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Chapter 2
Environment Performance Criteria as Means for Green Public Procurement

Qi Han, Sytske Blaauwbroek, and Pei-Hsuan Lee

Abstract Green Public Procurement (GPP) represents a government policy strategy with the primary aim of steering the market toward sustainable development while addressing the considerable environmental impact attributed to the construction sector. Regardless of the presence of both national and international regulations and guidelines, the effective implementation of GPP continues to pose challenges, resulting in its gradual adoption. This research delves into the potential utilization of environmental performance criteria (EPC) as a means to advance environmental policy objectives through GPP. The study commences with an extensive literature review to delve into the integration of EPC within the award method used in the context of the Economically Most Advantageous Tender (MEAT). Following this, project data were collected to statistically assess the current prevalence of EPC within Dutch municipal and provincial tendering projects. To gain insights into the critical organizational factors crucial for the successful application of environmental performance tools in GPP, expert interviews are conducted. Lastly, a case study evaluates the degree of GPP's effectiveness in real-world projects by scrutinizing the tendering process and its contributions toward achieving environmental policy objectives addressing these factors.

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2.1 Introduction

The Dutch government has recently outlined a forward-looking vision for the construction sector, emphasizing environmental sustainability to combat climate change and the depletion of natural resources [1]. In addition to calling for sustainability practices within the industry, government investments are pivotal in realizing these visions. Notably, approximately €73 billion are allocated by the Dutch government annually across various sectors, with a big share directed toward the construction industry. Specifically, the Ministry of Infrastructure and Water Management's budget surged from €10.1 billion in 2020 to €16.4 billion in 2021 [2]. These numbers underscore the substantial allocation of public funds to civil engineering, highlighting the pressing need for sustainability-oriented investments in this sector through public procurement.

Green Public Procurement (GPP) emerges as a robust policy instrument for the government, designed to steer market development toward sustainability while addressing the significant environmental footprint of the construction sector [3]. Existing research affirms that the widespread adoption of GPP and the integration of green criteria into construction tendering processes are instrumental in achieving government environmental policy objectives [4]. However, within the European Union (EU), comprehensive integration of a green procurement policy still lags behind [5]. Governments primarily concentrate on awarding contracts that exhibit reduced environmental footprints throughout their entire life cycles, seemingly incorporating GPP within the tendering process but without fully incentivizing long-term sustainability. Furthermore, the environmental criteria that are currently applied in Dutch construction tendering suggest that contracting authorities have not universally embraced green criteria across all their tendering procedures [6].

Despite established national and international regulations, guidelines, and tools [7], effectively executing GPP remains a considerable challenge [8]. Therefore, it is imperative to elucidate effective strategies for realizing environmental policy objectives through GPP. This study endeavors to ascertain the adoption of EPC to facilitate the successful implementation of GPP, thereby contributing to the attainment of national environmental policy goals. By conducting case studies on construction tenders, specifically those administered by Dutch local governments employing the award method of Economically Most Advantageous Tender (MEAT), this research underscores the importance of integrating environmental performance tools into the procurement process to advance these objectives.

2.2 Literature Review

2.2.1 The Most Economically Advantageous Tender (MEAT) Award Method

The concept of the "Most Economically Advantageous Tender" (MEAT) is designed to secure the best value for money by considering a weighted combination of various factors that enhance value for the contracting authority. These factors may encompass quality, environmental impact, safety measures, and social considerations. Nevertheless, there exists a noticeable difference between the extensive theoretical discussions and the comparatively limited practical applications of MEAT. Lundberg and Bergman [9] emphasized that contracting authorities should prioritize award methods that promote the attainment of quality rather than merely seeking to prevent legal conflicts. Consequently, there has been a proposal to establish a specific evaluation system as a priority for authorities to effectively determine the most economically advantageous tender [3]. In line with this proposal, researchers have provided detailed guidance for developing a MEAT evaluation system, including the identification of quality criteria [10], the selection of an appropriate scoring method [11], and the allocation of weight to quality criteria to determine their equivalent value against price.

Following the adoption of MEAT as the predominant method for awarding contracts in 2012, the Economisch Instituut voor de Bouw (EIB) made endeavors to identify indicators of successful MEAT tenders. These indicators encompass the association between project budget and quality and the costs for transaction. Furthermore, this study employs four specific success criteria as outlined in reference [10]: the selection of bids that optimize the price-quality ratio, the minimization of transaction costs to an optimal level, the distinction in quality, and the realization of an optimal tendering process. While this list of success conditions is not exhaustive, it represents the factors that determine the success of a tender, encompassing both tangible and intangible elements.

2.2.2 Developing Green Criteria: Types and Toolkits

The fundamental first step toward advancing green procurement involves the integration of green elements into the tender process. Presently, the Procurement Directive 2014/24/EU is in effect, mandating the utilization of green procurement toolkits to enable the seamless inclusion of environmental considerations into tendering procedures [12]. These toolkits serve as invaluable resources for contracting authorities, with their primary focus being the specification of green criteria tailored to different sectors, encapsulated in operational modules.

The national version of the European Commission (EC) Toolkit is known as "Maatschappelijk Verantwoord Inkopen" customized by PIANOo [13]. These criteria

encompass four clearly defined categories [14], each of which plays a significant role in different phases of the tendering process:

- Selection Criteria: These criteria are considered when specific tendering procedures are in place. They serve as initial filters to determine whether potential contractors meet certain prerequisites, such as financial stability or relevant experience, before proceeding further in the tender process.
- Mandatory Technical Requirements: These requirements are obligatory for all bidders and are typically non-negotiable. They are fundamental specifications or standards that must be met to ensure that the project is executed safely and in compliance with regulations.
- Award Criteria: These criteria come into play in the MEAT award method. They are used to evaluate and compare bids based on a combination of factors, such as price, quality, and environmental impact, to determine which offer provides the best overall value for the contracting authority.
- Contract Performance Clauses: These clauses are stipulated in the contract and define the standards and expectations that the contractor must meet during the execution of the project. They typically outline specific performance targets related to environmental, quality, and other relevant aspects that the contractor must adhere to throughout the contract period.

In essence, these distinct categories of criteria are strategically employed throughout the tender process to ensure that the selected contractor aligns with the contracting authority's objectives, meets essential requirements, and delivers on environmental and performance expectations during the execution of the project.

The adoption of a comprehensive suite of green criteria is a crucial step to achieve more advanced environmental performance [15]. Prior research has identified a plethora of green criteria, encompassing aspects such as environmental nuisance, ecology, climate impact, and even Life Cycle Assessments (LCA) [16]. Nevertheless, a significant gap becomes apparent when it comes to formulating and integrating green award criteria in a strategic manner, as underscored in the existing literature [8]. This gap is especially conspicuous among contracting authorities, who have yet to embrace structured approaches in this domain [5].

2.2.3 Tools to Determine Environmental Performance

Given the intricacies involved in establishing green award criteria, there is a compelling case for ensuring that the assessment systems utilized to evaluate environmental performance are robust enough to prevent unfavorable outcomes during the awarding process [15]. Drawing upon the framework introduced by Vidal and Sánchez-Pantoja [17], these tools can be categorized into three primary types. The following provides a reference for understanding the types of tools available at various procurement phases and their respective applications in Dutch construction and infrastructure projects to assess and promote environmental performance.

Knowledge-Based Tools: These tools provide information and knowledge to support environmental considerations. They encompass manuals and databases focused on environmental subjects, serving as invaluable resources for shaping criteria. Typically, these tools are employed during the Preparation Phase at the project level. Examples include the "EC GPP Toolkit" (an international tool) and "Aanpak Duurzaam GWW" (a Dutch tool).

Performance-Based Tools: These tools assess and measure environmental performance. They are designed to quantify a project's environmental impact, making them suitable for integration into tenders as either technical requirements or award criteria. These tools are applied at the project level, often for individual construction or infrastructure projects. When applied at the organizational level, they pertain to certifications or standards related to the environmental practices of the organization. Notable examples at the project level during the tender phase include the "Environmental Cost Indicator" and the "SBK Determination Method." At the organizational level, examples encompass "ISO14001" and the "CO_2 performance ladder."

Point Scheme Tools: This category involves assigning points or scores based on environmental criteria. It includes checklists and calculation methods used to specify design criteria and verify performance. For the tender phase, examples include "BREAM" (applicable to the building subsector) and "LEED" (also for the building subsector).

The cornerstone methodology underpinning performance-based tools is LCA. In the Netherlands, the widely utilized LCA model is the SBK Determination Method [18], while an advanced alternative is the Environmental Cost Indicator which uses the DuboCalc for calculation [19]. The latter allows for a comprehensive measurement of all environmental impacts associated with a project, consolidating them into a single value. Additionally, performance-based tools, like ISO14001, provide a structured framework for implementing and enhancing an organization's environmental performance, which can be incorporated as selection criteria to align with the strategic approach to GPP [8].

Nevertheless, the practical application of performance-based tools rooted in LCA remains infrequent, with limited research dedicated to this specialized field. Furthermore, these tools have drawn attention due to their complexity and time-intensive nature, coupled with identified deficiencies concerning the coverage of environmental impact categories and life cycle stages [20]. Recent studies [19] suggest that these disparities primarily stem from the underlying data in terms of the technical and time-sensitive representation, variations in the employed method, and the models and values used for calculating environmental impacts. In essence, contracting authorities must exercise heightened caution when considering a specific tool for inclusion in a tender.

2.3 Methodology

2.3.1 Data Collection

In addition to the literature review, this study integrates data analysis from three distinct sources: statistical analysis, expert interviews, and case studies. The data collection process involves the compilation of both publicly available tender data through TenderNed (the Dutch tender platform) and non-public available tender data via the knowledge institute, Bouwend Nederland, to underpin the descriptive statistical analysis.

The dataset obtained from TenderNed encompasses all tenders issued by the Dutch government across various sectors, resulting in a sample of tender announcements ($N = 1293$). Furthermore, additional data was sourced from Bouwend Nederland ($N = 285$). Subsequently, a rigorous filtration process was executed to exclude samples with green criteria unrelated to environmental aspects (e.g., accessibility) and to consolidate overlapping samples. Ultimately, this work incorporates a dataset of 1292 cases containing environmental criteria.

Following this data compilation, the study employs descriptive statistical analysis conducted using the Statistical Package for the Social Sciences (SPSS) to evaluate the current application level regarding EPC within governmental tenders. The expert interviews and case studies were carried out through the following sequential steps.

2.3.2 Expert Interviews and Case Studies

Expert interviews serve as a valuable qualitative research method, enabling access to the specialized knowledge, expertise, and insights held by experts on specific issues [21]. Accordingly, this study engaged procurement professionals affiliated with local contracting authorities to enrich our understanding of the integration of environmental performance tools within the context of Green Public Procurement (GPP).

A protocol featuring open-ended questions was employed in semi-structured interviews with the selected experts. This approach encourages in-depth conversations with the interviewees, fostering rich discussions rather than a simple format of question-and-answer. Its purpose is to gain a comprehensive understanding of the experts' perspectives without imposing preconceived notions. In total, 12 interviews were conducted with experts representing various contracting authorities, following the established protocol. The questions encompassed topics such as the organizational framework, tender organization, stakeholder collaboration, EPC utilization, mindset and responsibility of involved stakeholders, organization of EPC, and the allocation of resources for using EPC in tenders.

Subsequently, case studies were conducted in five projects to assess the practical effectiveness of GPP, with a focus on the progression of the tender process and its impact on the realization of environmental policy objectives.

2.4 Results

2.4.1 Descriptive Statistical Analysis

Rising Adoption of Performance-Based Criteria: A detailed examination of data pertaining to performance-based environmental award criteria highlights a notable increase in their incorporation over the past 3.5 years. This upward trend is evident in both municipalities, where it surged from 14.3% in 2017 to a substantial 37.8% in 2020, and in provinces, witnessing a remarkable ascent from 15.4% in 2017 to an impressive 78.6% in 2020, as illustrated in Table 2.1. The growing adoption of these criteria can be attributed to influential initiatives, exemplified by the Green Deal Duurzaam GWW 2.0. Such initiatives provide clear guidance and a valuable framework to promote the adoption and implementation of green criteria based on environmental performance.

Array of Performance-Based Criteria and Tools: The descriptive analysis has unveiled a spectrum of performance-based calculation methods and tools, neatly categorized into two groups: those linked to materials and those associated with execution or equipment. Among the material-related tools, several are firmly rooted in Life Cycle Assessment (LCA), including notable names such as DuboCalc, DuboTool,

Table 2.1 Annual progress in the adoption of environmental performance-based criteria in the projects

Client			Environmental performance-based criteria		
			Without (%)	With (%)	Total (%)
Municipality	Publication year	2017	24 (85.7%)	4 (14.3%)	28 (100.0%)
		2018	14 (73.7%)	5 (26.3%)	19 (100.0%)
		2019	42 (80.8%)	10 (19.2%)	52 (100.0%)
		2020	23 (62.2%)	14 (37.8%)	37 (100.0%)
	Total		103 (75.7%)	33 (24.3%)	136 (100.0%)
Province	Publication year	2017	22 (84.6%)	4 (15.4%)	26 (100.0%)
		2018	7 (70.0%)	3 (30.0%)	10 (100.0%)
		2019	11 (39.3%)	17 (60.7%)	28 (100.0%)
		2020	6 (21.4%)	22 (78.6%)	28 (100.0%)
	Total		46 (50.0%)	46 (50.0%)	92 (100.0%)

and the SBK Determination Method. Notably, DuboCalc emerges as the predominant choice, utilized in a total of 68 cases out of 79 cases, a finding consistent with the conclusions drawn from the literature review.

2.4.2 Results from Expert Interviews

By analyzing interview data gathered from 12 specialists working in the procurement process representing various contracting authorities, we have identified seven pivotal concepts that play a crucial role in reaching green procurement successfully through the incorporation of quality criteria based on environmental performance.

1. **Organizational Structure of Projects**: The local environmental policy is intricately tied to the political context of the contracting authority, and shifts can occur due to events like municipal elections. This may lead to changing priorities regarding environmental criteria during tendering, such as a shift toward carbon emissions or other environmental impacts. Furthermore, establishing strong connections with the evolving market is vital since green criteria used in tendering are not yet widespread and the market is rapidly evolving.
2. **Tender Organization**: Procurement teams must prioritize environmental aspects during the tendering process. Moreover, project objectives should align with environmental criteria from the project's inception. Employing various environmental criteria, such as describing innovations qualitatively and demonstrating their environmental benefits through performance metrics, can amplify their impact. This approach necessitates maintaining consistency and coordination among these criteria, which calls for awareness among the practitioners involved.
3. **Cooperation with Stakeholders**: Managing environmental performance-based criteria effectively requires aligning the interests of project managers and clients. It also demands seamless collaboration with various other stakeholders, including suppliers and contractors. These elements underscore the importance of early engagement and communication with stakeholders during the (pre-)tender phase and at a broader organizational level.
4. **EPC Evaluation**: Contracting authorities can demonstrate their commitment by giving weights to environmental criteria and identifying the scenario that produces the highest potential value for quality. Additionally, the integration of assessment tools into tenders facilitates more impartial proposal evaluation, while also allowing contractors to assess the supplementary value of their bids in terms of quality, thereby promoting clearness throughout the tendering process.
5. **Mindset and responsibility of involved stakeholders**: Integrating environmental aspects into tenders hinges on factors like awareness, shared responsibility, motivation among contracting authorities and contractors, and mutual trust. Respondents highlighted the transparency facilitated by environmental performance tools in evaluating green criteria, as these evaluations rely on Specific, Measurable, Acceptable, Realistic, and Time-bound (SMART) values rather than

subjective assessments. Clear delineation of responsibilities between the client and contractor for evaluation is also crucial.

6. **Management of EPC**: Incorporating environmental performance-based criteria into tender award methods can enhance the overall value of the tender process. This improvement stems from the ability to provide precise specifications and clarify the client's objectives, essentially rendering environmental aspects SMART. Furthermore, the significance of monitoring and verification is acknowledged as crucial in achieving promised green scores and the overall goal of the green project.
7. **Resources for Implementing EPC**: The success of this concept hinges on the knowledge and experience of the project team, encompassing both internal and external experts. Some interviewees noted that when dealing with materials-related tools, internal expertise is often inadequate, necessitating the involvement of external experts, which can incur financial expenses. Additionally, practitioners should proactively enhance their understanding of environmental performance tools and broaden their application expertise.

2.4.3 Results from Case Studies

Table 2.2 provides a concise overview of the essential attributes and elements comprising the award criteria employed across these cases, complemented by the presence of seven specific concepts within each project. The table illuminates the notable disparities and commonalities in the incorporation of environmental performance-based criteria, which have exerted a tangible impact on the success of green procurement endeavors. Furthermore, it highlights that the seven concepts established from expert interviews were implemented divergently across the projects, resulting in varying effects of the performance criteria.

It is worth highlighting Project 2 as an exemplar of successful green procurement, given its comprehensive integration of most of these concepts in comparison with the other projects. Additionally, the judicious utilization of precisely defined performance criteria has had a favorable influence on the tendering process, ensuring alignment with project objectives and, on occasion, enabling distinctions among different tenderers.

The integration of EPC into tender processes can yield diverse impacts on tender success. This study has yielded three principal findings:

Clarity, Objectivity, and Transparency: The incorporation of environmental performance tools into tenders facilitates the precise delineation of environmental objectives and elevates the level of objectivity and transparency in evaluating these criteria. While this can be advantageous for the overall tender process, it necessitates significant work and may request specific resources, particularly in terms of expertise.

Table 2.2 Overview of the five projects with the adoption of seven concepts

	Project 1	Project 2	Project 3	Project 4	Project 5
Project type	Replacement quay walls	Reconstruction	Reconstruction	Maintenance	Maintenance
	"Groenwegje"	N395	N224	N343	N817
Work type	Waterworks	Road pavement	Road pavement	Road pavement	Road pavement
Contract type	Traditional	Design, Build & Maintain	Engineering and Construction	Traditional (RAW)	Traditional (RAW)
	(STABU + RAW)	(DBM)	(E&C)		
Contract budget	€ 1,736,000	€ 20,810,000	€ 2,412,000	€ 2,020,000	€ 975,000
Max. Potential value based on qualitative criteria	€ 670,000	€ 15,000,000	€ 1,600,000	€ 2,000,000	€ 267,250
Qualitative criteria (environmental)	CO_2 and NO_x reduction specific equipment (incl. plan of approach) Environmental performance of predefined elements	Plan of approach (Surroundings; NO_x reduction) Environmental performance (CO_2 footprint; Risk analysis of green innovation)	Environmental performance and circularity (Environmental cost indicator; Plan of approach processing tar-containing asphalt; CO_2 performance ladder) Plan of approach surroundings	Planning; Environmental performance of asphalt	Environmental performance of asphalt; CO_2 performance ladder
Calculation tools	Excel format DuboTool	DuboCalc	SBK determination method (version 2.0)	SBK determination method	SBK determination method
Achievement of seven concepts	C1, C2, C4, C5, C6,	C1, C2, C3, C4, C5, C6, C7	C2, C3, C4, C5, C6	C1, C2, C4,	C1, C2, C3, C4

Note **C1** = Organizational Structure of Projects; **C2** = Tender Organization; **C3** = Cooperation with Stakeholders; **C4** = EPC Evaluation; **C5** = Mindset and Responsibility of Involved Stakeholders; **C6** = Management of EPC; **C7** = Resources for Implementing EPC

Restricted Scope for Differentiation: EPC offers constrained opportunities for differentiation. The extent of this constraint is predominantly shaped by the structure of the tender and the flexibility permitted in terms of design and execution methods within the contract.

Green Procurement Complexity: It is important to note that green procurement is not inherently guaranteed through the inclusion of EPC. These criteria, on their own, do not assure a qualitatively superior environmental performance in the submitted offers.

2.5 Discussion and Conclusion

The research underscores the significance of recurrently utilizing environmental tools as a valuable strategy for aligning with environmental policy objectives. These tools not only encourage a green mindset among contractors but also provide a quantifiable measure of progress toward long-term environmental goals. While these tools excel at facilitating impartial assessments, they may not inherently cultivate distinctiveness. While incentivizing uniqueness encourages investment, it may not always be imperative for the success of an individual green procurement project. To mitigate any potential adverse effects of tool usage in the tendering process, it is crucial to strive for consistency in criteria across contracting authorities and involve end managers in defining requirements and criteria.

Incorporating environmental performance objectives into a tender can take one of two forms: as a requirement in the technical specification or as an award criterion. When paired with a qualitative measure that revolves around green innovations, the environmental performance criterion seamlessly integrates into the award criterion. Achieving identical performance scores among competing offers can indeed be deemed a successful tender outcome. However, the importance of distinctiveness becomes paramount for aligning with environmental policy objectives and fostering innovative solutions within the market. Therefore, further investigation is necessary to discern how EPC can incentivize distinctiveness. Furthermore, additional research is warranted to explore effective methods for monitoring environmental performance during contract execution, especially the development of monitoring tools.

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