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AN ENERGY-NEUTRAL HIGHWAY, THE NEW STANDARD?

A qualitative case study of the A6 Almere- Havendreef Almere-Buiten-Oost on the influence of PPP governance instruments on the environmental sustainability

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SUMMARY

Recent global issues concerning climate change and the inefficient use of resources demand an increased attention towards sustainability considerations within public private partnership (PPP) infrastructure projects. This thesis explores how sustainability considerations can be stimulated with the help of PPP governance instruments. The aim of this thesis is to test existing scarce theory on PPP governance instruments and sustainability within the context of a Dutch infrastructure project. The case-study of “The A6 Almere Havendreef - Almere Buiten-Oost” contributes to increased knowledge on PPP governance instruments and their influence on sustainability. The empirical evidence for this case is collected through semi-structured interviews and an analysis of documents. According to the results of this thesis, the following instruments are influencing sustainability considerations in the project: setting sustainability norms in the output specifications, use of sustainability instruments, weighting of sustainability award criteria, attention devoted to stakeholder participation, competition on quality and rewards. The most important instrument in this case was the use of sustainability instruments, like the MKI (Dutch abbreviation for environmental cost indicator). In combination with the procurement strategy this instrument stimulated the sustainable behaviour of the bidders during the procurement phase and the consideration of sustainability in the implementation phase. In addition, the A6 Almere points out the importance of stakeholder participation, in which the municipality is involved. Furthermore, a ‘champion’ - a person with a high ambition towards sustainability - is considered to have influenced sustainability in the project. Additional case studies are recommended to investigate whether this factor is present in other projects, as this cannot be inferred from a single case study.

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1. INTRODUCTION

Challenges concerning climate change and the inefficient use of resources are nowadays rising global issues (Ministry of infrastructure and Water Management, 2018). In this line of thought, more attention than ever should be contributed to sustainable development of cities and infrastructure. With the launch of the Europe 2020 Strategy smart, sustainable and inclusive growth is emphasized with a key role for public procurement (European Commission, 2014). On this notion, the European Union increasingly drives member states towards smarter procurement of public infrastructure, contributing to a resource efficient and low-carbon economy. This links to the Ministry of Infrastructure and Water management (2018) latest sustainability report goals, in which they aim to be climate- and energy neutral, use less than half of their resources and work circularly by 2030.

Why environmental sustainability?

Devolder & Block (2015) acknowledge the need for more detailed research on sustainable development, in order to create learning pathways and highlight the potential. Regarding infrastructure projects, Tsai and Chang (2011) recognize the urgency of discussing environmental sustainability, as there is a high negative environmental impact in terms of energy, material and waste used. As a result, this thesis takes on an environmental perspective in discussing sustainability of a PPP infrastructure project. This both contributes to theoretical knowledge on environmental sustainability in PPP projects and creates learning paths for future projects (Bueno et al., 2015).

Why PPP?

Manos et al. (2014) found that procurement of infrastructure projects within a public-private partnership (PPP) structure have a higher sustainability performance than those without a PPP contract. Furthermore, public-private partnership (PPP) arrangements have been increasingly considered by public authorities in the infrastructure sector (Rijkswaterstaat, 2020). Although this might suggest that sustainability is common in infrastructure projects, the incorporation does not always have a priority nowadays (Hueskes et al., 2017). This thesis explores how sustainability consideration of an infrastructure project might be stimulated with the help of governance instruments within a PPP-structure. Here PPP is defined as “*an arrangement between a public authority and a private partner designed to deliver a public infrastructure project and service under a long-term contract*” (European PPP Expertise centre [EPEC], 2015).

1.1 Current research on sustainability and PPPs

Although sustainability in the context of PPPs is currently receiving more academic attention, the way in which public procurers currently incorporate and stimulate sustainability is not extensively researched (Hueskes et al., 2017; Lenferink et al., 2012). There are only a limited number of case-

studies on the topic of sustainability in PPP infrastructure projects (Hueskes et al., 2017). Besides, each PPP differs according to the societal context in which they take place (Engwall, 2002). Hueskes et al. (2017) researched sustainability in the context of PPP infrastructure projects in Flanders. They recommend additional research in other Western countries to further generalise findings regarding sustainability considerations. In addition, the literature mainly focuses on the public procurers perspective and the part they play in sustainability considerations (Hueskes et al., 2017; Verhoest et al., 2013). However, it would be valuable to include the experiences of the private party, who might have contributed to sustainability (Bueno et al., 2015; Robinson, 2004). This thesis will therefore include multiple perspectives and experiences as explained in paragraph 3.2.

1.2 Objectives and research question

The aim of this thesis is to increase insight into how sustainability is stimulated with the help of governance instruments within a PPP infrastructure project. The limited theory available on how to stimulate sustainability in PPP projects has not been extensively tested (Hueskes et al., 2017; Lenferink et al. 2012). This thesis will test the theory of Hueskes et al. (2017) on Flemish practices concerning PPP instruments, sustainability and PPP phases within the context of a Dutch case. A case study of the A6 Almere will contribute to increased knowledge on PPP governance instruments and their influence on sustainability. The results of this thesis could both contribute to theory and future policy and practices.

Thus follows my research question:

“What is the influence of governance instruments on the environmental sustainability considerations of the A6 Almere Havendreef - Almere Buiten Oost as a PPP infrastructure project?”

With sub-questions:

- To what extent can aspects of environmental sustainability be observed within this project?
- Which governance instruments can be identified in the different phases of the project?
- What role did the different governance instruments have in establishing environmental sustainability?
- What are challenges and improvements concerning the governance instruments?

1.3 Reading guide

This thesis is structured as follows. Chapter 2 will review theory concerning the key concepts of environmental sustainability and governance instruments used in PPP infrastructure projects. Subsequently, chapter 3 contains a short introduction on the case, the widening of the A6 Almere

Havendreef - Almere Buiten Oost, the methods of data collection and method of data analysis. Thereafter, in Chapter 4, the results of the research conducted are presented. The chapter finalizes with reflecting upon the main findings in the light of the existing theory. The last chapter outlines the key conclusions, practical and theoretical implications and recommendations for future research.

2. THEORETICAL FRAMEWORK

2.1 Environmental Sustainability

Before evaluating the environmental sustainability of a PPP project it is important to briefly reflect on the concept of environmental sustainability.

2.1.1 A general definition

Ekins et al. (2003) look at the environment from a human perspective, in which environmental functions make an important contribution to human welfare. Within this approach environmental sustainability is described as the provision of environmental functions by maintaining the environment's natural qualities and characteristics (Ekins et al., 2003; De Groot, 1992).

2.1.2 Environmental Sustainability and PPP infrastructure projects

It is important to stress that there is not, nor is desired, one single correct and coherent approach to the concept of sustainability in PPP projects. Sustainability should be approached as a process of experiencing and experimenting in the field, rather than following one precise definition. Robinson (2004) refers to the “constructive ambiguity” (p. 274) of the concept as a political opportunity in which multiple claims of sustainable practice can be made. Here Robinson (2004) implies that sustainability is mainly a political act, rather than a scientific concept. Critics refer to the vagueness of the concept that might result in a solely rhetorical use of sustainability in projects. If sustainability wants to shift from rhetoric to action, specific sustainability indicators are needed (Hueskes et al., 2014). However these measurable and specific indicators are often absent (Bueno et al., 2015; Labuschagne and Brent, 2004).

Although an absolute and objective measurement of sustainability is difficult (Hueskes et al., 2017), this thesis makes use of indicators as a starting point to better understand sustainability considerations in the project. On this notion the discussion framework from Devolder & Block (2015) is used. These indicators can give direction to the assessment in what aspects a project is sustainable and therefore will help lead the discussion on environmental sustainability embedded in the case.

The framework consists of three dimensions: ecological footprint, closed loop, nature and environment (Devolder & Block, 2015). “The ecological footprint” can be described as minimizing the pressure on the environment by keeping the project's footprint as low as possible. The “closed loop”, concerns mitigating outgoing flows, such as water, waste and materials. Short chains and local knowledge of materials and technologies are prioritized. Within the third dimension there is an emphasis on biodiversity, maintaining natural elements and the reconstruction of the natural characteristics of the environment.

Dimensions	Sub – criteria	Examples of indicators
Ecological footprint	Respect critical loads for ecosystems	e.g. reference to environmental friendly materials, e.g. reducing CO2 emissions
	Prudent use of non-renewables	e.g. reference to limited fossil fuels, fertile soil, water usage
	Use of renewable resources	e.g. reference to renewable energy
Closed loop	resource-using efficiency	e.g. reference to the re-use of materials
	recycling of resources	e.g. reference to recycling of waste
Nature & environment	Landscape conservation	e.g. reference to efficient land-use, prevent landscape degradation
	Respect standards for human health	e.g. noise pollution, air pollution
	Maintain biodiversity	e.g. reference to protection of species and habitat, e.g. maintaining ecosystems resilience

Table 1: Discussion framework environmental sustainability - Based on Devolder & Block (2015); Hueskes et al. (2017)

2.2 Governance instruments in PPPs

The following section will shortly discuss governance and governance instruments in the context of PPPs. Consequently, in paragraph 2.3 different governance instruments encountered by Hueskes et al. (2017) that might influence sustainability will be presented structured according to the different PPP phases. The phases by EPEC (2015) and the different governance instruments encountered by Hueskes et al. (2017) form the main framework for this thesis.

Governance in the context of public-private partnership (PPP) projects is focussed on the process of decision-making, implementation processes (Abednego & Ogunlana, 2006; Klijn, 2008) and the relationship with other actors and stakeholders involved in the project (Klijn, 2008). The high amount of existing literature on the concept of governance contributes to the multiple theoretical perspectives, which makes governance a heterogenous concept (Ahola et al., 2013; Hodge & Greve, 2007; Klijn, 2008). This research limits its scope to governance instruments and tools used by the public procurer, as part as an element that constitutes PPP governance (Hurk & Verhoest, 2015).

Three kinds of PPP governance instruments can be identified. Verhoest et al. (2013) distinguish: “hierarchical”, “market” and “network instruments”. Hierarchical instruments are characterised by direct and top-down instructions by the public actor in the PPP. This could be translated, for example, into very precise output specifications regarding materials or other requirements set by the public party (Hueskes et al., 2017). Network instruments typically focus on mutual control, goals sharing, and stakeholder involvement in the process. The general assumption of network mechanisms is that the government steps away from its hierarchic position and joint decisions and

solutions between the actors involved are key. Last, market instruments focus on the interaction and behaviour of actors through competition, hard contractual arrangements and performance based rewards and sanctions (Verhoest et al., 2013). Although each instrument can have its own influence and effects, instruments might also complement each other on achieving sustainability within a PPP project (Hueskes et al., 2017).

2.3 Governance instruments and the different PPP phases

The EPEC PPP guide is designed to guide, mainly public procurers, through the key challenges and aspects involved in the delivery of a PPP project (EPEC, 2015). It is useful to include and explore the different phases of a PPP lifecycle, because each phase includes its own instruments, which could influence sustainability (Hueskes et al., 2017). Secondly, the phase approach is helpful in understanding the governance of a PPP as *“control instruments, mechanisms and practices in one phase, for instance, present institutional constraints in the following phase”* (Verhoest et al., 2013, p. 207). The third reason concerns the purpose of sustainability assessment, in which a long-term approach is often adopted (Sijtsma, 2006). Some literature emphasizes the main role of earlier phases in assessing and stimulating sustainability considerations (Bueno et al., 2015; Tsai and Chang, 2012). However, an assessment including all phases is equally important. As Bueno et al. (2015, p. 625) state *“verifying the sustainability of an already existing project can be useful to “recycle” best practices and procedures in future projects, due to the retrospective character it implies”*. The following four phases are identified by EPEC (2015): “identification phase”, “detailed preparation phase”, “procurement phase” and “implementation phase”.

2.3.1 Project identification phase

During the project identification phase a preliminary environmental assessment of the potential impacts of the project is conducted by the private party. Furthermore, the output specifications and alternatives, such as the renovation of infrastructure, are explored (EPEC, 2015). The project definition, actions and ambitions at the start can influence the degree in which sustainability is considered throughout the other phases of the project (Tsai and Chang, 2012).

Setting sustainability norms in the output specifications

The output specifications entail the further translation of the goals and principles for the project and therefore provide opportunities concerning sustainability (Hueskes et al., 2017). The essence of output specifications is to focus on results rather than input (EPEC, 2015; Grimsey and Lewis, 2004). However, when public procurers set sustainability norms in the output specification of PPP projects, it is important to have specific indicators to be able to assess the performance of the contractor on sustainability requirements. Nevertheless, these measurable sustainability indicators often seem to be absent (Bueno et al., 2015; Hueskes et al., 2017).

Use of sustainability instruments

A sustainability instrument, or an assessment method of sustainability impact, can be used to assess and stimulate the incorporation of sustainability. Sustainability instruments should be initiated within the identification phase in order to influence processes in other phases of the project (Hueskes et al., 2017; Arts and Faith-ell., 2012). An example in the Dutch infrastructure sector is the "CO2 performance ladder", which weights the working processes of potential contractors during the procurement phase. Where the "CO2-ladder" focusses on CO2 emissions, "DuBoCalc" (Dutch abbreviation for Sustainable Building Calculator) focuses on sustainable use of materials. Both can be used as a quality or performance criterion (Arts and Faith-ell., 2012; Rijkswaterstaat, 2017). These instruments include clear performance indicators and enable coordination from the public party towards the private party. However, the detailed and quantitative nature of the instruments lacks the capacity to measure possible relevant 'qualitative' criteria of sustainability (Arts and Faith-ell., 2012; Hueskes et al., 2017).

2.3.2 The detailed preparation phase

Where the project identification phase is more explorative in nature, the preparation phase concerns getting organised and preparing the launch of the tender. In this phase the public procurer can include his own ambitions concerning sustainability through establishing bid evaluation criteria and by exploring the best method to stimulate sustainability within the procurement phase (EPEC, 2015). In addition, the public procurer is obligated to involve stakeholders in the decision-making process and aligning plans with other public organizations, due to strict formal participation requirements (EPEC, 2020; Nederhand & Klijn, 2019).

Weighting of sustainability award criteria

During the preparation phase sustainability ambitions by the public party are translated into preconditions and awarding criteria (EPEC, 2015). Whereas the output specifications should set the minimum requirements, the award criteria can express preferences, for example with regard to sustainability. The weighting of award criteria in the bid evaluation seems like a relatively simple way to increase sustainability considerations of the contractor. However, sometimes bidders rather set a competitive price than applying sustainability criteria in their tender (Hueskes et al., 2017).

Attention devoted to stakeholder participation

The concept of stakeholder participation in the context of PPPs, used in this thesis, focuses on societal actors, consisting of citizens and societal groups. The involvement of these actors can range from having no voice to intensive involvement in the decision-making process (Nederhand & Klijn, 2019). The literature recognizes the impact of stakeholder involvement on the quality, in the context of sustainability, and innovative character of the project itself (Hueskes et al., 2017; Lenferink et al., 2019; Nederhand & Klijn, 2019). This argument is mainly based on the increase of shared knowledge and expertise and the confrontation with different perspectives (Klijn & Koppenjan, 2016; Lenferink et al., 2012). However, in practice stakeholder participation is often

neglected because of the increased complexity of the decision-making process and the restricted focus on the public procurer and the contractor within the tendering process (Klijn & Koppenjan, 2016; Verweij, 2015).

2.3.3 Procurement phase

The procurement phase starts with the publication of the public procurement notice. This initiates the start of the bidding process in which interaction with bidders takes place. The phase ends with the finalisation of the PPP contract and the financial close (EPEC, 2015).

Competition on quality

Competitive bidding processes and contractual arrangements play an important role within the governance strategy of PPPs. Here, competition could be enhanced by the public authority while maintaining sufficient control over the content of the negotiations (Verhoest et al., 2013). According to Dreschler (2009) competition on quality can be reached with the application of EMVI. Although this award mechanism might increase the value price ratio of bids and stimulate innovative solutions, the application of EMVI is not widespread due to its complex nature.

2.3.4 Implementation phase

During the implementation phase there is a shift in responsibilities from the public procurer towards the contractor concerning project- and contract management (EPEC, 2015). Apart from sustainability ambitions of the public procurer, in this phase the private partner plays a significant role to the extent in which sustainability is incorporated (Tsai and Chang., 2012). It is important to note that no matter how great the ambitions and agreements during the earlier phases of the project seem, there is a chance they fail during the implementation phase (Verweij., 2015). During this phase an ex-post evaluation is conducted by the private party with support of the public procurer, which could be linked to sanctions or rewards (EPEC, 2015).

Rewards

Hueskes et al., (2017) encounter a reward or more specifically a “bonus for energy efficiency” as an instrument with an important financial incentive for the consideration of sustainability by the private party. As Verhoest et al. (2013) state “*The principal builds in performance-based sanctions and rewards to stimulate the agent to align his objectives with those of the principal*” (p. 192). On the one hand, the use of performance based awards can be rather top-down and control based, characterized by very detailed, frequently monitored and a range of sanctions. On the other hand, more nuanced and informal, with weak, simple or no sanctions at all.

Table 2 gives an overview of the main phases, activities in which decisions are made and governance instruments by Hueskes et al. (2017).

Project phase	Main activities	Governance instruments
Project identification phase	<ul style="list-style-type: none"> • Project definition • Output specifications 	<ul style="list-style-type: none"> • Use of sustainability instruments • Setting sustainability norms in the output specifications
Detailed preparation phase	<ul style="list-style-type: none"> • Procurement method and PPP design • Bid evaluation criteria • Stakeholder involvement 	<ul style="list-style-type: none"> • Weighting of sustainability award criteria • Attention devoted to stakeholder participation
Procurement phase	<ul style="list-style-type: none"> • Interaction with bidders • Contract and financial close 	<ul style="list-style-type: none"> • Competition on quality (rather than price)
Project implementation phase	<ul style="list-style-type: none"> • Contract management • Monitoring & sanctions/ rewards 	<ul style="list-style-type: none"> • Rewards, e.g. “bonus for energy efficiency”

Table 2: Phases, main activities and governance instruments that may be used to stimulate sustainability – adapted from Hueskes et al. (2017); EPEC (2015).

2.4 Conceptual model

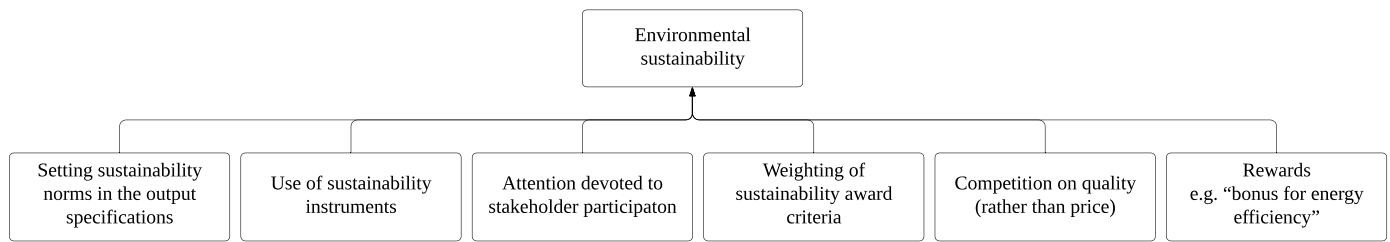


Figure 1: Conceptual model

The conceptual model (see figure 1) shows the relationship between the dependent and the independent variables of this thesis. The dependent variable in this thesis is the level of sustainability of a PPP infrastructure project. The independent variables are the difference governance instruments identified by Hueskes et al. (2017).

3. METHODS

The A6 Almere Havendreef - Almere Buiten Oost as a PPP infrastructure project will be studied. A case study allows to study a phenomenon in detail in its own context (Flyvbjerg, 2006), which will contribute to the detailed and profound knowledge about sustainability and governance instruments in the context of the case.

3.1 Case selection

The case has been selected based on its sustainable and innovative character (Haan, 2017; Koenen, 2017; Rijkswaterstaat, 2016). With this infrastructure project the first energy-neutral national highway is established. Furthermore, limiting CO2 emissions of the project with a sustainable procurement procedure, has been rewarded with the Procura+ Award (Rijkswaterstaat, 2016). The sustainable elements included in this case, allow to further examine how these were achieved and stimulated. The second motive for the selection of this case concerns the status of the project. The A6 is recently finished in 2019, which enables a holistic ex-post evaluation. This might contribute to identifying best practices and procedures of stimulating sustainability within a project (Bueno et al., 2015).

Project name	A6 Almere Havendreef – Almere Buiten-Oost	Start tender	Beginning of 2015
Description	Widening of the highway and area development	Contract award	May 2016
Public Authority	Rijkswaterstaat	Contract type	DBFM (design, Build, Finance & Maintain)
Consortium	Parkway6 (Dura Vermeer, Besix, Rebel valley, John Laing)	Budget	€ 300.000.000

table 3: A short overview of the case

3.2 Data collection

Semi-structured interviews and the analysis of documents have provided empirical evidence for the case (see appendix 2 for the interview). Five project-specific participants participated in an approximately one hour interview Besides Rijkswaterstaat and Parkway6, the Municipality Almere is involved in the interviews (see table 4).

Organisation	Occupation
DuraVermeer	Manager Surrounding Environment
Gemeente Almere	Deputy manager development and mobility
Rijkswaterstaat	Project Manager
DuraVermeer	Technical Manager
Rijkswaterstaat	Technical Manager

Table 4: overview of respondents (see Appendix 1 for detailed description)

The first respondents were selected based on the integrated project management model (IPM), in which different approaches and concerns are translated into five process-specific roles (Rijkswaterstaat, n.d.). Three of those roles were included in the interviews, based on their involvement on sustainability considerations in the project. Subsequently, respondents were selected through the snow-ball effect, with the same criteria of involvement. This resulted in a complete view of the case, in which the data was continuously confirmed and supplemented by the different actors and perspectives included. Saturation of the data was experienced as no new aspects of sustainability nor instruments were mentioned by the fifth respondent. In addition, the data is supplemented by the analysis of project documents and media documents (see appendix 1). News articles were collected with LexisNexis and the project documents were provided by respondents.

3.3 Ethical considerations

Four out of five respondents were involved during the whole project, but one only cooperated within the implementation phase of the project. This might have influenced his holistic view on the project, which has been taken into account during the interpretation of the data. Furthermore, the interviews were conducted in Dutch, while the results were presented in English. Misinterpretation is minimised through careful translation and interpretation of the data. In order to act ethically the respondents were informed about the research objectives and the data process (see appendix 3 for the agreement to participate).

3.4 Instruments for data analysis

Semi-structured interviews

The interview and an initial code tree were established based on the concepts of the theoretical framework (see appendix 4 for the code trees). After transcribing the interviews, using Microsoft Word, the interviews were coded and analysed through Atlas.ti. Because the results were linked to preconceived concepts and indicators, the coding process can be seen as deductive. However, during the data process of data analysis some codes were re-organized and new codes outside the preconceived theory were added. The notion of a potential new governance instrument by the first interviewee was consequently also included in the following interviews.

Document analysis

The documents are analysed in Atlas.ti according to the final and adapted code tree from the interviews.

4. RESULTS

4.1 Environmental sustainability

Table 4 gives an overview of the environmental sustainability aspects included in the project. These aspects were mentioned by respondents and documents.

Dimension	Sub – criteria	Indicators within the context of the case
Ecological footprint	Respect critical loads for ecosystems	Reducing CO2 emissions
	Prudent use of non-renewables	Limited asphalt use (thin-asphalt); High quality materials (Eco-pave)
	Use of renewable resources	Renewable energy (solar field)
Closed loop	resource-using efficiency	The re-use of leftover sand from the project itself and from projects nearby; Energy efficiency (LED-lightning)
	recycling of resources	Recycling of waste-sand (Eco-sand)
Nature & environment	Landscape conservation	Conserving or re-planting trees
	Respect standards for human health	Noise reduction measures (quiet asphalt, noise barriers); Air quality
	Maintain biodiversity	Protection of species and habitat (nests); Creating ecological corridors

Table 5: An overview of sustainability indicators mentioned by respondents and the documents

The use of renewable resources, with the construction of a solar field, was an aspect of sustainability most emphasized. D5 and D6 highlight this project as the “first energy-neutral highway”. This is reinforced by all respondents, mentioning the great attention for energy in the project, which contributed to the unique sustainable character of the project.

Another important sustainable aspect of this project concerns the great efforts to reduce CO2 emissions. The reduction of CO2 emissions in the project is often mentioned in relation to sustainable transport solutions or shorter transport distances of material (e.g. D8, R1). But, also in relation to the use of higher quality materials (e.g. Eco pave), which contributes both to limited use of non-renewables, lower lifecycle costs and less CO2 emissions due to an extended lifespan of the product. In addition, according to D1 and D7 and respondents, thin asphalt constructions, minimised both the use of non-renewables, transport and associated emissions.

Lastly, according to respondents and documents the use of innovative materials in this project is very unique. Eco-sand and eco-pave were both initiated by DuraVermeer within this case, which highly contributed to the closed loop and thus sustainability of the project (e.g. D5, R4).

4. 2 PPP Governance instruments

This paragraph starts with table 5, which gives an overview of the instruments identified in the case. Accordingly, the table will shortly present what the instruments looked like in the case, which sustainability indicators they aimed to serve and if they were successful. Subsequently, the findings of the research are discussed following the structure of the governance instruments identified in the project. In paragraph 4.3 the instruments will be discussed in relation to the theory and the different PPP phases.

Instrument	Interpretation in the case	Sustainability aspects	
The output specifications	<ul style="list-style-type: none"> Setting sustainability requirements 	Maintain biodiversity	-
		Landscape conservation	-
		Use of renewable resources	+
		Resource efficiency	+
Use of sustainability instruments	<ul style="list-style-type: none"> DuboCalc CO2 performance ladder 	Respect critical loads for ecosystems	+
		resource-using efficiency	±
		Prudent use of non-renewables	±
A project champion	<ul style="list-style-type: none"> A person with ambitions towards sustainability 	Use of renewable resources	+
		Recycling of resources	±
Stakeholder participation	<ul style="list-style-type: none"> Citizens and societal groups The municipality of Almere 	Maintain biodiversity	-
		Landscape conservation	-
		Respect standards for human health.	±
		Recycling of resources	+
Sustainability award criteria	<ul style="list-style-type: none"> EMVI-criteria 	Respect critical loads for ecosystems	+
		Resource-using efficiency	±
		Prudent use of non-renewables	±
Competition on quality	<ul style="list-style-type: none"> By means of the MKI value 	Respect critical loads for ecosystems	+
		Resource-using efficiency	±
		Prudent use of non-renewables	±
Rewards	<ul style="list-style-type: none"> Fictional discount on the bid price 	Respect critical loads for ecosystems	+
		Resource-using efficiency	±
		Prudent use of non-renewables	±

Legend	
+	Highly effective, contributed to additional consideration of this aspect in the project
±	Effective, somewhat stimulating this sustainability aspects in the project
-	Moderately effective, contributed to this aspect of sustainability but not more than normal

Table 6: Overview of the results + legend

4.2.1 Setting sustainability norms in the output specifications

The inclusion of sustainability indicators in the output specifications of the A6 is relatively modest. Most things, concerning asphalt and viaducts, and some sustainability indicators concerning *landscape conservation* and *maintaining biodiversity*, were prescribed normative, according to the Rijkswaterstaat standard guidelines. In addition, Rijkswaterstaat explicitly requested the establishment of a solar field. According to respondents, the requirement of solar energy indirectly resulted in the application of LED-lighting by the contractor.

Regarding the instrument in general, respondents recognize the efficiency of the output specifications to influence sustainability considerations. Explicit and precise requirements give certainty on what to expect as the public authority (R5). Nonetheless, according to Rijkswaterstaat, bidders should have the freedom to make their own choices. To this end, they must only be provided with functional requirements and technical conditions (D2). According to R5 the input of the private parties in the design have resulted in sustainable solutions.

“This resulted in very surprising things that we could not have come up with ourselves in terms of construction site design” - R5

However, financial and technical constraints play a role. R4 mentions that innovation and sustainability are difficult to be translated into explicit requirements. Furthermore, R5 mentions that requesting new innovative and sustainable products cost additional time to test and monitor.

4.2.2 Use of sustainability instruments

The project made use of the CO2 performance ladder as a performance metric. Parkway6 has offered work under the fifth level of the ladder, resulting in a 5% discount on their bid price. This instrument not only gives an insight into the energy use and footprint of the design but also stimulates the development of ambitious targets for CO2 reduction (D2). Another sustainability instrument used is DuBoCalc, which is based on life cycle analysis (LCAs) of all materials used in the project. DuBoCalc expresses the environmental cost of the design in MKI value (Dutch abbreviation for environmental cost indicator).

This sustainability instrument not only challenged the private partners to develop a sustainable and innovative design during the procurement phase. It also stimulated sustainability during the actual implementation of the project. In this phase financial consequences for exceeding the MKI value contributed to the incentive for the private party to stick to their initial solutions concerning sustainability. The citation from R1 below emphasises the importance of the use of sustainability instruments in the case.

“That was actually the most important control tool for us, the MKI calculation. So that you stay within those values and try to stay as low as possible during the work. That was our main steering tool” -R1

4.2.3 A project champion for sustainability

The existence of a person or small group with high ambitions, drive and persistence towards sustainability is encountered by most of the respondents to influence sustainability considerations. This can be considered as a counterpart to the dominant way of thinking in economic incentives (R2). The respondents identify multiple *champions* or “kruiwagens” (R5) in this project who might have influenced sustainability considerations, especially regarding the construction of the solar field. In addition, persons from previous projects or actions were mentioned, concerning the initiation of DuboCalc by Rijkswaterstaat.

A *champion* is considered to be most relevant during earlier phases of the project (e.g. the project definition and preparation phase), illustrated by the initial ambition to develop an energy neutral road, which formed a guiding line throughout the following phases (R5). Although a *project champion* contributed to additional sustainability in this project, there are some challenges. According to R2 this concerns the difficulty to reach people with one's enthusiasm and ideas. Furthermore, respondents recognize that although there were multiple inspiring ideas at the start. Only a few of those ambitions were eventually implemented. R2 here implies that besides good will you also need competent and persistent people to follow through with an initial vision (see citation).

“I notice that you always start with a vision. These are often very alluring, ambitious and look good on paper. At the end of the ride, 30% of that is left in the realization. You can do two things: stop those ambitious visions or you can think if I never had that vision in the first place, then nothing would have happened... these visions can give direction to the public authority, but you need to stick to that vision from beginning to end and act accordingly” – R2

4.2.4 Stakeholder participation

First of all, citizens and societal groups involvement during the preparation phase has taken place on a modest level through the invitation to react on the planning approval decision (tracébesluit) and the development of an opportunity book with the municipality and Rijkswaterstaat. In addition, citizen involvement was mentioned within the implementation phase (D4), however this participation remained rather limited (R1). Secondly, according to respondents and the documents the municipality Almere participated during the preparation, procurement and implementation phase of the project, which is considered exceptional. According to D8 and R2 the municipality financially contributed to the project which meant they had a say in things, for example concerning the contract award or the design.

Involvement of citizens and societal groups hardly contributed to any additional sustainability considerations in the project. Moreover, R2 mentions that within the few stakeholder participation that took place sustainability did not have a priority, illustrated by the citation below.

“I don't have the impression that that was the biggest theme here... Sustainability in this project mainly came from the municipality and Rijkswaterstaat itself” - R2

The involvement of the municipality resulted in increased sustainability of the project. First of all, by using an innovative and sustainable product (eco-sand) in cooperation with the contractor. Secondly, the municipality demanded additional noise reduction measurements. According to D1 this project makes clear that administrative partners (e.g. provinces and municipalities) can significantly contribute to the sustainability ambitions and sustainability tasks of Rijkswaterstaat projects.

According to the respondents, stakeholder participation as an instrument in general had two positive functions: generating knowledge and ideas (e.g. concerning sustainability) and giving people the feeling that they are included in the decision-making process, which will result in more societal support for the project.

4.2.5 Weighing of sustainability award criteria

Rijkswaterstaat used an EMVI (Dutch abbreviation for economically most advantageous tender) approach including the MKI value and the CO₂ performance ladder. According to these three criteria (price, MKI-value and CO₂ level) Rijkswaterstaat calculates a price advantage, which will determine which bidder has the lowest (fictional) price and wins the project (D2). The EMVI approach, determined during the preparation phase, means that both the quality of the work process and the quantity of the environmental impact are weighted and awarded.

Quality and sustainability were two important criteria which were awarded by Rijkswaterstaat in the procurement phase and therefore contributed to sustainability considerations by the bidders. This is emphasized by R1 in the following citation:

“I think that the award criteria and the tender have formed the foundation” - R1

4.2.6 Competition on quality rather than price

The bidders were challenged to come up with a design with a 50% lower MKI value than the reference design developed by Rijkswaterstaat (D2). According to Rijkswaterstaat the value was rather ambitious, with the aim to significantly decrease the environmental impact of the project. By submitting a tender with the lowest MKI value, as part of the EMVI, bidders could distinguish themselves from the competition due to the fictional discount on the contract price, which

subsequently led to more sustainable bids. Although competition on quality in the procurement phase played a role in sustainability considerations, respondent R4 mentions that the MKI value set by Rijkswaterstaat was not challenging enough. This prevented DuraVermeer from taking an extra step towards innovative and sustainable solutions, described by the following citation.

“The difficult thing with these MKIs was that the lower limit was too easy to achieve, with the effect that all parties were not really distinguished in this...You don't really get innovative ideas” - R4

This indicates that it is important to make a challenging EMVI to stimulate private parties to come up with sustainable proposals. Hence, Rijkswaterstaat needs to have the technical ability to create a well-thought out reference design in order to know where there is room for improvement but moreover to challenge the private parties enough in sustainable solutions (D2).

4.2.7 Rewards, e.g. bonus for energy efficiency

During the procurement phase Rijkswaterstaat gives preference to bidders who offer a product that has a small environmental impact as a result of the materials and work processes used (CO2 emissions are part of this). This preference is translated into a fictional discount on the bid price. A (fictional) discount or reward provided an important incentive for bidders to come up with additional energy efficiency measures and other interesting solutions (e.g. eco-sand and the transport of material by boat) which have contributed to sustainability.

Another aspect often mentioned by respondents within the content of this instrument, was the economic benefit that the private party gained from energy-efficient measures. In other words, the energy-neutral highway is economically beneficial during the exploitation of the project.

4.3. Discussion of the results

This section will briefly reflect on results that stand out from the theory (see table 7). First of all, the results show that an ambitious person is important for stimulating sustainability in the project. However, this is not considered a formal governance instrument by the theory of Hueskes et al. (2017). Nevertheless it was mentioned and emphasized by all respondents, which contributed to the consideration of this factor in the results. This factor has been included in the adapted model as “a project champion”. Secondly, *stakeholder participation* as a PPP governance instrument is mentioned as a process within the preparation phase (Hueskes et al., 2017; Lenferink et al., 2019; Nederhand & Klijn, 2019). However, with the A6 Almere, stakeholder participation during the implementation phase appeared to be more effective in stimulating sustainability. Thirdly, the theory mentions *rewards* in relation to the implementation phase (Hueskes et al., 2017). Nevertheless, within the case this instrument proved to be highly effective during the procurement phase resulting in additional innovation and sustainability of the project.

Project phase	Governance instrument
Project identification phase	<ul style="list-style-type: none"> • Setting sustainability norms in the output specifications • Use of sustainability instruments • A project champion
Detailed preparation phase	<ul style="list-style-type: none"> • Attention devoted to stakeholder participation • Weighting of sustainability award criteria
Procurement phase	<ul style="list-style-type: none"> • Rewards • Competition on quality (rather than price)
Project implementation phase	<ul style="list-style-type: none"> • Attention devoted to stakeholder participation

Table 7: Adapted theoretical model based on the results

6. CONCLUSION

6.1 Reflection on the findings

The aim of this thesis was to gain insight into how sustainability is stimulated with the help of governance instruments. Thus, the following research question was formulated:

“What is the influence of governance instruments on the environmental sustainability performance of the A6 Almere Havendreef - Almere Buiten Oost as a PPP infrastructure project?”

Renewable energy, reducing CO₂ emissions and the use of innovative materials are important aspects that contribute to the environmental sustainable nature of this project. In general, all governance instruments identified in the project have influenced certain aspects of environmental sustainability. Some instruments appeared to be more effective than others. Overall, the award criteria and the tender have formed the foundation for sustainability considerations by the private party. The most important instrument considered in this case was the use of sustainability instruments. Sustainability instruments already coordinated in the identification phase, contributed to increased sustainable behaviour of the private party in the following phases. In addition, an ambitious person with an initial vision is important for further sustainability considerations throughout the project. Furthermore, stakeholder participation within the implementation phase of the project highly stimulated innovative and sustainable solutions.

6.2 Theoretical and practical implications

The first contribution of this thesis is that it shows that the theory of Hueskes et al. (2017) on PPP governance instruments and sustainability is suitable for researching PPP infrastructure projects. The governance instruments by Hueskes et al. (2017) were identified within the case and contributed to more sustainability. Note that, some minor adaptations of the theory might be considered, based on the results of this case.

The second contribution of this thesis is mainly of practical value, in which experiences and lessons from this case can form an inspiration for stimulating sustainability in other projects.

Lessons within the context of the A6 Almere are:

- The municipality can influence and contribute to sustainability. Continuous communication between Rijkswaterstaat, Parkway6 and the municipality ensured and further encouraged sustainability considerations. To this extent, they should be included in the decision-making concerning the tender process and the design.

- The public authority needs to have the technical ability to create a well thought out reference design in order to sufficiently challenge the private parties in designing sustainable solutions.
- A sustainable vision and high ambitions are needed early in the project. A competent and persistent person is important in order to get the most out of these ambitions. In this thought these people should be given the space and opportunity early in the project.

6.3 Limitations and suggestions for future research

Although the interviews include a high level of detailed information and sufficient saturation of the data was experienced, additional interviews can always contribute to profound knowledge on the case. Besides, acknowledgments should be made that the experiences and practices concerning PPP governance instruments are case and context specific and cannot be directly transferred to future projects.

Future studies on PPP governance instruments and sustainability are recommended, as this thesis limits itself to the experiences of a single Dutch highway case. Furthermore, sustainability in this thesis was approached from an environmental perspective. It might be valuable to include other perspectives (e.g. social or economic) in order to research if these instruments contribute to other forms of sustainability. In the context of this case study, additional research needs to investigate whether the adaptations of the theory discussed in this thesis are grounded, as this can not be inferred from a single case study.

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Appendix 1

List of interview respondents

Full name	Name in thesis	Organization	Occupation	Date of the interview	Online medium	Duration of the interview
Martijn	R1	DuraVermeer	Manager Surrounding Environment	May 20th 2020	Qrooms	50 minutes
Esther	R2	Gemeente Almere	Deputy manager development and mobility	May 20th 2020	Google meet	50 minutes
Lex	R3	Rijkswaterstaat	Project Manager	June 3th 2020	Skype	70 minutes
Jaap	R4	DuraVermeer	Technical Manager	June 5th 2020	Skype	40 minutes
Johan	R5	Rijkswaterstaat	Technical Manager	June 16th 2020	Skype	60 minutes

List of documents analysed

Document	Name in thesis	Author	Release date	Sort document
Factsheet duurzaam inkopen A6 Almere	D1	Rijkswaterstaat	June 2017	Project document
GPP 2020 tender model duurzame aanbesteding A6 Almere	D2	Rijkswaterstaat	May 2016	Project document
DBFM-Overeenkomst Schiphol – Amsterdam – Almere Project A6 Almere: Bijlage 9 Deel 2 Output Specificatie	D3	Rijkswaterstaat	February 2020	Project document
DBFM-Overeenkomst Schiphol – Amsterdam – Almere Project A6 Almere: bijlage 9 deel 3 Management Specificaties	D4	Rijkswaterstaat	January 2020	Project document
'Ze moesten wel even wennen aan dat zwarte goedje'	D5	Haan, A. de	November 2017	News article
Nul-op-de-meterop de snelweg	D6	Reporter unknown	February 2017	News article
De slag om het mooiste, slimste, duurzaamste asfalt	D7	Van den Eerenbeemt, M	August 2017	News article
Een dichtgetimmerd contract kan soms best flexibel zijn	D8	Koenen, I	June 2018	News article

Appendix 2

The interview

Beforehand, without recording it, I will discuss the following things with the participant:

- *Introduce myself*
- *Explain my research objectives*
 - *Research question: “What is the influence of governance instruments on the environmental sustainability performance of the A6 Almere Havendreef - Almere Buiten Oost as a PPP infrastructure project?”*
 - *Research aim: This research aims to gain a deeper understanding of the sustainability and the governance instruments used in the project “the widening of A6 Almere Havendreef - Almere Buiten-Oost”.*
 - *Methods: This is a qualitative research. Data will be collected with the help of semi-structured interviews. These interviews will be transcribed and analysed with the help of a pre-established code-tree. Furthermore, project documents of the A6 Almere collected through respondents and online will be used. The document analysis will be making use of the same code tree as the analysis of the semi-structured interviews*
- *Refer to interview duration, inform whether the participant is on a time budget*
- *Explain how the interview is structured*
- *Explain the ‘Agreement to participate form’ and let the participant sign it (appendix 3)*
- *Starting the interview by starting recording*

1. Introductie

Ter introductie kort ingaan op uw rol en de rol van de organisatie binnen het project

Persoonlijk

- *Kunt u kort iets vertellen over wat uw rol en functie binnen het project is geweest?*

Organisatie

- *Wat is rol van uw organisatie geweest binnen dit project?*

2. Duurzaamheid

Ecologische voetprint

- *In hoeverre is de druk op het milieu zo laag mogelijk gehouden binnen dit project?*

Gesloten kringloop

- *In hoeverre zijn uitgaande stromingen, zoals water, afval en materiaal tot een minimum behouden?*

Natuur & omgeving

- *In hoeverre was er aandacht voor natuur, landschap en biodiversiteit?*

3. Governance instrumenten

In de literatuur worden er governance instrumenten geïdentificeerd, binnen de verschillende fasen van een PPP project, die duurzaamheid kunnen stimuleren binnen een project. Ik onderzoek de volgende vier fases: Initiatie fase, voorbereidingsfase, aanbestedingsfase, realisatie fase. De volgende vragen gaan hierover:

- In hoeverre zijn er normen voor duurzaamheid vastgesteld in outputspecificaties?
 - Hoe zag dit er uit/ kunt u een voorbeeld noemen?
 - Op welke manier heeft dit bijgedragen aan duurzaamheid? (en in welk aspect)
 - Wanneer/ In welke fase van het project was dit instrument van belang?
 - Zou dit beter kunnen?

- In hoeverre is de duurzaamheidsimpact van het project daadwerkelijk gemeten en gemonitord?
 - Hoe zag dit er uit/ kunt u een voorbeeld noemen?
 - Heeft en op welke manier heeft dit bijgedragen aan duurzaamheid? (en in welk aspect)
 - Wanneer/ In welke fase van het project was dit instrument van belang?
 - Zou dit beter kunnen?

- Zijn er nog andere factoren die in de initiatiefase hebben bijgedragen aan duurzaamheid binnen het project?
 - Hoe zag dit er uit/ kunt u een voorbeeld noemen?
 - Op welke manier heeft dit bijgedragen aan duurzaamheid? (en in welk aspect)
 - Wanneer/ In welke fase van het project was dit instrument van belang?
 - Zou dit beter kunnen?

- In hoeverre zijn er actoren, naast Rijkswaterstaat en Parkway6, betrokken geweest die invloed hebben gehad op de duurzaamheid van het project?
 - Hoe zag dit er uit/ kunt u een voorbeeld noemen?
 - Op welke manier heeft dit bijgedragen aan duurzaamheid? (en in welk aspect)
 - Wanneer/ In welke fase van het project was dit instrument van belang?
 - Zou dit beter kunnen?

- In hoeverre zijn duurzaamheids criteria meegewogen door rijkswaterstaat bij de gunning?
 - Hoe zag dit er uit/ kunt u een voorbeeld noemen?
 - Heeft de mate van weging van duurzaamheidscriteria bijgedragen aan duurzaamheid binnen dit project? (en in welk aspect)
 - Op welke manier heeft dit wel/ niet bijgedragen aan duurzaamheid?
 - Wanneer/ in welke fase van het project was dit instrument van belang?
 - Wat kan er beter?

- Zijn er nog andere factoren die in de voorbereidingsfase hebben bijgedragen aan duurzaamheid binnen het project?
 - Hoe zag dit er uit/ kunt u een voorbeeld noemen?

- Op welke manier heeft dit bijgedragen aan duurzaamheid? (en in welk aspect)
- Wanneer/ In welke fase van het project was dit instrument van belang?
- Zou dit beter kunnen?

- In hoeverre heeft er competitie tussen bidders omtrent kwaliteit in plaats van prijs plaatsgevonden?
 - Hoe zag dit er uit/ kunt u een voorbeeld noemen?
 - Heeft en op welke manier heeft dit bijgedragen aan duurzaamheid? (en in welk aspect)
 - Wanneer/ In welke fase van het project was dit instrument van belang?
 - Zou dit beter kunnen?

- Zijn er nog andere factoren die in de aanbestedingsfase hebben bijgedragen aan duurzaamheid binnen het project?
 - Hoe zag dit er uit/ kunt u een voorbeeld noemen?
 - Op welke manier heeft dit bijgedragen aan duurzaamheid? (en in welk aspect)
 - Wanneer/ In welke fase van het project was dit instrument van belang?
 - Zou dit beter kunnen?

- Waren er (financiële) beloningen om duurzaamheid te stimuleren?
 - Hoe zag dit er uit/ kunt u een voorbeeld noemen?
 - Heeft en op welke manier heeft dit bijgedragen aan duurzaamheid? (en in welk aspect)
 - Wanneer/ in welke fase van het project was dit instrument van belang?
 - Zou dit beter kunnen?

- Zijn er nog andere factoren die in de realisatiefase hebben bijgedragen aan duurzaamheid binnen het project?
 - Hoe zag dit er uit/ kunt u een voorbeeld noemen?
 - Op welke manier heeft dit bijgedragen aan duurzaamheid? (en in welk aspect)
 - Wanneer/ In welke fase van het project was dit instrument van belang?
 - Zou dit beter kunnen?

3. Afsluiting

- Zijn er nog overige onderwerpen met betrekking tot mijn hoofdvraag die niet aan bod zijn gekomen en die u wel graag nog zou willen bespreken?
- Zijn er documenten die bruikbaar zouden zijn voor mijn onderzoek?
- Bedanken voor deelname aan het onderzoek

Appendix 3

Agreement to participate

In research project: Nikki Sweere

Title: An energy-neutral highway, the new standard?

The purpose of this research is to explore what governance instruments were applied to the PPP infrastructure project, the widening of A6 Almere Havendreef - Almere Buiten Oost and their influence on the environmental sustainability performance of the project.

- I have had the opportunity to discuss this study. I am satisfied with the answers I have been given.
- I understand that taking part in this study is voluntary and that I have the right to withdraw from the study up to three weeks after the interview, and to decline to answer any individual questions in the study.
- I understand that my participation in this study is confidential. Without my prior consent, no material, which could identify me, will be used in any reports generated from this study.
- I understand that this data may also be used in articles, book chapters, published and unpublished work and presentations.
- I understand that all information I provide will be kept confidentially either in a locked facility or as a password protected encrypted file on a password protected computer.

Please circle YES or NO to each of the following:

I consent to my interview being audio-recorded YES / NO

I wish to remain anonymous for this research YES / NO

If YES

My first name can be used for this research YES / NO

OR

A pseudonym of my own choosing can be used in this research YES / NO

“I agree to participate in this individual interview and acknowledge receipt of a copy of this consent form and the research project information sheet.”

Signature of participant: _____ Date: _____

“I agree to abide by the conditions set out in the information sheet and I ensure no harm will be done to any participant during this research.”

Signature of researcher: _____ Date: _____

Appendix 4

Coding trees

