEN	Nederlandse Norm (Dutch Norm)
NGO	Non Governmental Organisation
NOI	Nederland Ondernemend Innovatieland (the Netherlands entrepreneurial innovation country)
OED	Oxford English Dictionary
PCP	Pre-Commercial Procurement
PIANOO	Professioneel en Innovatief Aanbesteden Netwerk voor Overheidsopdrachtgevers (Professional and Innovative Tendering Network for Governmental Procurement officers)
PI	The project team Procurement for Innovation
PLM	Production & Logistic Management
R&D	Research & Development

SME	Small and Medium size Enterprises
SN	SenterNovem since January 2010 under the name of Agentschap NL
SBIR	Small Business Innovation Research
TCO	Total Cost of Ownership
V&W	Verkeer & Waterstaat (Ministry of transport, public works, and water management)
WFS	Weighted Factor Score

Appendix II Interviewed and brainstorming sessions attendees

Tale II.1 Interviewed during Master's thesis

Name	Organisation	Function	Date
Michiel Ottolander	Ministry of EZ	Senior policy advisor Launching Customer	11-Jun-09
Paula Kuijpers	Ministry of V&W	Purchasing consultant	06-Aug-09
Laura van Breen	Ministry of EZ		10-Aug-09
André Roos	Ministry of EZ, SBIR programme	Policy advisor	12-Aug-09
Chiel Husmann	Ministry of VROM	Senior policy advisor	18-Aug-09
Harold Thijssen	Ministry of VROM	Purchasing Manager	18-Aug-09
Robert Droop	Ministry of VROM	Senior policy advisor	18-Aug-09
Rob van Dorsten	Ministry of AZ	category management for the Central Government	19-Aug-09
Jan van der Plas	Ministry of EZ, Fronrunners office	Senior policy advisor	20-Aug-09
Laura van Breen	Ministry of EZ		21-Aug-09
Marieke van Putten	Ministry of EZ/PIANOo	Programme director	21-Aug-09
Linda van Duivenbode	Ministry of EZ; Lead market initiative	Advisor	24-Aug-09
Bart Vos	NEVI/University of Tilburg	Professor Purchasing management	25-Aug-09
Sander Klaver	Ministry of EZ	Purchasing Manager	26-Aug-09
Dennis Robben	Ministry of VROM	Purchasing Manager	26-Aug-09
Jos Reinhoudt	BECO consultancy	Senior advisor	03-Sep-09
Marieke van Putten	Ministry of EZ/PIANOo	Programme director	17-Sep-09
Huib van Romburgh	BAG legal commission	Chairman	25-Sep-09
Wouter van Schelten	Ministry of V&W		30-Sep-09
Ruben Prins	SenterNovem		06-Oct-09
Lie Chahboun	SenterNovem	Senior Advisor	12-Oct-09
Nico van den Berg	SenterNovem		29-Oct-09

Tale II.2 Invited to the brainstorming session for office furniture

Name	Organisation	Function
Marieke van Putten	Ministry of EZ/PIANOo	Programme director
Nico van den Berg	SenterNovem	Consultant
Willem Bruring	Ministry of VROM	Deputy programme manager
Axel de Boer**	Ministry of VROM	Senior policy advisor
Gert Vos	Twente University	Master student

** Canceled.

Tale II.3 Invited to the brainstorming session for roads

Name	Organisation	Function
Marieke van Putten	Ministry of EZ/PIANOo	Programme director
Lie Chahboun*	SenterNovem	Consultant
Wouter van Schelt	Ministry of V&W	Purchasing advisor
Paula Kuijpers*	Ministry of V&W	Purchasing consultant
Axel de Boer**	Ministry of VROM	Senior policy advisor
Gert Vos	Twente University	Master student

* Separately delivered input during interview.

** Canceled.

Appendix III

Criteria document: Office furniture

The product group office furniture entails the following Common Procurement Vocabulary (CPV) codes:

39120000-9 Tables, cupboards, desk and bookcases	39132100-7 Filing cabinets
39121000-6 Desks and tables	39133000-3 Display units
39121100-7 Desks	39134000-0 Computer furniture
39121200-8 Tables	39134100-1 Computer tables
39122000-3 Cupboards and bookcases	39135000-7 Sorting tables
39122100-4 Cupboards	39135100-8 Sorting frames
39122200-5 Bookcases	39141100-3 Shelves
39130000-2 Office furniture	39141200-4 Worktops
39131100-0 Archive shelving	

For office furniture only tender criteria have been developed, i.e. no tenderer criteria or contract clauses. For this tender obligatory technical specifications as well as discretionary award criteria have been developed.

Obligatory technical specifications.

For office furniture the following six technical specifications have been developed.

- The equipment has a life span of at least five years. Compliance with this criterion should be proved with a declaration of the tenderer.
- All the cellular polyurethane complies with NEN 3373. Compliance with this criterion should be proved with a declaration of the tenderer.
- Spare parts have to be available up to at least ten years after procurement. Compliance with this criterion should be proved with a declaration of the tenderer.
- Particle boards should comply with formaldehyde class E1 as described in EN 120, EN 717-1, and EN 717-2. To prove compliance with this criterion a test report is required.
- The fabrics in the equipment should not contain more of the materials as specified below. Compliance with this criterion should be proved with a declaration of the tenderer.
 - Chloride fabrics
 - Halogenated fire retardants (unless this is required by legislation)
 - Benzedrine analog colouring dye
 - None of the following heavy metals in colouring dyes above the shown concentrations:
 - Antimone: 300mg/kg (for polyester), and 50/250 mg/kg (dyes/ pigments)
 - Arsenic: 50 mg/kg (dyes/ pigments)
 - Chrome total: 100 mg/kg (dyes/ pigments)
 - Cupper: 250 mg/kg (dye)
 - Nickel: 200 mg/kg (dye)
 - Tin: 250 mg/kg (dye)
 - Zinc: 1 g/kg (elastan) and 1.5/1 g/kg (dyes/ pigments)
- Coatings on the furniture should not contain more Antimone, Arsenic, Barium, Cadmium, Chrome, Lead, Quicksilver, and Selenium as described in EN 73-3. Compliance with this criterion should be proved with a declaration of the tenderer.
- Equipment should be separable using everyday tools. Compliance with this criterion should be proved with a declaration of the tenderer.

Discretionary Award criteria.

For this product group only one award criterion exist.

- A certain percentage of the total volume of the order should have a composition label indicating all the materials used in the equipment. If higher percentage of the order has this, this is awarded.

Appendix IV

Criteria document: Roads

The product group roads entails the following Common Procurement Vocabulary (CPV) codes:

45112730-1 Landscaping work for roads and motorways.	45233140-2 Roadworks.
71311210-6 Highways consultancy services.	45233141-9 Road-maintenance works.
71311220-9 Highways engineering services.	45233142-6 Road-repair works.
34929000-5 Highway materials.	63712200-5 Highway operation services.
45233000-9 Construction, foundation and surface works for highways, roads.	71631480-8 Road inspection services.
44113900-4 Road-maintenance materials.	45111100-9 Demolition work.
45233139-3 Highway maintenance work.	

For roads only tender criteria and one contract clause have been developed, no tenderer criteria have been developed. For this tender obligatory technical as well as discretionary award criteria have been developed.

Obligatory technical specifications.

Assimilation and carrying away of materials.

- In the case where stone like materials are broken down into smaller parts this should be done according to BRL 2506. Compliance with this criterion should be proved with a declaration of the tenderer.
- Tar products should be assimilated and transported to a facility operating according to official Dutch legislation for thermal assimilation of tar. Compliance with this criterion should be proved with a declaration of the tenderer.
- For instances of temporary facilities that do not have to comply with environmental legislations. On the location special facilities have to be arranged to separately collect and transport waste. Also for secondarily released raw materials, special facilities should be made on the location of the works. Compliance with this criterion should be proved with a declaration of the tenderer.

Discretionary award criteria.

For this product group three award criteria are developed.

- The environmental impact determined by a LCA according to a NEN 8006 will earn the tender and advantage. Compliance with this criterion should be proved with a declaration of the tenderer indicating which LCA method has been used.
- The more ground coming from the construction site, used again in the same construction site, the better the tender will be evaluated. Compliance with this criterion should be proved with a plan for the ground balance during the project.
- The more the road infrastructure is used to yield energy, the better the tender will be evaluated. No suggestions for compliance have been developed for this criterion.

Contract clause.

At completion of the tender a maintenance plan has to be presented. This plan should describe the maintenance requirements to preserve the road in its original status. The plan also describes the way how to maintain the sustainable aspects of the road.

Appendix V

Comments questionnaires office furniture

Table V.1 Comments to the questionnaire concerning the influence of innovation stimulating elements on the procurement of sustainable office furniture

Innovation element	Policymakers VROM / SenterNovem	Policymakers PPI	Purchasers	Suppliers
MEAT		1) MEAT only stimulates sustainability if this is a criterion.	1) MEAT is not necessary, the same demands can also be made in the technical specifications.	1) MEAT is a good opportunity to excel on other than price aspects. 2) Only works if sustainability has a serious influence compared to the price.
Market sounding		1) Only works if the consultation is also aimed at sustainability.		1) It is difficult to do this honestly.
80/20 rule				1) Only if the 20% It's used for innovative sustainable solutions. 2) A well performed MEAT awarding method makes this unnecessary.
Lots				1) Difficult to measure. 2) A well performed MEAT awarding method makes this unnecessary.
Functional specifications		1) Innovation and sustainability aspects both need to be included.	1) Only works if innovation is a prerequisite. 2) Technical specifications can be better to accomplish goals.	
TCO/LCC approach				1) Recycling or remanufacturing should be part of this. 2) Should gain more attention, very good for sustainability.
Variant bids	1) Difficult to measure.		1) Difficult to measure.	
Award/demand innovative capabilities	1) Difficult to measure.			1) Would be good to make this a minimal requirement.
Norms for desired development				1) It would be better to award good behaviour. 2) Stimulates lead supplier behaviour.
Incentives for continuous improvement			1) These should be aiming at innovation or sustainability.	1) This could work very well in a leasing construction

Table V.2 Comments to the questionnaire concerning the influence of sustainability criteria on the procurement of innovative for office furniture

Sustainability criterion	Policymakers VROM / SenterNovem	Policymakers PPI	Purchasers	Suppliers
5 year warranty	1) This can have both positive and negative effects on innovation.	1) This can have both positive and negative effects on innovation, for this case, however, I feel it will stimulate innovation. 2) Good criterion, focuses on effects.		1) There should be a distinction between technological lifetime and economical lifetime.
10 year spare parts		1) This criterion can hinder new SMEs to submit their offers.		1) This criterion is not complementary to the economical lifespan. 2) This does not have anything to do with sustainability, only rubbish cannot comply with this criterion.
Disassembly simple tools				1) This has been possible, with our products for the past 15 years.
Formaldehyde norms	1) Too specific to stimulate innovation.	1) Too specific To stimulate innovation.	1) All the suppliers can comply with this.	1) This has been a demand for many years, all the suppliers can comply with this.
Hazardous materials in fabrics	1) Too specific To stimulate innovation.		1) All the suppliers can comply with this.	
Hazardous materials in paint	1) Too specific To stimulate innovation.		1) All the suppliers can comply with this.	
Composition label		1) this criterion has no effect.		1) this tells nothing about the sustainability or innovativeness of the products.

Appendix VI Comments questionnaires roads

Table VI.1 Comments to the questionnaire concerning the influence of innovation stimulating elements on the procurement of sustainable roads

Innovation element	Policymakers VROM / SenterNovem	Policymakers PPI	Purchasers	Suppliers
MEAT	1) If sustainability is seriously influencing the outcome.		1) If applied correctly, this will stimulate sustainability. 2) This is the standard methods at RWS.	1) If sustainability is seriously influencing the outcome.
Market sounding			1) This is the standard methods at RWS for a new tasks, for a straight re-buy this is not done.	
80/20 rule		1) Depending on the tender, this could be a good solution.	1) this is not a line with the procurement policy of RWS.	1) Where possible the whole tender should be made as sustainable as possible.
Lots			1) This is not a line with the procurement policy of RWS. 2) It is important to integrate projects. 3) This depends on the required size of the tender to introduce sustainable market ready solutions.	1) The tenders should be large enough to create incentives for suppliers to develop new solutions.
Functional specifications		1) The specifications, however, should guarantee a sustainable solution	1) The right specifications are required to challenge the market. 2) This strongly depends on the tender.	1) This provides great opportunities for sustainability, tenders are too often too specific, and the market needs to be challenged.
TCO/LCC approach		1) This has the most potential for products that have the most of their costs during the use phase.	1) This is the best way to stimulate innovation and sustainability. 2) This will provide sustainable solutions with the necessary edge.	

Table VI.1 Continued 'Comments to the questionnaire concerning the influence of innovation stimulating elements on the procurement of sustainable roads'

Innovation element	Policymakers VROM / SenterNovem	Policymakers PPI	Purchasers	Suppliers
Variant bids			1) This is impossible in combination with functional specifications.	1) This works well for situations where the tenderer has no good idea about the possibilities. 2) difficult for tenderers to evaluate variant bids.
Award/demand innovative capabilities			1) Innovation is not a goal on itself.	1) An innovative solution does not necessarily mean also a sustainable solution. 2) if the tender leaves room for creativity, innovation will come automatically.
Norms for desired development	1) This could work well in combination with contracts clauses.		1) Other policy instruments might be better equipped to do this.	1) This can also exclude overall, more sustainable products. 2) Generic aspects don't work for sustainability.
Incentives for continuous improvement	1) For this to work, arrangements need to be seriously monitored.		1) This works well for long lasting contracts. 2) This should focus on general levels, not on product level.	1) Changes during projects are minimal.

Table VI.2 Comments to the questionnaire concerning the influence of sustainability criteria on the procurement of innovative roads

Sustainability criterion	Polymakers VROM / SenterNovem	Polymakers PPI	Purchasers	Suppliers
Stone like materials BRL 2506	1) Too detailed, should be more functional. 2) Indirect focus on recycling.	1) Too stringent.	1) This has been a requirement for many years at RWS.	1) This has been a requirement for many years. 2) Easy to fulfil. 3). This does not change the market, has been a requirement for many years.
Assimilation of tar products	1) Too detailed, should be more functional.		1) This has been a requirement for many years at RWS.	
Separate waste collection at temporarily locations	1) Too detailed, should be more functional.	1) Too detailed, should be more functional.	1) This is not a desired method for RWS.	1) This stimulates checklist behaviour. 2) No performance required.
LCA according to NEN 8006			1) At RWS DuboCalc is going to be introduced.	1) Together with DuboCalc a strong instruments to stimulate innovation.
Ground balance.	1) Neglects alternative solutions.	1) Effect oriented.	1) This is very situation dependent.	1) This has been a requirement for many years at RWS. 2) The real environmental profits are difficult to estimate.
Road as energy source		1) Effect oriented.	1) Not suitable for all situations.	1) Not frequently used. 2) Good manner to stimulate innovation.
Maintenance plan.			1) This has been a requirement for many years at RWS.	1) Combining maintenance and design would lead to the best outcome.

Appendix VII Modified Weighted Factor Score model

Sub-criterion:	Weight:
Guaranteed lifespan (semi-knockout)	30
index:	score:
< 5 years	exclusion
5 years	0
6 years	0,2
7 years	0,4
8 years	0,6
9 years	0,8
≥10 years	1
Delivery of spare parts (semi-knockout)	10
index:	score:
< 5 years	exclusion
5 years	0
6 years	0,2
7 years	0,4
8 years	0,6
9 years	0,8
≥10 years	1
Disassembly with simple tools (knockout)	K.O.
index:	score:
not comply	exclusion
comply	0
Formaldehyde class E1 (knockout)	K.O.
index:	score:
not comply	exclusion
comply	0
Conc. Hazardous materials in textiles (semi-knockout)	25
index:	score:
> existing lower bound	exclusion
< 100% existing conc.	0
< 80% existing conc.	0,2
< 60% existing conc.	0,4
< 40% existing conc.	0,6
< 20% existing conc.	0,8
undetectable	1
Conc. Hazardous materials in paints (semi-knockout)	20
index:	score:
> existing lower bound	exclusion
< 100% existing conc.	0
< 80% existing conc.	0,2
< 60% existing conc.	0,4
< 40% existing conc.	0,6
< 20% existing conc.	0,8
undetectable	1
Composition label (scoring)	15
index:	score:
0 % volume of the order	0
20% volume of the order	0,2
40 % volume of the order	0,4
60% volume of the order	0,6
80% volume of the order	0,8
100% volume of the order	1

$$\text{Total sustainability score supplier } j = \sum_{i=1}^n S_{ji} \times W_i$$

Figure VII.1 Example of modified WFS-model for office Furniture.

Appendix VIII Quick-scan all product groups

Table VIII.1 Results quick-scan forty-seven product groups

Product group	Type	Tenderer crit.		Tender criteria		contract clauses
		Obl.	Sel.	technical criteria	award criteria	
Artworks/waterworks	GWW	no	no	yes	yes	maint.plan.
Audio equipment		no	no	yes	yes	no
Cables and pipes		no	no	yes	yes	maint.plan.
Catering	Cat. Mgmt	no	no	min40%	>40%	yes
Cleaning of buildings	Cat. Mgmt	no	no	yes	no	no
Cleaning of public areas	Cat. Mgmt	no	no	yes	yes	no
Cleaning of working clothes		no	no	yes process conc.	yes alt. method	no
Coaches	Cat. Mgmt	no	no	Euro Norms/soot filter	Euro Norms/tires	no
Computer hardware	Cat. Mgmt	no	no	Energy star	no	no
Demolition of office buildings		yes	no	BRL2506	svms007 plan	yes
Electricity		no	no	100% green	no	no
External meeting locations		no	no	yes location	yes catering	no
gardening	GWW	no	no	no	yes	no
ground works	GWW	no	no	no	ground balance	no
International business trips	Cat. Mgmt	no	no	yes	yes	yes
Large kitchen equipment		no	no	yes	yes	no
Maintenance of transportation		no	no	max. conc.	tire	no
Moveable machinery	GWW	no	no	Euro Norms/soot filter	emission	no
Networks, phone services/eq.	Cat. Mgmt	yes	yes	Energy star	yes	cont. improvement
New office buildings		no	no	GreenCalc. 200	>200	maint.plan.
Office articles	Cat. Mgmt	no	no	max conc.	recycled paper100%	no
office build. procure/rent		no	no	Energy label	no	no
Office buildings renovation		no	no	+.60 GreenCalc	+.>GreenCalc 60/>200	maint.plan& energy
office decoration		no	no	yes	yes	no
Office furniture	Cat. Mgmt	no	no	yes	yes	no
Office building maintenance		no	no	isolation+roof	no	yes
Outdoor furniture		no	no	yes	c2c	no
paint		no	no	max conc.	no	maint.plan.
Paper	Cat. Mgmt	no	no	yes process conc.	no	no
Postal services	Cat. Mgmt	no	no	Euro Norms/soot filter	Euro Norms/tires	yes
Printed matters	Cat. Mgmt	no	no	yes process conc.	yes process conc.	
Printing equipment + cartridges		no	no	Energy star/reuse	no	no
Public lighting	GWW	no	no	yes	yes	no
Public transportation	Cat. Mgmt	no	no	Euro Norms/soot filter	Euro Norms/tires	no
Pump houses	GWW	no	no	Yes. Techn & Energy	Yes. Techn & Energy	maint.plan.
Roads	GWW	no	no	BRL/tar/disposal	yes	yes
security / transport		no	no	Euro Norms/soot filter	Euro Norms/tires	no

Table VIII.1 Continued 'Results quick-scan forty-seven product groups'

Product group	Type	Tenderer crit.		Tender criteria		contract clauses
		Obl.	Sel.	technical criteria	award criteria	
Sewer	GWW	no	no	yes	yes	maint.plan.
special transportation		no	no	Euro Norms/soot filter	Euro Norms/tires	no
student transportation		no	no	Euro Norms/soot filter	Euro Norms/tires	no
Traffic regulation installations	GWW	no	no	yes	yes	no
Vehicles	Cat. Mgmt	no	no	Euro Norms/soot filter	Euro Norms/tires	no
vendor machines		no	no	yes	yes C2C	maint.plan.
Vessels		no	no	yes	yes	yes
Water purification installations		no	no	max conc.	yes	yes
Winter road operations	GWW	no	no	yes crow	no	no
Working clothes		no	no	yes	yes	yes

Appendix IX Validating the recommendations

In order to validate the generalised recommendation they have been applied to two additional product groups. From the remaining product groups we chose two product groups that contain obligatory as well as discretionary tender criteria. The product groups that have been selected are “special transportation” and “working clothes”. The validation is based on falsification, i.e. the recommendations have been applied to two additional product groups to test whether the recommendations were not applicable to these product groups. The validation concerns applying the recommendations from the first three steps in subsection 7.1.1.

Special transportation

For the product group “special transportation” there are three obligatory technical specifications and three discretionary award criteria (SN, 2009f). For “special transportation” the offer should comply with the following three obligatory sustainability criteria.

1. Vehicles \leq 3500 KG have to comply with Euro-IV norm.
2. Vehicles \leq 3500 KG with diesel engines have to be equipped with a soot filter.
3. Vehicles $>$ 3500 KG have to comply with Euro-V norm.

For “special transportation” the tenderer can earn extra points, if the award criteria are applied by the contracting authorisation, on the following three award criteria.

1. If all vehicles of the tender \leq 3500 KG comply with Euro-V norm, the tenderer can earn extra points.
2. If all vehicles of the tender $>$ 3500 KG comply with “Enhanced Environmentally friendly Vehicle” (EEV) or comply with a Euro-VI norm, the tenderer can earn extra points.
3. If all vehicles of the tender are equipped with silent tires (additional specifications are provided in the criteria document), the tenderer can earn extra points.

We applied the recommended modifications from subsection 7.1.1. We observe that for this product group two of the obligatory award criteria are aiming at the same sustainability aspect as the discretionary technical specifications. Adhering to the recommendations we made, these two award criteria and technical specifications are combined into two semi-knockout criteria. Furthermore, we modify the second technical specification and the third award criterion.

No additional research has been performed on the possible hindering effects of these sustainability criteria. To complete the first two steps we make the following two assumptions.

- The lower bound of the technical specification is not excluding innovative solutions.
- A lower bound is desirable for the award criterion focussing on silent tires.

However, for other situations than testing the parameter dependent flowchart, these assumptions should be further investigated.

Following the parameter dependent flowchart in Figure 7.1, we arrive at the following modification for the second technical specification; Keep this criterion as a knockout criterion. We come to this modification by going through the flowchart. First, we observe that the criterion is a technical specification. Second, we observe that the criterion is not quantifiable. Third we the lower bound of the criterion is not excluding innovative solutions. Following the parameter dependent flowchart the modification for in the second award criteria is; introduce a lower bound and apply the criterion as a semi-knockout criterion. We come to this modification by going through the flowchart. First, we observe that the criterion is an award criterion. Second, we observe that the criterion is quantifiable. Third, a lower bound is desirable for this criterion. In sum, following the recommendations from subsection 7.1.1 we come to the set of aggregated sustainability criteria for the modified WFS-model presented in Table IX.1.

Table IX.1 Modified WFS-model for special transportation

Criterion \ Characteristics	type	Minimum score	Maximum score
Euro norm for vehicles ≤ 3500 kg.	Semi-knockout	EURO IV	EURO V
Euro norm for vehicles > 3500 kg.	Semi-knockout	EURO V	EURO VI or EEV
Vehicles ≤ 3500 KG with diesel engines have to be equipped with a soot filter.	knockout	comply	comply
The amount of DB produced by the tires.	Semi-knockout	Add. research	Add. research

Working clothes

For the product group “working clothes” there is one obligatory technical specification and there are three discretionary award criteria (SN, 2009g). For “working clothes” the offer should comply with the following obligatory sustainability criterion.

1. The amount of hazardous materials cannot exceed the concentrations given in the appendix 1 of (SN, 2009g).

For “working clothes” the tenderer can earn extra points, if the award criteria are applied by the contracting authorisation on the following three award criteria.

1. The higher the percentage of sustainable cotton, the more points the tenderer can earn.
2. The higher the percentage of recycled fabrics, the more points the tenderer can earn.
3. The higher the percentage of written off clothes during the contract that are recycled, the more points the tenderer can earn.

We applied the recommended modifications from subsection 7.1.1. First, we observe that for this product group no obligatory award criteria are aiming at the same aspect as the technical specifications. We modified the technical specification and the three award criteria.

We did not execute additional research on the possible hindering effects of these sustainability criteria. To complete the first three steps we make the following two assumptions.

- Lower bound of the amount of hazardous materials is not hindering the procurement of innovative working clothes.
- The desired lower bounds for the award criteria is 40%.

However, for other situations than testing the parameter dependent flowchart, these assumptions should be further researched.

Following the parameter dependent flowchart in Figure 7.1, we arrive at the following modification for the technical specification. Change this criterion into a semi-knockout criterion with a lower bound at the same level as the existing ambition level. We come to this modification by going through the flowchart in Figure 7.1. First, we observe that the criterion is a technical specification. Second, we observe that the criterion is quantifiable. Third, the lower bound of the criterion is not excluding innovative solutions. We observe that, following the parameter dependent flowchart, the three award criteria should all be modified in the following manner; introduce a lower bound of 40% and apply the criterion as a semi-knockout criterion. We come to this modification by going through the flowchart. First, we observe that the criterion is an award criterion. Second, we observe that the criterion is quantifiable. Third, a lower bound is desirable for this criterion. Altogether, following the recommendations from subsection 7.7 we come to the following set of aggregated sustainability criteria for the modified WFS model (Table IX.2).

Table IX.2 Modified WFS-model for working clothes

Criterion: \ Characteristics:	type	Minimum score	Maximum score
Conc. hazardous materials.	Semi-knockout	existing conc.	0 µg/L
Percentage of sustainable cotton	Semi-knockout	40%	100%
Percentage of recycled fabrics	Semi-knockout	40%	100%
Recycling of written off clothes.	Semi-knockout	40%	100%

Appendix X One-sample Kolmogorov-Smirnov test

Office Furniture:

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of InnovElement1 is normal with mean 1.905 and standard deviation 1.044.	One-Sample Kolmogorov-Smirnov Test	.143	Retain the null hypothesis.
2	The distribution of InnovElement2 is normal with mean 1.85 and standard deviation 0.933.	One-Sample Kolmogorov-Smirnov Test	.123	Retain the null hypothesis.
3	The distribution of InnovElement3 is normal with mean 1.07 and standard deviation 1.849.	One-Sample Kolmogorov-Smirnov Test	.177	Retain the null hypothesis.
4	The distribution of InnovElement4 is normal with mean 1.524 and standard deviation 1.123.	One-Sample Kolmogorov-Smirnov Test	.194	Retain the null hypothesis.
5	The distribution of InnovElement5 is normal with mean 2.091 and standard deviation 0.921.	One-Sample Kolmogorov-Smirnov Test	.065	Retain the null hypothesis.
6	The distribution of InnovElement6 is normal with mean 1.87 and standard deviation 0.968.	One-Sample Kolmogorov-Smirnov Test	.284	Retain the null hypothesis.
7	The distribution of InnovElement7 is normal with mean 1.624 and standard deviation 1.138.	One-Sample Kolmogorov-Smirnov Test	.670	Retain the null hypothesis.
8	The distribution of InnovElement8 is normal with mean 1.455 and standard deviation 1.371.	One-Sample Kolmogorov-Smirnov Test	.416	Retain the null hypothesis.
9	The distribution of InnovElement9 is normal with mean 1.8 and standard deviation 1.005.	One-Sample Kolmogorov-Smirnov Test	.246	Retain the null hypothesis.
10	The distribution of InnovElement10 is normal with mean 1.524 and standard deviation 1.436.	One-Sample Kolmogorov-Smirnov Test	.494	Retain the null hypothesis.
11	The distribution of SustCriterion1 is normal with mean 1 and standard deviation 1.609.	One-Sample Kolmogorov-Smirnov Test	.773	Retain the null hypothesis.
12	The distribution of SustCriterion2 is normal with mean 0.105 and standard deviation 1.997.	One-Sample Kolmogorov-Smirnov Test	.768	Retain the null hypothesis.
13	The distribution of SustCriterion3 is normal with mean 1.238 and standard deviation 1.578.	One-Sample Kolmogorov-Smirnov Test	.699	Retain the null hypothesis.
14	The distribution of SustCriterion4 is normal with mean 0.312 and standard deviation 1.991.	One-Sample Kolmogorov-Smirnov Test	.964	Retain the null hypothesis.
15	The distribution of SustCriterion5 is normal with mean 0.7 and standard deviation 1.689.	One-Sample Kolmogorov-Smirnov Test	.471	Retain the null hypothesis.
16	The distribution of SustCriterion6 is normal with mean 0.632 and standard deviation 1.802.	One-Sample Kolmogorov-Smirnov Test	.401	Retain the null hypothesis.
17	The distribution of SustCriterion7 is normal with mean 0.342 and standard deviation 1.415.	One-Sample Kolmogorov-Smirnov Test	.472	Retain the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

Roads:

Hypothesis Test Summary

	Null Hypothesis	Test	Sig.	Decision
1	The distribution of InnovElement1 is normal with mean 2 and standard deviation 1.124.	One-Sample Kolmogorov-Smirnov Test	.125	Retain the null hypothesis.
2	The distribution of InnovElement2 is normal with mean 1.95 and standard deviation 0.999.	One-Sample Kolmogorov-Smirnov Test	.288	Retain the null hypothesis.
3	The distribution of InnovElement3 is normal with mean 1 and standard deviation 1.62.	One-Sample Kolmogorov-Smirnov Test	.443	Retain the null hypothesis.
4	The distribution of InnovElement4 is normal with mean 0.75 and standard deviation 1.41.	One-Sample Kolmogorov-Smirnov Test	.667	Retain the null hypothesis.
5	The distribution of InnovElement5 is normal with mean 2.429 and standard deviation 0.811.	One-Sample Kolmogorov-Smirnov Test	.020	Reject the null hypothesis.
6	The distribution of InnovElement6 is normal with mean 2.095 and standard deviation 0.944.	One-Sample Kolmogorov-Smirnov Test	.118	Retain the null hypothesis.
7	The distribution of InnovElement7 is normal with mean 1.579 and standard deviation 1.216.	One-Sample Kolmogorov-Smirnov Test	.376	Retain the null hypothesis.
8	The distribution of InnovElement8 is normal with mean 0.9 and standard deviation 1.553.	One-Sample Kolmogorov-Smirnov Test	.882	Retain the null hypothesis.
9	The distribution of InnovElement9 is normal with mean 1.632 and standard deviation 1.165.	One-Sample Kolmogorov-Smirnov Test	.414	Retain the null hypothesis.
10	The distribution of InnovElement10 is normal with mean 2.105 and standard deviation 0.875.	One-Sample Kolmogorov-Smirnov Test	.217	Retain the null hypothesis.
11	The distribution of SustCriterion1 is normal with mean -0.423 and standard deviation 1.631.	One-Sample Kolmogorov-Smirnov Test	.209	Retain the null hypothesis.
12	The distribution of SustCriterion2 is normal with mean 0.179 and standard deviation 1.564.	One-Sample Kolmogorov-Smirnov Test	.394	Retain the null hypothesis.
13	The distribution of SustCriterion3 is normal with mean 0.526 and standard deviation 1.349.	One-Sample Kolmogorov-Smirnov Test	.212	Retain the null hypothesis.
14	The distribution of SustCriterion4 is normal with mean 2.25 and standard deviation 0.851.	One-Sample Kolmogorov-Smirnov Test	.131	Retain the null hypothesis.
15	The distribution of SustCriterion5 is normal with mean 1.556 and standard deviation 1.097.	One-Sample Kolmogorov-Smirnov Test	.388	Retain the null hypothesis.
16	The distribution of SustCriterion6 is normal with mean 2.35 and standard deviation 0.875.	One-Sample Kolmogorov-Smirnov Test	.032	Reject the null hypothesis.
17	The distribution of SustCriterion7 is normal with mean 0.526 and standard deviation 1.429.	One-Sample Kolmogorov-Smirnov Test	.303	Retain the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

Figure X.1 Kolmogorov-Smirnov test for office furniture and roads

Appendix XI One-sample T-test for significant difference from zero

One-Sample Test

	Test Value = 0					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
InnovElement1	8,359	20	,000	1,90476	1,4294	2,3801
InnovElement2	8,865	19	,000	1,85000	1,4132	2,2868
InnovElement3	2,540	19	,020	1,05000	,1847	1,9153
InnovElement4	6,216	20	,000	1,52381	1,0125	2,0352
InnovElement5	10,647	21	,000	2,09091	1,6825	2,4993
InnovElement6	9,264	22	,000	1,86957	1,4510	2,2881
InnovElement7	6,216	17	,000	1,66667	1,1010	2,2324
InnovElement8	4,977	21	,000	1,45455	,8468	2,0623
InnovElement9	8,008	19	,000	1,80000	1,3295	2,2705
InnovElement10	4,863	20	,000	1,52381	,8702	2,1774
SustCriterion1	2,637	17	,017	1,00000	,2000	1,8000
SustCriterion2	,230	18	,821	,10526	-,8573	1,0678
SustCriterion3	3,595	20	,002	1,23810	,5197	1,9564
SustCriterion4	,628	15	,539	,31250	-,7482	1,3732
SustCriterion5	1,853	19	,079	,70000	-,0905	1,4905
SustCriterion6	1,528	18	,144	,63158	-,2367	1,4999
SustCriterion7	1,054	18	,306	,34211	-,3398	1,0240

Table XI.1 One sample T-test for answers questionnaire office furniture.

One-Sample Test

	Test Value = 0					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
InnovElement1	7,958	19	,000	2,00000	1,4740	2,5260
InnovElement2	8,732	19	,000	1,95000	1,4826	2,4174
InnovElement3	2,545	16	,022	1,00000	,1670	1,8330
InnovElement4	2,380	19	,028	,75000	,0903	1,4097
InnovElement5	13,729	20	,000	2,42857	2,0596	2,7976
InnovElement6	10,175	20	,000	2,09524	1,6657	2,5248
InnovElement7	5,658	18	,000	1,57895	,9927	2,1652
InnovElement8	2,592	19	,018	,90000	,1734	1,6266
InnovElement9	6,106	18	,000	1,63158	1,0702	2,1930
InnovElement10	10,484	18	,000	2,10526	1,6834	2,5271
SustCriterion1	-,935	12	,368	-,42308	-,14087	,5625
SustCriterion2	,427	13	,676	,17857	-,7245	1,0817
SustCriterion3	1,701	18	,106	,52632	-,1237	1,1763
SustCriterion4	11,828	19	,000	2,25000	1,8519	2,6481
SustCriterion5	6,018	17	,000	1,55556	1,0102	2,1009
SustCriterion6	12,010	19	,000	2,35000	1,9404	2,7596
SustCriterion7	1,606	18	,126	,52632	-,1623	1,2149

Table XI.2 One sample T-test for answers questionnaire roads.

Appendix XII Questionnaire for office furniture

*Gert Vos min. VROM
Master Thesis onderzoek
Gert.vos@minvrom.nl
070 339 1912
PB 30945 2500 GX Den Haag
Interne postbus 680*

Enquête; interactie tussen duurzaamheidscriteria en Innovatie stimulerende elementen voor de productgroep “kantoormeubilair”

Het doel van deze enquête is inzicht krijgen in de opinie van direct betrokkenen over de interactie tussen instrumenten ontwikkeld ter stimulering van de inkoop van duurzame en innovatieve producten. Mijn onderzoek richt zich op de productgroepen van kantoormeubilair en wegen, deze enquête richt zich alleen op de productgroep kantoormeubilair. Binnen deze twee productgroepen zijn er twee aspecten die ik onderzoek: enerzijds de invloed van innovatie stimulerende elementen¹ op duurzaamheid, anderzijds de invloed van duurzaamheidscriteria² op innovatie. Het invullen van deze enquête, bestaande uit 17 multiple choice vragen, duurt ongeveer 10 minuten. Bij voorbaat dank voor het invullen en hiermee de hulp bij mijn afstudeeronderzoek!

Aannames:

Voor deze enquête zijn twee aannamen gedaan. Ten eerste, dat de instrumenten, geïdentificeerd door het projectteam Innovatie gericht inkopen van het ministerie van Economische Zaken, de inkoop van innovatieve producten stimuleert. Ten tweede, dat de duurzaamheidscriteria opgesteld door het ministerie van VROM en SenterNovem (zoals deze te vinden zijn op <http://www.senternovem.nl/duurzaaminkopen/>), de inkoop van duurzame producten stimuleert.

Algemeen:

Wat is uw expertisegebied:

- Duurzaam inkopen.
- Innovatie stimulerende elementen.
- Inkoopmanagement.
- Productgroep kantoormeubilair.
- Productgroep wegen.
- Anders nl.

¹ Niet alle elementen zijn letterlijk overgenomen, dit om de leesbaarheid voor de geënquêteerde te vergroten en voor de vergelijkbaarheid van deze elementen met de duurzaamheidscriteria.

² Sommige criteria zijn niet letterlijk overgenomen, dit om de leesbaarheid voor de geënquêteerde te vergroten.

Invloed van innovatieve elementen op duurzaamheid.

Dit deel richt zich op de elementen die tijdens het inkoopproces kunnen worden toegepast om de inkoop van innovatieve producten te stimuleren. Deze elementen zijn op dit moment in ontwikkeling bij het projectteam innovatiegericht inkopen van het ministerie van Economische Zaken.

- 2.1 Stimuleert volgens u het volgende element, ter stimulering van de inkoop van innovatieve producten, ook de inkoop van duurzaam kantoormeubilair? *“Het toepassen van economisch meest voordelige inschrijving (EMVI) als beoordelingsmethode ipv alleen op prijs waarden.”*

Geen mening

-3 -2 -1 0 +1 +2 +3

Vult u -3 in dan stelt u dat dit element duurzame inkopen maximaal tegenwerkt. Vult u +3 in dan stelt u dat dit element van innovatie stimulerend inkopen duurzaam inkopen maximaal stimuleert.

Toelichting:

- 2.2 Stimuleert volgens u het volgende element, ter stimulering van de inkoop van innovatieve producten, ook de inkoop van duurzaam kantoormeubilair? *“Het uitvoeren van markt oriëntatie of consultatie, dit om informatie in te winnen over de mogelijkheden voor de aanbesteding.”*

Geen mening

-3 -2 -1 0 +1 +2 +3

Vult u -3 in dan stelt u dat dit element duurzame inkopen maximaal tegenwerkt. Vult u +3 in dan stelt u dat dit element van innovatie stimulerend inkopen duurzaam inkopen maximaal stimuleert.

Toelichting:

- 2.3 Stimuleert volgens u het volgende element, ter stimulering van de inkoop van innovatieve producten, ook de inkoop van duurzaam kantoormeubilair? *“Het toepassen van de 80/20 regel, i.e. 20% van de tender mag worden aanbesteed zonder volledig aan de EU aanbestedingsregels te voldoen.”*

Geen mening

-3 -2 -1 0 +1 +2 +3

Vult u -3 in dan stelt u dat dit element duurzame inkopen maximaal tegenwerkt. Vult u +3 in dan stelt u dat dit element van innovatie stimulerend inkopen duurzaam inkopen maximaal stimuleert.

Toelichting:

- 2.4 Stimuleert volgens u het volgende element, ter stimulering van de inkoop van innovatieve producten, ook de inkoop van duurzaam kantoormeubilair? *“Het opsplitsen van de tender in percelen om zo kleinere bedrijven met innovatieve oplossingen een kans te geven een deel van de opdracht te winnen.”*

Geen mening

-3 -2 -1 0 +1 +2 +3

Vult u -3 in dan stelt u dat dit element duurzame inkopen maximaal tegenwerkt. Vult u +3 in dan stelt u dat dit element van innovatie stimulerend inkopen duurzaam inkopen maximaal stimuleert.

Toelichting:

2.5 Stimuleert volgens u het volgende element, ter stimulering van de inkoop van innovatieve producten, ook de inkoop van duurzaam kantoormeubilair? *“Functioneel specificeren, de technische oplossing wordt niet gevraagd in de tender maar juist de functie van de oplossing, dit om de markt met een passende oplossing te laten komen.”*

Geen mening

-3 -2 -1 0 +1 +2 +3

Vult u -3 in dan stelt u dat dit element duurzame inkopen maximaal tegenwerkt. Vult u +3 in dan stelt u dat dit element van innovatie stimulerend inkopen duurzaam inkopen maximaal stimuleert.

Toelichting:

2.6 Stimuleert volgens u het volgende element, ter stimulering van de inkoop van innovatieve producten, ook de inkoop van duurzaam kantoormeubilair? *“Het beoordelen van oplossingen gebaseerd op een Total Cost of Ownership (TCO) methode, i.e. niet alleen de aanschafprijs is de doorslaggevende factor maar ook de kosten gedurende de gebruikersfase en afdankfase.”*

Geen mening

-3 -2 -1 0 +1 +2 +3

Vult u -3 in dan stelt u dat dit element duurzame inkopen maximaal tegenwerkt. Vult u +3 in dan stelt u dat dit element van innovatie stimulerend inkopen duurzaam inkopen maximaal stimuleert.

Toelichting:

2.7 Stimuleert volgens u het volgende element, ter stimulering van de inkoop van innovatieve producten, ook de inkoop van duurzaam kantoormeubilair? *“Het toestaan van varianten waar dit expliciet is aangegeven in de tender, dit kan alleen wanneer EMVI als beoordelingsmethode wordt gebruikt.”*

Geen mening

-3 -2 -1 0 +1 +2 +3

Vult u -3 in dan stelt u dat dit element duurzame inkopen maximaal tegenwerkt. Vult u +3 in dan stelt u dat dit element van innovatie stimulerend inkopen duurzaam inkopen maximaal stimuleert.

Toelichting:

Stimuleert volgens u het volgende element, ter stimulering van de inkoop van innovatieve producten, ook de inkoop van duurzaam kantoormeubilair? *“Het expliciet opnemen van creatief/innovatief vermogen als wens of gunningscriterium”*

Geen mening

-3 -2 -1 0 +1 +2 +3

Vult u -3 in dan stelt u dat dit element duurzame inkopen maximaal tegenwerkt. Vult u +3 in dan stelt u dat dit element van innovatie stimulerend inkopen duurzaam inkopen maximaal stimuleert.

Toelichting:

2.9 Stimuleert volgens u het volgende element, ter stimulering van de inkoop van innovatieve producten, ook de inkoop van duurzaam kantoormeubilair? *“Het opnemen van eisen/normen gericht op gewenste ontwikkelingen in de leveranciersmarkt”*

Geen mening

-3 -2 -1 0 +1 +2 +3

Vult u -3 in dan stelt u dat dit element duurzame inkopen maximaal tegenwerkt. Vult u +3 in dan stelt u dat dit element van innovatie stimulerend inkopen duurzaam inkopen maximaal stimuleert.

Toelichting:

2.10 Stimuleert volgens u het volgende element, ter stimulering van de inkoop van innovatieve producten, ook de inkoop van duurzaam kantoormeubilair? *“Het opnemen van prikkels om constante verbetering van de uitvoering van de opdracht te stimuleren, deze zouden de vorm van een bonus-/malusregeling kunnen hebben.”*

Geen mening

-3 -2 -1 0 +1 +2 +3

Vult u -3 in dan stelt u dat dit element duurzame inkoop maximaal tegenwerkt. Vult u +3 in dan stelt u dat dit element van innovatie stimulerend inkoop duurzaam inkoop maximaal stimuleert.

Toelichting:

Invloed van duurzaamheidscriteria op innovatie.

Dit deel richt zich op de criteria, ter stimulering van de inkoop van duurzaam kantoormeubilair, ontwikkeld door het ministerie van VROM en SenterNovem. Stimuleert volgens u de volgende wens, ter stimulering van de inkoop van duurzame wegen, ook de inkoop van innovatieve oplossingen voor wegen?

2.11 Stimuleert volgens u de volgende eis, ter stimulering van de inkoop van duurzaam kantoormeubilair, ook de inkoop van innovatieve oplossingen voor kantoormeubilair? *“De te leveren meubelen hebben bij dagelijks gebruik in een kantoor omgeving een levensduur van tenminste 5 jaar, dit geldt ook voor het polyurethaanschuim verwerkt in het materiaal.”*

Geen mening

-3 -2 -1 0 +1 +2 +3

Vult u -3 in dan stelt u dat dit criterium innovatie maximaal tegenwerkt, vult u +3 in dan stelt u dat dit criterium innovatie maximaal stimuleert.

Toelichting:

2.12 Stimuleert volgens u de volgende eis, ter stimulering van de inkoop van duurzaam kantoormeubilair, ook de inkoop van innovatieve oplossingen voor kantoormeubilair? *“Vervangende onderdelen moeten tot 10 jaar na datum van aflevering van het meubel kunnen worden nageleverd.”*

Geen mening

-3 -2 -1 0 +1 +2 +3

Vult u -3 in dan stelt u dat dit criterium innovatie maximaal tegenwerkt, vult u +3 in dan stelt u dat dit criterium innovatie maximaal stimuleert.

Toelichting:

2.13 Stimuleert volgens u de volgende eis, ter stimulering van de inkoop van duurzaam kantoormeubilair, ook de inkoop van innovatieve oplossingen voor kantoormeubilair? *“Materialen moeten met behulp van huis-, tuin- en keukengereedschap van de andere materialen in het meubel (exclusief oppervlaktebehandeling) zijn te scheiden. Deze eis geldt niet voor composieten of samengestelde panelen.”*

Geen mening

-3 -2 -1 0 +1 +2 +3

Vult u -3 in dan stelt u dat dit criterium innovatie maximaal tegenwerkt, vult u +3 in dan stelt u dat dit criterium innovatie maximaal stimuleert.

Toelichting:

- 2.14 Stimuleert volgens u de volgende eis, ter stimulering van de inkoop van duurzaam kantoormeubilair, ook de inkoop van innovatieve oplossingen voor kantoormeubilair? *"Het in het meubilair toegepaste plaatmateriaal voldoet aan formaldehydklasse E1, bepaald volgens EN 120, EN 717-1 of EN 717-2."*

Geen mening

-3 -2 -1 0 +1 +2 +3

Vult u -3 in dan stelt u dat dit criterium innovatie maximaal tegenwerkt, vult u +3 in dan stelt u dat dit criterium innovatie maximaal stimuleert.

Toelichting:

- 2.15 Stimuleert volgens u de volgende eis, ter stimulering van de inkoop van duurzaam kantoormeubilair, ook de inkoop van innovatieve oplossingen voor kantoormeubilair? *"Het in het meubilair gebruikte textiel bevat geen: gechloreerde kunstvezels, gehalogeneerde brandvertragers (uitgezonderd waar dit is voorgeschreven), benzidine analoge kleurstoffen, en geen kleurstoffen en pigmenten boven gestelde concentraties."*

Geen mening

-3 -2 -1 0 +1 +2 +3

Vult u -3 in dan stelt u dat dit criterium innovatie maximaal tegenwerkt, vult u +3 in dan stelt u dat dit criterium innovatie maximaal stimuleert.

Toelichting:

- 2.16 Stimuleert volgens u de volgende eis, ter stimulering van de inkoop van duurzaam kantoormeubilair, ook de inkoop van innovatieve oplossingen voor kantoormeubilair? *"De in/op het meubel gebruikte coating voldoet aan de grenswaarde voor emissie van antimoon, arseen, barium, cadmium, chroom, lood, kwik en selenium zoals vermeld in EN-71-3."*

Geen mening

-3 -2 -1 0 +1 +2 +3

Vult u -3 in dan stelt u dat dit criterium innovatie maximaal tegenwerkt, vult u +3 in dan stelt u dat dit criterium innovatie maximaal stimuleert.

Toelichting:

- 2.17 Stimuleert volgens u de volgende wens, ter stimulering van de inkoop van duurzaam kantoormeubilair, ook de inkoop van innovatieve oplossingen voor kantoormeubilair? *"Naarmate een groter percentage van het te leveren meubilair, gemeten in omzetwaarde, vergezeld wordt van een samenstellingsetiket, wordt dit onderdeel van de inschrijving hoger gewaardeerd. Het etiket bevat de opsomming van alle in het meubel gebruikte materialen en het gewicht van deze materialen."*

Geen mening

-3 -2 -1 0 +1 +2 +3

Vult u -3 in dan stelt u dat dit criterium innovatie maximaal tegenwerkt, vult u +3 in dan stelt u dat dit criterium innovatie maximaal stimuleert.

Toelichting:

=====*einde van deze enquête, nogmaals dank voor het invullen*=====

Appendix XIII Reviewing committees' feedback

Table XIII.1 Reviewing committees' feedback

Source:	Comment:
DR	Why are the purchasers not involved in the brainstorming session? This results in a highly theoretical chapter. Some of the additional ideas from table 12 are very difficult to put into practice.
DR	What will be the result of including more criteria than price and sustainability? This is not included in the example.
DR	Concerning creating incentives for continuous improvements, it is hard to evaluate the performances of the supplier.
DR	In practice the focus is often on processes and procedures with a high degree of accountability for the purchasing department.
DR	The combination between sustainable public procurement and public procurement for innovation is in my opinion undesirable. They should be approached separately where they can be symbiotic in some cases.
DR	The purchasing department is highly dependent on the internal customer. The internal customers should be made more aware of these extra policy goals for public procurement.
DR	Policy for public procurement is often too ideological. The interaction between purchasing practice is too little. In addition to this, the ideas require additional resources from the procurement departments whereas the allocation of tasks aims more at secondary processes.
KM	The fourth research question implies the criteria are hindering innovation, whereas, in the previous chapter it is concluded that it does not hinder.
KM	What is the influence of the price on the suggested MEAT method?
KM	Does the suggested approach assure the procured product is more sustainable than with the existing method?
KM	Are the suggestions focusing on an instrument for purchasers to use or can it be applied instead of the current criteria documents?
KM	Do you recommend a fixed lower bound for the total sustainability score, and is this also a lower bound when awarding on MEAT?
KM	The section concerning market consultation seems to come out of the blue. This might be better in place somewhere else. This provides opportunities to explain about the other innovation stimulating elements too.
RP	The research sub question is not the most suited but well suited maybe. Not all the possibilities have been analysed.
RP	The conclusion for the third research question is very interesting. Which other possible reasons could be given to explain these differences?
RP	In which way are the recommendations you make more functional if the focus remains on the same sustainability level?
RP	The rationales given for the modifications for office furniture and roads are not obvious, these should be more explicit in my opinion.
RP	Why are there no lower bounds introduced for the existing discretionary sustainability criteria?
RP	The examples you provide for the scores, should they be used in a pilot version of your model or are there other manners to determine the weights of the criteria?
RP	Are the positive effects of the modified WFS-model unique for this model or can the existing criteria provide the same advantages?
MvP	Extra barrier and driver for public procurement for innovations
MvP	There are additional demand and supply side measures (Chapter 2)
MvP	Conclusion Chapter 5, stimulate innovation where required.
MvP	Excellent idea to modify the obligatory requirements where possible.
MvP	Conclusion chapter 6, not obvious how the existing K.O. criteria are going to be included in the suggested model.
MvP	The suggested total score for sustainability removes the idea from its bureaucratic level.
MvP	Complementary suggestions originated after the brainstorming session.