



Green Public Procurement Practices in Norway

*The application of environmental criteria and the use of scoring
rules in Norwegian road transport tenders*

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This thesis was written as a part of the Master of Science in Economics and Business Administration at NHH. Please note that neither the institution nor the examiners are responsible – through the approval of this thesis – for the theories and methods used, or results and conclusions drawn in this work.

Preface

We were two students writing this thesis in the fall semester of 2017 as part of our MSc in Economics and Business Administrations at the Norwegian School of Economics. The thesis corresponds to credits worth one full semester of studies.

Writing this master thesis was a challenging project and the completion of it would have not been possible without the help of the following people and organizations:

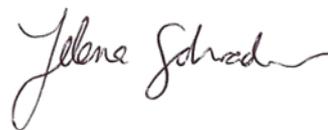
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Abstract

The goal of this thesis is to examine green public procurement (GPP) practices in Norway with a focus on road transport. In recent years, both in Norway and in the European Union there has been an increased focus on using public procurement to support environmental goals. The most suitable award method for this purpose is MEAT – most economically advantageous tender – which not only considers the price and minimum requirements of a bid but also other quality aspects. Such quality aspects can concern the environment. The use of MEAT as an award method usually requires organisations to adopt scoring rules. This thesis both identifies the extent to which public organisations in Norway consider environmental aspects in tenders and whether optimal scoring rules are applied. For this purpose, we use three data sources. First, two datasets comprised of road related tenders in Norway set the base for our analysis to better understand the status quo and past developments of green public procurement in Norway. Secondly, expert interviews help us explain some of the observations made in the data analysis. Lastly, survey results from public transport organisations in Norway inform us about the current scoring rules used for tenders, and allow comparing them with an existing framework on optimal scoring rules for different preferences. Our results show that there has been an increase in the share of tenders including environmental criteria in the past years and that there are regional, organisational and contractual differences. Northern Norway appears to have the lowest share of road transport related tenders with environmental criteria. Furthermore, tenders published at a county or municipal level are more likely to consider the environment than tenders published at a national level. In terms of contract type, it appears that service contracts have a higher share of environmental criteria than product contracts. Finally, we find that organisations or departments with the sole purpose of procuring road vehicles seem to value environmental criteria at a higher level than organisations where transport tenders are only a part of their value chains. When it comes to the use of scoring rules by public transport organisations in Norway, we identify a mismatch between the organisations' stated preferences regarding tender features and the actual scoring rules that are used. The results of our thesis inform policy makers about current GPP practices in Norway and on which basis they can assess whether the current level is as desired.

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List of Abbreviations

EC	Environmental criteria
EEA	European Economic Area
GHG	Greenhouse gas
GPP	Green public procurement
LCC	Life cycle cost
LP	Lowest price
MEAT	Most economically advantageous tender
MRS	Marginal rate of substitution
MVP	Monetary value of a point

1. Introduction

Public procurement is defined as the purchase of goods, services and works by the government and state-owned enterprises and accounts for 12% of GDP in OECD countries (OECD, 2017a). In the European Union, more than 250 000 public authorities annually spend 14% in GDP on public procurement - a public sector spending that amounts to a significant part of the economy (European Commission, 2017a).

In OECD countries, there is an increasing trend of using public procurements as a policy tool to achieve certain policy objectives (OECD, 2017b). While public procurements were traditionally viewed as solely fulfilling specific demands, they are now being used more strategically to add value to the surrounding environment (Telgen, 2007). In fact, public procurements can be used to address societal needs and achieve certain societal goals such as reducing unemployment, encouraging R&D and supporting small local businesses (Grandia & Meehan, 2017).

The main policy objective of public procurement is to properly spend taxpayer money by focusing on efficiency and cost-effectiveness (OECD, 2015). Secondly, the aim is to increase societal benefits such as sustainability and innovation (ibid.). Hence, it can be argued that societal benefits like environmental quality originating from public procurement can be part of the policy objective. Such an objective can be met through green public procurement (GPP), which is defined as the purchasing of goods, services and works with a reduced environmental impact across their respective product life cycles (European Commission, 2016a). GPP can include criteria that concern technical specifications and eco labels (ibid.).

When it comes to public procurement strategies, there are two main award methods that can be used to evaluate bids received for a published tender. The different award schemes are the lowest price (LP) and the most economically advantageous tender (MEAT) approach. Under LP, the procurer evaluates the different bids based on the lowest price, and only minimum requirements can be specified. Under MEAT, not only the price and minimum requirements are assessed, but also quality aspects are taken into account. This approach has become more popular in the past years and is recommended by the EU (European Commission, 2016b). It is argued that by considering both quality and price in the evaluation of bids, the efficiency of public procurement can be enhanced (Bergman & Lundberg, 2013). When MEAT is used as award method, scoring rules can be applied to account for the added quality aspect. Scoring

rules allow a procurer to weigh the different price and quality aspects and to arrive at one score (Ballesteros-Pérez et al., 2015). An underlying feature of scoring rules is that there is a trade-off between price and quality, i.e. usually a lower price implies a lower level of quality and vice-versa (Dini et al., 2006).

In 2015, Norway spent 480 billion NOK in public procurements, which corresponds to 15% of the national GDP (SSB, 2016). The Norwegian government is actively trying to support GPP practices in Norway. Both by allocating financial resources to relevant administrative areas and implementing regulations, the government aims to make it easier and more popular for public organisations to procure more environmentally friendly (Regjeringen, 2016).

Transport is the largest source of greenhouse gas (GHG) emissions in Norway and was responsible for 16.7% of all released GHG in 2015, out of which CO₂ is the main emission (Miljødirektoratet, 2017a). Within transport, most emissions originate from passenger cars and heavy vehicles like buses and trucks (ibid.). In the government's efforts to reduce GHG, the transport sector plays a vital role. That is why making road vehicles greener, and using public procurement to do so, is considered a relevant policy tool (Miljødirektoratet, 2017b).

1.1 Research questions

Given the increasing interest in procuring more environmentally friendly in Norway and the critical role the transport sector plays, this thesis is focused on understanding to what extent GPP is practiced in Norwegian road transport related tenders.

Question 1: To what extent do Norwegian public organizations consider environmental criteria in road transport related tenders?

Furthermore, the increased focus on MEAT as an award scheme in public organisations and therewith, the importance of scoring rules, generates the question of optimal scoring rules for tenders with environmental aspects.

Question 2: Do Norwegian organizations apply optimal scoring rules in road transport related tenders in accordance with their preferences for price and quality?

1.2 Thesis outline

This thesis is structured as follows: First, we present the past trends in GPP practices at EU level and in Norway in Chapter 2. Secondly, relevant literature on GPP is discussed in Chapter 3. We then differentiate between the two award schemes LP and MEAT and outline the different scoring rules that can be used for MEAT. A framework of price scoring rules is presented in Chapter 4. In Chapter 5, we briefly define the chosen methodology of this thesis, which includes two datasets, a survey and two expert interviews. The findings of the different data sources are individually presented and analysed in Chapter 6. We merge the different findings in Chapter 7 and discuss broader implications as well as limitations and weaknesses of our research. Finally, we conclude in Chapter 8 and discuss the contribution of our findings and future research topics.

2. Green Public Procurement development

The aim of this chapter is to better understand current GPP practices in the EU and in Norway. Since Norway is a member of the European Economic Area (EEA), GPP developments and practices at EU level are relevant for the country and can have legal implications. In fact, there is an EEA agreement that establishes a single public procurement market for all members (EFTA, 2010).

2.1 Green Public Procurement in the EU

As defined by the European Commission, GPP is the “*process whereby public authorities seek to procure goods, services and works with a reduced environmental impact throughout their life cycle when compared to goods, services and works with the same primary function that would otherwise be produced*” (European Commission, 2008, p.4).

The EU states that even though GPP is a voluntary instrument it can play a major role in the EU’s effort to reduce emissions and become more resource-efficient (European Commission, 2017c). In 2016, the European Commission published a GPP handbook called “Buying green!” with the aim to facilitate the purchase of more environmentally friendly goods, services and works by public authorities. The handbook discusses how GPP can be implemented, the overall procurement process and how contract requirements can be defined. Furthermore, the selection and exclusion of tenders as well as the rules for awarding a contract are presented. By providing general guidance, discussing practical examples and presenting sector specific GPP approaches, the EU hopes to offer a useful reference for public and private actors who are interested in green tenders (European Commission, 2016b).

In terms of preferred award schemes, the EU’s procurement directive advises in 2014 that all contracts in public procurement should be awarded based on a framework called MEAT – most economically advantageous tender – which is particularly relevant for GPP (European Commission, 2016b). The new procurement package was established to put more focus on quality aspects such as environmental quality. It includes three new directives that ensure the legislative framework: Directive 2014/24/EU on public procurement, directive 2014/25/EU on procurement by entities operating in the water, energy, transport and postal services and directive 2014/23/EU on the award of concession contracts (European Commission, 2017d). Overall, the aim of the directive is to facilitate the entire procurement process – from planning

a tender to signing a contract (Regjeringen, 2015). Through the directives, the EU hopes to ensure equal treatment of tenderers, hinder corruption, support economic integration and enhance current procurement practices (European Commission 2017a). As a committed member of the EEA agreement, Norway implemented this new procurement regulation on January 1st 2017 (Torkelsen, 2017).

2.2 Green Public Procurement in Norway

In recent years, the Norwegian government has paid more attention to public procurement as a policy instrument. Norway is currently experiencing a so called “green shift”, which describes the goal of becoming a zero-emission nation by 2050 (Regjeringen, 2016). The government states that public procurement can be a useful tool to reach that goal (ibid.). In fact, in 2016, the Norwegian Parliament proposed a public procurement regulation that advises public organizations to value environmental quality aspects at a minimum of 30% in tenders where they are considered relevant. The regulation came into force on May 1, 2017 (Regjeringen, 2017). The aim of this regulation is to increase the share of green public procurements in Norway. According to the Norwegian climate and environment minister Vidar Helgesen, this regulation demonstrates that public procurements should contribute to environmentally friendly solutions in areas where they are relevant (ibid.). Furthermore, the government allocated NOK 15 million in the 2017 budget to the national public management agency Difi, dedicated to support the development of a scheme for better GPP assessment (Difi, 2017a).

In 2016, Inventura published a report that analyses the inclusion of environmental criteria in four public procurement areas in Norway: Furniture, work clothes, IT equipment and transport. The report includes 244 tenders that were published on Doffin in 2015. Almost half of them were transport related with 100 tenders in total, which included road transport, ferries as well as airplanes. Out of the transport related tenders, 30% include environmental aspects as qualification requirements or award criteria (Inventura, 2016). The report does not differentiate between LP and MEAT and includes any kind of minimum environmental requirement in the analysis.

In a study conducted by Michelsen and de Boer (2009) on GPP practices in Norway, a significant positive correlation between the size of a municipality and the focus on GPP was found. Furthermore, the size of a municipality was also found to be correlated with the

existence of a purchasing department and a procurement strategy. Overall, the scholars conclude that there is an increased focus on GPP in Norway. However, there also appears to be a need for more guidance from national authorities when it comes to developing environmental capabilities at a county and municipality level (Michelsen & de Boer, 2009).

As for procurement standards in Norway, Norwegian municipalities are fairly independent when setting their own priorities and deciding on how to provide services to their local community (Michelsen & de Boer, 2009). That is why the different municipalities' procurement budgets can vary considerably. Some municipalities may provide all the services like waste management and elderly care themselves, whereas other municipalities may outsource such services to third parties (*ibid.*). Furthermore, the municipalities are also free to set their own environmental criteria as long as they comply with the public procurement act from 2016 (Regjeringen, 2017).

3. Literature review

This chapter presents previous GPP research, outlines the two main award methods that can be used in public procurement and discusses GPP specific award methods. Furthermore, the concept of scoring rules under the MEAT award method is introduced.

3.1 Green Public Procurement

According to Bouwer et al. (2005), GPP is defined as the practice of public actors to integrate environmental criteria into their procurement process throughout all stages. By choosing products and services that have the least possible impact on the environment throughout their life-cycle, the development of environmentally friendly products and the spread of environmental technologies can be encouraged (Bouwer et al., 2005).

Bowen et al. (2001) differentiate between two main types of green supply. The first type refers to “greening the supply process” and describes the adjustments made by the firm’s supplier management activities to incorporate environmental considerations. The second type describes “product-based green supply” and aims at greening the product itself rather than the behaviour of the supplier (Bowen et al., 2001). When environmental aspects are considered in public procurements, the latter supply type should be chosen to include relevant award criteria in the tender (Michelsen & de Boer, 2009).

Under GPP, the use of environmental criteria is required. Such standards can include eco-labels, certain energy efficiency levels as well as thresholds for emission intensity and noise (Rainville, 2016). With a suitable set of criteria, all forms of GPP can potentially stimulate secondary policy goals of environmental improvement (ibid.). However, the establishment of such criteria can be challenging due to the issues linked to identifying and describing the environmental impact of projects (Uttam & Le Lann Roos, 2015).

Within the field of economics, international peer-reviewed literature on the topic of GPP has been scarce (Lundberg & Marklund, 2011). Previous studies that have been conducted on GPP primarily focused on the potential benefits of GPP (ibid.) but not on how useful it can be as a policy instrument (Lundberg et al., 2015). According to a study conducted by Lundberg et al. (2015) on cleaning service procurements in Sweden, GPP has very limited effects as a policy tool. The scholars find that green criteria in tenders may not be well identified. The

organisations that participated in the study were often unable to specify the environmental problems their criteria were supposed to solve (Lundberg et al., 2015). With respect to cost-effectiveness, using GPP as a climate policy tool is not as environmentally cost-effective as an emission tax (Lundberg & Marklund, 2013).

Another aspect to consider is the potential of positive externalities originating from GPP. Through stimulating demand for environmental products on a public level, GPP may also inspire the private sector and could even create a market for more sustainable products and services (Preuss, 2007). According to Li and Geiser (2005), this can be the case when public authorities are a significant buyer in a sector.

3.2 Contract awarding methods

As part of any public procurement strategy, an award method needs to be determined for a tender to set the basis for the evaluation of the different bids. Today, there are two main approaches that procurers implement. First, a procurer can base the evaluation on the LP method, where bidders compete on price. The second method is the most economically advantageous tender MEAT approach that also takes other quality aspects into account (Bergman & Lundberg, 2013).

3.2.1 Lowest price

The public sector has used the lowest price criterion as award method for a long time (Waare & Bröchner, 2006). This award method can set minimum quality requirements that bidders will have to satisfy when submitting a bid. The bids received will then be evaluated solely based on price. The contract is awarded to the bid with the lowest price (Bergman & Lundberg, 2013). The advantage of this method is that it is relatively simple to implement for the procurer. There is no need to evaluate the quality aspect other than the minimum requirements. However, a limitation of LP can be that this method ignores any additional quality a bid may provide. Furthermore, it can be challenging for organisations to define appropriate and effective minimum requirements, and in the case of multiple price elements in one bid, to measure them in a single price unit (ibid.).

3.2.2 Most economically advantageous tender

The shortages in the LP award method can be solved by using the most economically advantageous (MEAT) method, which enables the procurer to consider additional quality aspects. There are different approaches under MEAT an organisation can use. One option is to award the contract to the bid with the highest level of quality for a given price, which is called a *beauty contest* (Bergman & Lundberg, 2013). The other option is to combine the price and quality elements to one score (ibid.). This option makes scoring rules necessary.

3.2.3 Concept of scoring rules under MEAT

A scoring rule is a method where quality is weighted against price according to the buyer's preferences. In scoring auctions, the buyer announces the way the different offers will be ranked and suppliers submit an offer including all dimensions of the product (Asker & Cantillon, 2008). The contract will be awarded to the supplier with the highest score according to the scoring rules (ibid.). To calculate a score, there are two approaches a procuring organisation can follow. Either the quality aspect is evaluated in monetary terms, or the price and the quality aspects are transformed into points, which add up to a score (Bergman & Lundberg, 2013). For the latter, there are specific price scoring rules that can be used (Dini et al., 2006).

A procurer may score a bid based on the relative offer or based on absolute terms (Dini et al., 2006). A relative scoring rule can include the highest and/or lowest bid as a base price, whereas an absolute scoring rule specifies a reserve price that is determined independently of the submitted bids (ibid.). According to Chen (2008), scoring based on relative rules is inefficient due to a possible ranking paradox. Relative scores hinder full transparency in the tender and consequently, do not reveal the best possible tender. By basing the scores on either the lowest or highest bid or both there is the risk of tenderers applying game theory. Under game theory, the tenderers will have to try to guess or calculate what the other tenderers submit, to be able to find their best strategy. Hence, applying relative scoring rules does not necessarily lead to the economically optimal solution (Chen, 2008). Instead, a fully transparent award system enables tenderers to calculate their score after they have formulated their proposal, independently of other bids (ibid.).

3.2.4 GPP award methods

In recent years, it has become more popular to include environmental aspects in the quality criteria under MEAT (Bouwer et al., 2005; Parikka-Alhola, Nissinen & Ekroos, 2006). One way of doing so is by considering the life cycle impact of a procurement (Parikka-Alhola & Nissinen, 2012). By analysing the life cycle impact, it is possible to account for the negative externalities originating from a product, service or work (European Commission, 2016a).

More generally, to create an efficient environmental policy tool, authorities need to find award methods and scoring rules that account both for price and environmental aspects (Lundberg & Marklund, 2011). When it comes to the different award methods and scoring rules for GPP, Lundberg and Marklund (2011) propose four main methods: Price only, environmental quality only, environmental quality-to-price scoring and price-to-environmental quality scoring. Under *price only*, the procurer specifies minimum environmental requirements and the participating bidders compete only based on price. The bidders who meet the minimum requirements are allowed to submit a sealed bid and the contract is awarded to the lowest bid. However, the disadvantage of this approach as discussed by Parikka-Alhola and Nissinen (2012), is that even though the procurer would settle for a decent level of environmental aspects, she would not be able to reward additional environmental performances. The next three approaches mitigate this risk. When *environmental quality only* is considered, the procurer sets a certain price and the bidders only compete in environmental quality (Lundberg & Marklund, 2011). This approach falls under the category *beauty contest* as discussed in the beginning of this subchapter. The third method *environmental quality-to-price scoring* transforms environmental quality aspects into price units, which are then deducted from the bid price. Lastly, under *price-to-environmental quality scoring* the price is transformed into points and then scored together with the environmental quality (ibid.). The scholars state that in terms of practicality, the *environmental quality to-price* is to be preferred, since the contractors can award the contract based on price.

4. Formulating price scoring rules

In this chapter, we present the different scoring rules that can be used for bid evaluations under MEAT with a focus on price scoring rules. We discuss the underlying economic principles that can shape price scoring rules and describe the individual features of the rules. This chapter is based on the scoring rule framework proposed by Dini, Pacini and Valletti (2006) in the *Handbook of Procurement*.

4.1 Scoring rules

In the framework proposed by Dini et al. (2006), scoring rules are based on a price scoring equation where the price bid is transformed into a score. The total score is initially allocated between price and quality. As discussed by the scholars, a price scoring rule reveals the buyer's preference for price and quality based on a given price score.

4.1.1 Transforming the price into a score

Dini et al. (2006) propose to start the scoring rule process by evaluating the price. For this purpose, the scholars introduce the term monetary value of a point (MVP), which represents the amount by which the price has to be reduced to gain an additional point on the price scoring scale. The MVP indicates the buyer's preference for price – her willingness to pay - at any given level of a price bid. MVPs can be constant or variable. When an MVP is constant, the marginal valuation of quality is constant, whereas when the MVP is variable, the valuation of quality is related to the price level.

4.1.2 The indifference curve of the buyer

An indifference curve shows all combinations of two goods or parameters that yield the same utility for the buyer (Pindyck & Rubinfeld, 2013), in our case the combination of price and environmental quality. There are three basic forms of indifference curves: Linear, convex and concave (ibid.). Indifference curves are based on the concept of a marginal rate of substitution (MRS). MRS indicates how much the buyer is willing to give up of one good in exchange for one additional unit of the other good at any level of one of the goods (Pindyck & Rubinfeld, 2013). It could also be viewed from the opposite perspective, that is, how much of a good does the buyer have to obtain to be willing to give up one unit of the other good. Another important

aspect of indifference curves is the budget constraint. With a limited amount of capital available, the buyer faces a trade-off between two goods (ibid.). The three indifference curve slopes are explained below and illustrated in Figure 4.1.

Linear indifference curve

In a linear indifference curve, the buyer's MRS of two goods is constant (Pindyck & Rubinfeld, 2013). The same holds for price scoring rules where the two goods are described by quality and price. As we see in Figure 4.1, the amount of money the buyer is willing to pay for an additional unit of quality is constant for all levels of price and quality.

Concave indifference curve

In a concave indifference curve, MRS is not constant (Pindyck & Rubinfeld, 2013). In the case of scoring rules, for a low level of quality, the buyer is willing to pay more than one unit of price to obtain an additional unit of quality. For a high level of quality, she needs a significant quality improvement to be willing to give up one unit of the price parameter. In other words, the more she has of one of the two goods, the more she is willing to give up of that good to get an additional unit of the other good. This type of preference indicates a positive but decreasing marginal utility of the goods (ibid.).

Convex indifference curve

In a convex indifference curve, the preferences at different levels for two goods have the opposite shape as the concave indifference curve (Pindyck & Rubinfeld, 2013), see Figure 4.1. In the case of scoring rules, this implies that at a low level of quality a high quality improvement is required to be willing to give up one unit of price. However, the higher the quality level, the more the buyer is willing to spend for an additional unit of quality. The convex indifference curve corresponds to a scoring rule that promotes aggressive bidding, where the score value of one unit of price increases as the price decreases (Dini et al., 2006).

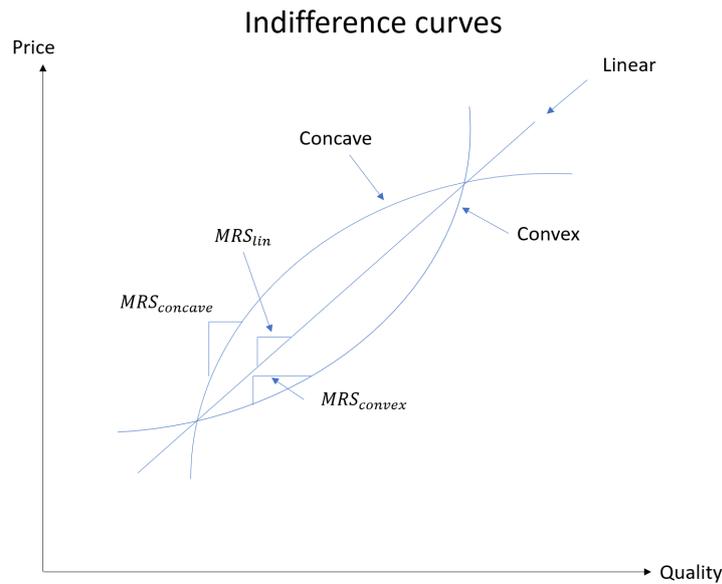


Figure 4.1: Three types of indifference curves and their respective MRS. Source: own illustration, based on Pindyck & Rubinfeld, (2013).

4.2 Price scoring rules

Dini et al. (2006) divide price scoring rules into simple and alternative rules, which are based on either absolute or relative terms. Within these categories, the scholars discuss five different types of price scoring rules that differ in terms of price valuation. The differences between the five rules can be assessed based on four features: *simplicity*, *predictability*, *competition* and *sensitivity of bid distribution*. The scholars do not define these features in detail. Based on how they are applied on the five rules, though, we find the following definitions suitable: The feature *simplicity* is defined as how simple it is for both the procurer and the bidder to understand the rule. *Predictability* describes how effortlessly the bidder can calculate her score in advance, based on the proposed bid. *Competition* can be described as the extent to which the rule promotes competition in price bidding, whereas *sensitivity of bid distribution* reflects how sensitive the price bid is to the submitted other bids.

4.3 Simple scoring rules

Simple scoring rules only consider the tenderer's bid price in the equation and do not benchmark it against other bids when calculating the price score. With simple scoring rules,

the relationship between the score, the price and the MVP are known a priori (Dini et al., 2006).

4.3.1 Linear rules

The linear scoring rule is the most primitive rules of the five types (Dini et al., 2006). A linear rule means a linear indifference curve. The rule proposed by Dini et al. (2006) is presented below:

$$Price\ score = nn * \frac{(Reserve\ price - Price\ bid)}{Reserve\ price - Price\ threshold}$$

The reserve price in this formula is defined as the highest bid allowed, e.g. the buyer's budget constraint. The price threshold, on the other hand, indicates the lowest bid allowed. Finally, *nn* stands for the share of total points allocated to the price parameter. The price threshold can be used to avoid abnormally low bids and thereby reduces the risk of choosing a bid with an unrealistic price.

A feature of the linear rule is that the score does not depend on the other bids. In this way, the bidders know their price score a priori. In addition, the MVP is constant (Dini et al., 2006).

Based on the aforementioned four rule features, the linear scoring rule is categorized as follows: Both in terms of predictability and simplicity the linear rule receives a full score (3). The linearity of the rule makes its application simple compared to other rules (simplicity). Also, the score is independent of other bids (simplicity and predictability). Finally, the calculation of points can be done ex ante (predictability). As for competition, the rule only scores 1 point. This is mainly because prices below the price threshold will not be considered, and the linearity of the rule does not award low bids increasingly as they decrease in price. It should be noted that the incentive for price competition can be altered by adapting the price threshold. Given that the rule does not depend on any other bid, it achieves a minimum score on sensitivity to bid distribution.

4.3.2 Parabolic rules

The second simple rule is the parabolic rule. With parabolic scoring, the score increases with lower bids, but at a diminishing rate (Dini et al., 2006). This reflects a preference for price and quality described by the concave indifference curve. The buyer has a positive but decreasing

marginal utility of both price and quality, given a budget constraint. The parabolic scoring rule is defined as follows (Dini et al., 2006):

$$Price\ score = nn * \left(1 - \left(\frac{Price\ bid}{Reserve\ price} \right)^2 \right)$$

This rule differs from the linear rule. The MVP increases with a lower price (Dini et al., 2006). Since the indifference curve of the buyer for this rule is not linear, the MVP must be calculated for any price bid, which makes the bidding strategy more complicated. An important aspect of the parabolic rule is that it stimulates aggressive bidding when the price is close to the reserve price (ibid.). Hence, the likelihood of receiving bids close to the reserve price is lower. At the same time, the chance of receiving abnormally low price bids is reduced due to diminishing marginal returns of a lower price. For the valuation of quality, this implies that quality is increasingly favoured as the price bid decreases.

Furthermore, the four aforementioned features in this rule partially differ from the linear rule (Dini et al., 2006). The parabolic scoring rule receives 2 points on simplicity. Compared to the linear scoring rule it is more complex, which leads to a lower score. It is considered less simple because the score increases with a lower price at a diminishing rate. Like the linear scoring rule, a score of a bid under the parabolic rule does not depend on other bid prices, which is why it scores 3 points in predictability. As for competition, the rule receives 2 points. Even though the marginal growth of the score decreases with lower price bids, the curve flattens close to the lowest possible price bid. This lays the ground for aggressive price competition at high price levels. Finally, the rule receives a minimum score on sensitivity to bid distribution as it does not depend on other bids than the bid to be assessed.

4.4 Alternative scoring rules

Alternative scoring rules are more complex and less predictable than simple scoring rules (Dini et al., 2006). In the case of alternative scoring rules, calculating the score of a bid depends on the distribution of the other bids submitted. That is why the bidder cannot know her score a priori. This creates uncertainty about the MVP and the bidder's final score. In contrast to the simple rules, alternative rules do not require a reserve price in the formula to compare the price bids. Instead, each bid score is relative to other bids. By not requiring a reserve price, alternative scoring rules can allow a buyer to formulate rules for new and more complex

projects, for which there might be a lack of available data (Dini et al., 2006). The different alternative scoring rules are presented below. An ex ante setting of parameters is not necessary, except for the weighting of price and quality (nn) (Dini et al., 2006).

4.4.1 Lowest bid scoring

The lowest bid scoring rule uses the lowest bid to calculate the score of a given bid. Dini et al. (2006) define the rule as shown below.

$$Price\ score = nn * \frac{Lowest\ bid}{Price\ bid}$$

Distinct features of the lowest bid scoring rules are the following (Dini et al., 2006): Since the price score depends on the lowest bid, an abnormally low bid which is retracted might change the score and the ranking. Also, the rule gives an incentive for aggressive bidding. By submitting a very low bid, a bidder increases the likelihood of obtaining the highest score while reducing the score of the other bidders. A convex indifference curve reflects the application of the lowest bid rule.

The lowest bid scoring rule receives a maximum score on simplicity, as the buyer only needs to know the lowest bid to calculate the score. With respect to predictability, the rule achieves a minimum score, since the bidder will need to know the lowest bid to be able to calculate her expected score. The rule gives strong incentives for aggressive bidding, because the marginal price score increases with a decreasing price. This means that the lower the price the more points can be obtained by decreasing the price by one additional unit. It is also given a maximum score on sensitivity to bid distribution because it is highly sensitive to the lowest bid.

4.4.2 Highest bid-lowest bid scoring

The highest bid-lowest bid rule considers both the highest and the lowest bids to calculate a price score. The scholars propose the following formula (Dini et al., 2006):

$$Price\ score = nn * \frac{Highest\ bid - Price\ bid}{Highest\ bid - Lowest\ bid}$$

Like the aforementioned parabolic and lowest bid rules, this rule can promote aggressive bidding, as the lowest bid receive the maximum score while the highest bid receives zero points.

The highest bid- lowest bid scoring rule is given 1 point on simplicity. The rule includes two relative terms, the highest score and lowest score, which makes it more complex than the rules mentioned so far. In terms of predictability, the rule is also given 1 point, since it can be difficult for the buyer to estimate both the highest and the lowest bid beforehand. With a constant marginal growth of the score, it receives a maximum score on competition. The rule depends solely on the highest and lowest bids and is given 1 point on sensitivity to bid distribution.

4.4.3 Average scoring

The average scoring rule uses the average bid price to determine the price score. The rule is illustrated below (Dini et al., 2006).

$$\text{If } bid < \text{Average bid} \rightarrow \text{Price score} = nn$$

Otherwise:

$$\text{Price score} = nn * \frac{\text{Highest bid} - \text{Price bid}}{\text{Highest bid} - \text{Average bid}}$$

All bids below the average bid are granted a full score. Bids above the average are scored based on the variance between the submitted bid and the highest bid as well as the variance between the highest bid and the average bid. The lower a bid above the average is, the higher is the score. The larger the variance between the highest bid and the average bid is, the lower is the score achieved. The score of a bid above the average decreases and increases at a linear rate with a changing bid price (Dini et al., 2006). For all bids above average the linear indifference curve reflects this rule. All bids below the average have a constant score.

One important feature of the average scoring rule is that all bids lower than the average bid are scored equally, which can function as an incentive against very low bids. This feature can be compared with the aforementioned price threshold in simple scoring rules, which has a similar function. This rule incentivizes to forecast the average bid and place a bid slightly below the forecasted value. As discussed in the beginning of this subchapter, a buyer might

lack market knowledge to set a reserve price for some tenders. In that case, this scoring rule can be considered a suitable replacement rule for buyers who usually apply simple scoring rules. By including the average bid price in the formula, a procurer can approximate a market price.

The average scoring rule achieves a minimum score on simplicity, predictability and competition. However, in terms of sensitivity to bid distribution, the rule scores 2 points due to its dependency on all bid prices received. This makes the rule rather complex and the bidders will not know their respective score ex ante. The average scoring rule is not only unpredictable compared to the simple scoring rules but also compared to the other alternative scoring rules. It might be more difficult to gain information about all bid prices beforehand than identifying the highest and/or lowest bid price. As for competition, the average scoring rule receives a minimum score, mainly because all bids below the average are rated identically. Compared to the lowest bid scoring rule, the average scoring rule is less vulnerable to changes in the individual bid prices.

4.4.4 Summary of scoring rules

Overall, it can be noted that the features of the five rules differ fundamentally. The buyer should make a careful choice depending on her preferences. The table below summarizes the scores of the five scoring rules on the different features.

Feature	Scoring rule				
	Average	Lowest bid	Highest bid – lowest bid	Linear	Parabolic
Simplicity	0	3	1	3	2
Predictability	0	0	1	3	3
Competition	0	3	3	1	2
Sensitivity to bid distribution	2	3	1	0	0

0 = min. level 3 = max level

Table 4.1: Relative scoring of price scoring rules on different features. Source: own illustrations, based on Dini et al. (2006).

4.5 Scoring rule example

To illustrate how the five scoring rules can differ in terms of score points we present the example discussed by Dini et al. (2006). However, it should be noted that this is only one specific example and that the scores might differ in another example. In the example, the assumptions are the following:

Price parameters: 30 points (maximum number of points to be achieved by price)

Number of bids: 10

Reserve price: \$ 1000

Threshold: \$ 100

Average bid price: \$ 500

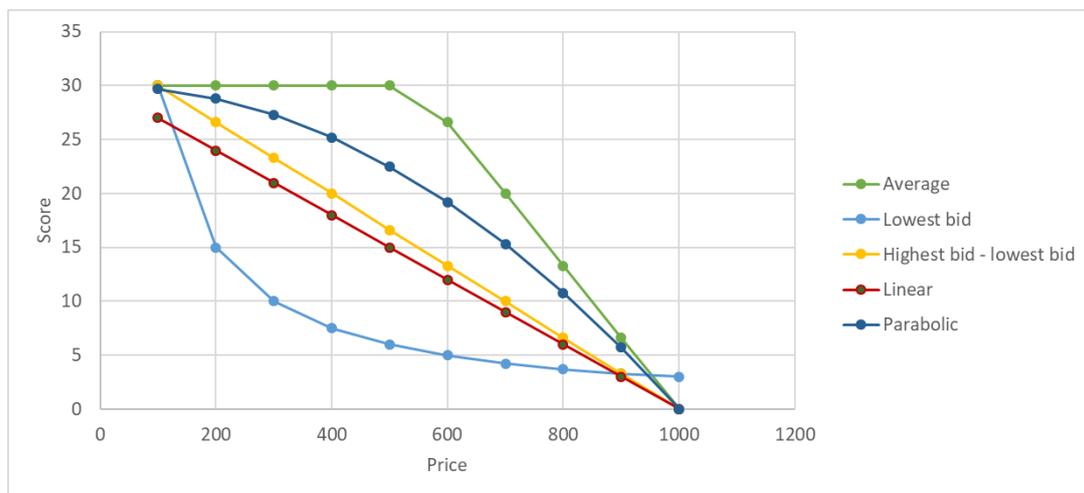


Figure 4.2: Example of price-scoring rules, Source: own illustration, based on Dini et al. (2006).

In Figure 4.2 it can be seen that the **average scoring rule** provides the highest marginal return on price reductions - in terms of score – for bid prices above 600. The **lowest bid rule** presents a different approach. A price bid at the reserve price scores 3 points, while at high prices in general the marginal return on lower prices is the lowest of all the rules. The aggressive bidding incentive in this rule lies in the increasing marginal return on lower prices, as can be seen in the figure. Only the lowest bid receives 30 points. In this example, the **highest bid-lowest bid rule** has a constant marginal return on lower prices. It has a similar slope as the

linear rule, and only rewards 30 points to the lowest bid price. The **linear rule** also has a constant marginal return on lower prices, but a slightly less steep slope than the highest bid-lowest bid rule. The **parabolic rule** has a positive but decreasing marginal return on lower prices and a steeper slope close to the reserve price than the linear rule. Thus, the rule provides an incentive for aggressive bidding close to the reserve price (the highest price), but an incentive against aggressive bidding for bids closer to the lowest possible price bid.

To explain how price scoring rules can be used in tenders that consider the environment, we could assume that the remaining 70 points are all allocated to environmental quality aspects. Such an aspect could concern CO₂ reductions by ton. The level of reduced CO₂ emissions, e.g. compared to conventional technology, would be transformed into a score equivalent with a maximum level of 70 possible points.

5. Methodology

Our two research questions determine the choice of our methodology and research design. The purpose of this thesis is to better understand GPP practices in Norway with a focus on award methods and scoring rules. That is why our approach follows both a descriptive and an exploratory research approach. A descriptive research approach investigates *what* rather than *how* and *why* (Saunders et al., 2009). However, to be able to investigate the topic more thoroughly and to allow for more flexibility in our research, we also pursue an exploratory purpose.

5.1 Research design

The research design of this thesis follows a mixed methods research approach where both quantitative and qualitative data is collected as described by Saunders et al. (2009). We have a diverse research strategy with two datasets, a survey and expert interviews. There are several reasons why a mixed methods research approach is favourable for our thesis. First, using three research strategies allows collecting complementary data that fill potential gaps originating from using one strategy only (Bryman, 2006). Secondly, with the help of quantitative findings we can assess the overall environment of public procurements in Norway, whereas we need qualitative data to analyse the different aspects. Lastly, the rather scarcely researched nature of our topic implies uncertainty to obtain relevant information. That is why a diverse set of findings is required.

5.2 Research strategy

The data collection was done in three phases. We first analysed publically available data from the Norwegian public procurement database Doffin before conducting and designing qualitative research approaches. Once we had gained a better understanding of the public procurement environment in Norway, we designed a survey that was sent out to different public transport organisations. Based on our findings in the Doffin data and the focus in our survey, we contacted relevant procurement organisations for expert interviews. It should also be noted that we conducted two test interviews with relevant organisations to gain a better understanding of the overall topic before defining our research strategy. The survey and interview questions can be found in the appendix.

5.2.1 Doffin dataset

The method chosen in this thesis is to analyse award notices published on Doffin in 2014, 2016 and 2017. An award notice announces the winning bid of a tender and includes all relevant information of the original tender. We created two Doffin datasets that include all road transport related award notices by filtering on relevant CPV codes (common procurement vocabulary). Doffin provided a dataset with all published award notices in 2014. The 2016/2017 dataset was solely created by us and comprised all relevant award notices published on Doffin between September 2016 and September 2017. It should be noted that it was not possible to create or obtain a similar dataset for 2015 due to a lack of available information online. Doffin stated that this type of dataset currently only exists for 2014.

5.2.2 Survey

To answer our second research question, we designed a survey for Norwegian public transport organisations. The survey questions are based on information obtained from existing literature, official EU and Norwegian procurement documents as well as the two test interviews. We created a list of all public transportation organisations in Norway. We contacted the different organisations and explained the purpose of the thesis before sending out the survey. The survey was internet-based and self-administered. It was sent out to 15 public transportation organisations in Norway and comprised of 32 questions. The organisations were asked about their current public procurement practices with respect to preferred award methods and EC. In total, eight organisations filled in the survey, primarily completed by the head of procurement of the respective organisation. Due to the limited and partially incomplete pool of replies, only six responses are presented and discussed in this thesis.

5.2.3 Expert interviews

Two public organisations with a relevant public procurement background related to road transport were interviewed. The expert interviews follow a flexible structure to allow for a better exploration of the topic. The questions in the expert interviews relate to current GPP practices and the overall procurement environment in Norway with a focus on future trends. The interviews were conducted via telephone and Skype and lasted for 40-60 minutes. They were both recorded and transcribed.

6. Data analysis

This chapter presents our empirical findings and is divided into three subchapters. First, the findings of the two Doffin datasets are described. Secondly, the results of the survey are illustrated in a table. Finally, the conducted expert interviews are summarized.

6.1 Doffin datasets

This analysis is based on two datasets that include all road transport related award notices that were published on Doffin in 2014 and 2016/2017. Doffin is the Norwegian national notification database for public procurements and allows contracting authorities to create and publish notices, and suppliers to find them (Doffin, 2017). All tenders with a value above or equal to 500 000 NOK are to be published on Doffin (Doffin, 2014). A tender is usually marked with one or several CPV codes, which refer to *common procurement vocabulary*. This method was introduced by the European Commission and allows procurement contracts to be described by standardized references (European Commission, 2017b). We filtered the published award notices by road transport related CPV codes to create our two research datasets.

In the following subchapters, we describe and discuss the features of these two datasets. The focus in this analysis is on the use of different award methods and the application of environmental criteria (EC). The tenders are sorted by transport categories, regions, contract types and public organization level. Due to restrictions in the amount and quality of the observations gathered, our analysis is limited to descriptive statistics. However, it should be noted that the datasets represent the entire population and not only a sample.

6.1.1 Features of the datasets

In the following section, the features of the two datasets are presented in terms of applied CPV codes, number of observations and the chosen periods and categories.

CPV codes

We identified all road transport relevant CPV codes, which set the basis of our analysis. The individual codes with their respective description are presented in the table below.

Table 6.1: Road transport related CPV codes

CPV codes	Description
34000000	Transport equipment and auxiliary products to transportation
60000000	Transport services (excl. Waste transport)
64100000	Post and courier services
90500000	Refuse and waste related services
90620000	Snow-clearing services

Dataset characteristics

We received the 2014 dataset from Doffin. We created the 2016/2017 dataset ourselves, since Doffin could not provide us with a similar dataset for this period. The 2014 dataset initially contained 2604 award notices. Filtered by the road transport CPV codes chosen for this thesis, this number was reduced to 72 award notices. The 2016/2017 dataset contains all road transport related award notices published on Doffin from the 30th of September 2016 to the 25th of September 2017, which are 224 award notices in total. At the time of the creation of the dataset, this was the maximum amount of publicly available award notices in Doffin's search tool.

Identification of EC

In MEAT tenders, we classify as "EC applied" when the buyer weighs the environment at more than 0%. In the case of LP tenders, this is the case when there is an environmental requirement above today's legal standards, e.g. the buyer requires biofuel. To be able to assess whether EC are being applied in LP tenders published on Doffin, we had to access the actual tender documents, since such information was not systematically stated on Doffin. We searched the documents for ten environmental key terms, e.g. "miljø", "bærekraft" and "bio". It is to be noted that 83% of LP tenders in the 2014 dataset and only 19% in the 2016/2017 dataset were linked to documents. Hence, it is likely that we did not identify all LP tenders with EC in our analysis. This is further discussed in limitations and weaknesses in Chapter 7.

Categories

For the purpose of the following analysis, the award notices, i.e. tenders, in both datasets are allocated to six different transport categories:

- Bus
- Fire truck
- Waste management
- Heavy truck/other heavy vehicle

- Passenger car/van
- Taxi/minibus

The decision to merge taxi and minibus to one category was made on the grounds that both taxi and minibus tenders often related to the transport of patients or students. In passenger car and van tenders the transport purpose was not specified.

Furthermore, we differentiate between the geographical regions in Norway. The country is commonly divided into are five different areas. However, due to a limited amount of observations for Sørlandet, we decided to merge that region with Vestlandet. Hence, the regions discussed in this thesis are the following:

- Østlandet
- Vestlandet (including Sørlandet)
- Trøndelag
- Nord-Norge

Data cleaning

Award notices for cancelled tenders, i.e. no supplier was awarded the contract, were eliminated and not considered in our analysis. Tenders that neither specify the award method (LP or MEAT) nor mention price or environment/quality in the tender description, are assumed to follow LP as the award method.

6.1.2 Award method and the use of EC

This part of our analysis focuses on the two award methods used by organisations and the application of EC.

Award method

Since the EU prefers MEAT as an award method and supports organisations in their procurement strategies with information material, we consider it relevant to identify the preferred award method in Norway. Figure 6.1 shows the development in the use of LP and MEAT as an award method. Overall, it can be observed that the majority of published road transport related tenders use MEAT as an award method. In fact, the use of MEAT increased from 57% in 2014 to 63% in 2016/2017.

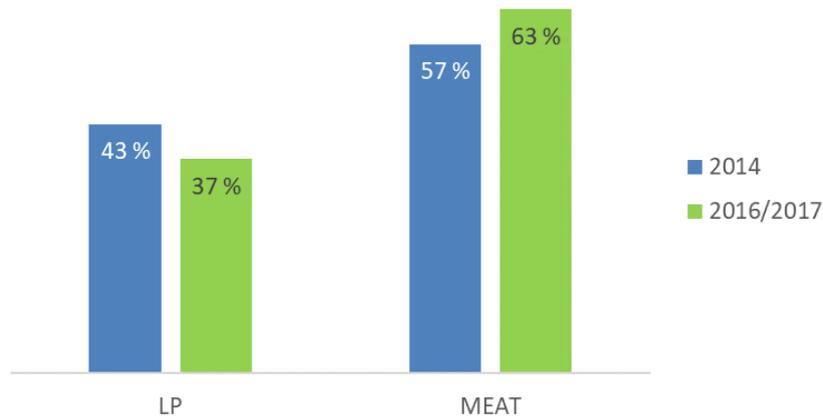


Figure 6.1: Use of award method

Share of EC

When it comes to the use of EC in tenders, one third of all published road transport tenders include some sort of environmental criteria as part of their evaluation method. As can be seen in Figure 6.2, the share of tenders using EC increased by 74%¹ between 2014 and 2016/2017. Available data do not allow us to determine the growth rate per year. The Inventura study on transport related tenders (see Chapter 2) identified a share of 30% of tenders with EC in 2015. This would correspond to a slight increase of three percentage points between 2015 and 2016/2017. However, since the study also included non-road transport related tenders like airplanes and ferries, we cannot consider this share fully representative.

As presented in Chapter 1 and 2, MEAT is the preferred award method for GPP and hence for all tenders that consider EC. That is why this analysis also evaluates how many MEAT tenders included EC. In 2016/2017 every second tender includes EC. Compared to 2014, there was an increase of 50% in the use of EC under MEAT. Although our analysis lacks information for some LP tenders, the extremely low percentage of LP tenders that involve EC justifies the assumption that the share of EC in relevant tenders using MEAT is significantly higher.

¹ 0,33/0,19

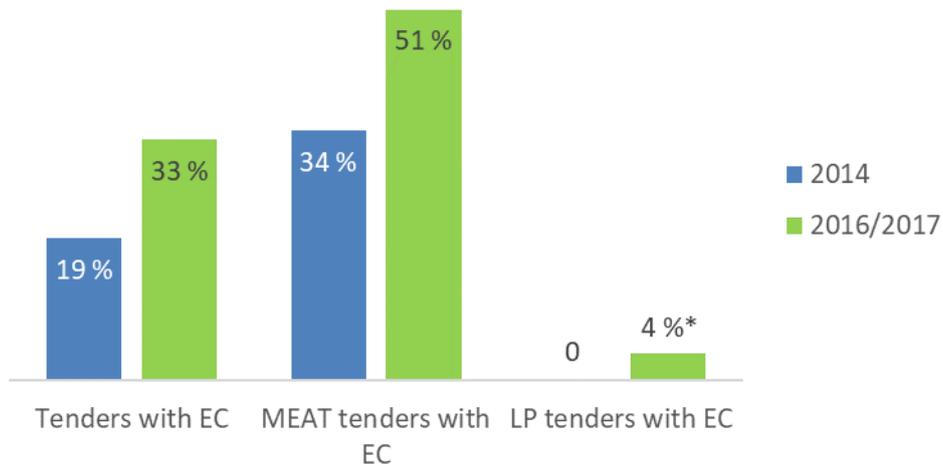


Figure 6.2: Share of tenders with EC
 *Please note the low number of LP tenders with documents

6.1.3 Transport categories

As part of our analysis, we differentiate between the different aforementioned transport categories.

Award method by transport category

The use of MEAT within the individual transport categories differs to a great extent, both in terms of the current share and the percentage change in the past years. As can be seen in Figure 6.3, the most significant difference is between the transport category *bus*, with a current MEAT share of 31%, and the category *fire truck*, which a current MEAT share of 86%. In addition to the transport category *bus* with the lowest share of MEAT, *taxi/minibus* also uses MEAT less frequently than the average tender in our datasets. However, the remaining transport categories apply MEAT in the majority of their tenders. Both *heavy truck/other heavy vehicle* and *passenger car/van* have relatively high shares, with 75% and 68%, respectively. The category *waste management* is almost identical with the average share in 2016/2017, at 62%, with a slight decrease compared to 2014).

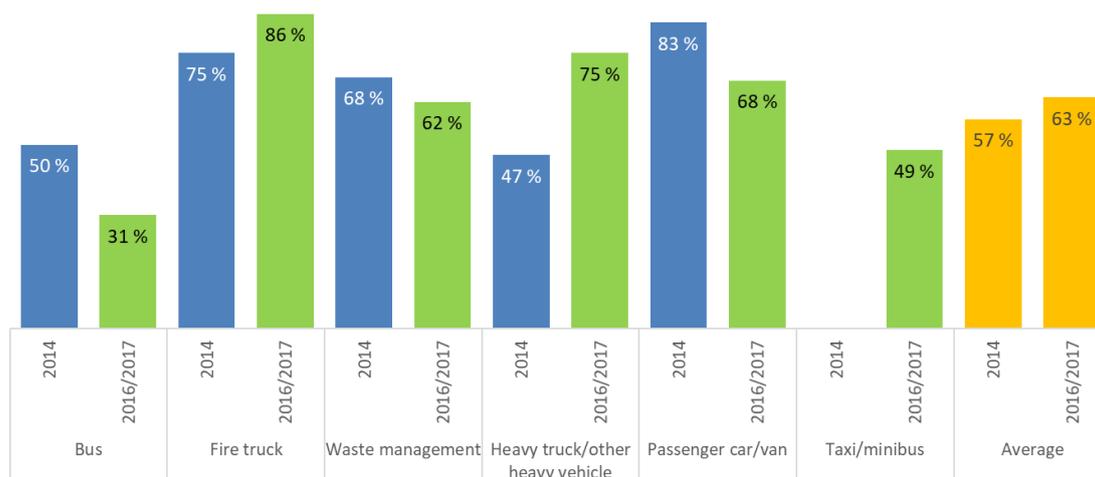


Figure 6.3: Share of MEAT by transport category

Table 6.2: Number of observations by transport category

Transport Category	Year	Number of observations
Bus	2014	6
	2016/2017	13
Fire truck	2014	4
	2016/2017	21
Waste management	2014	19
	2016/2017	86
Heavy truck/other heavy vehicle	2014	36
	2016/2017	32
Passenger car/van	2014	6
	2016/2017	37
Taxi/minibus	2014	1
	2016/2017	35
Sum	2014	72
	2016/2017	224

Share of EC by transport category

As with MEAT, the share of tenders with EC differs noticeably between the different transport categories. *Bus*, which had the lowest share of MEAT tenders, is above the average share of tenders with EC in 2016/2017. This is because all MEAT observations and two LP observations in that period assessed EC. For the other categories, the share of EC is lower than the corresponding share of MEAT. While the average share of EC in 2016/2017 was 33%, the share for the individual categories ranges from 25% for *heavy truck/other heavy vehicle* to 46% for *bus*.

As for the change between the two periods, some of the categories show a noticeable increase. However, for the categories *taxi/minibus*, *bus*, *passenger car/van* and *fire truck* the validity of the increase rates is limited due to a low number of observations in 2014. A significant change

is to be noted for *heavy truck/other heavy vehicle* that more than doubled its share of tenders with EC, from 11% to 25%, based on a comparable number of observations.

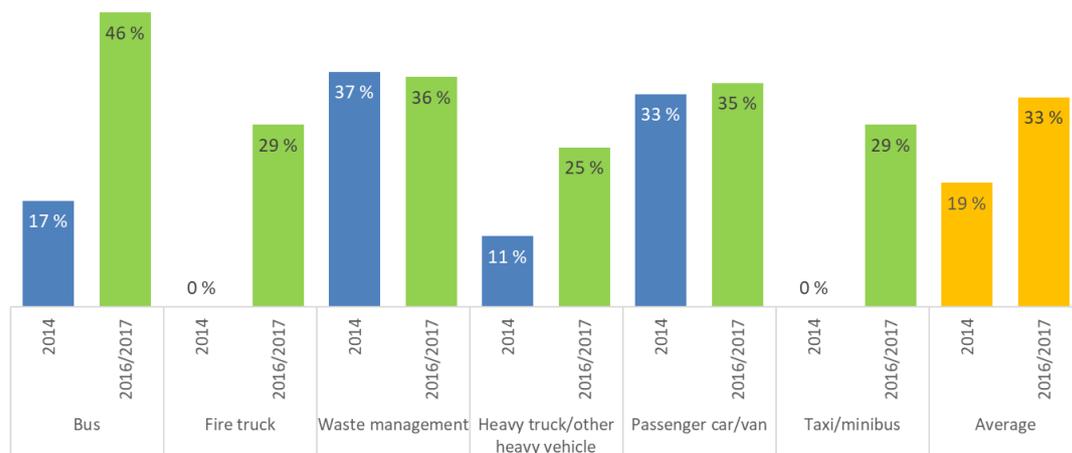


Figure 6.4: Share of EC by transport category

6.1.4 Regions

In the following analysis, regional differences in preferred award methods and the use of EC are investigated.

Award method by region

Figure 6.5 illustrates the noticeably lower use of MEAT as an award method in Nord-Norge, where only every third tender is based on MEAT as opposed to roughly two thirds in the other regions. Hence, Nord-Norge primarily uses LP for tenders, whereas the other regions mostly use MEAT as an award method.

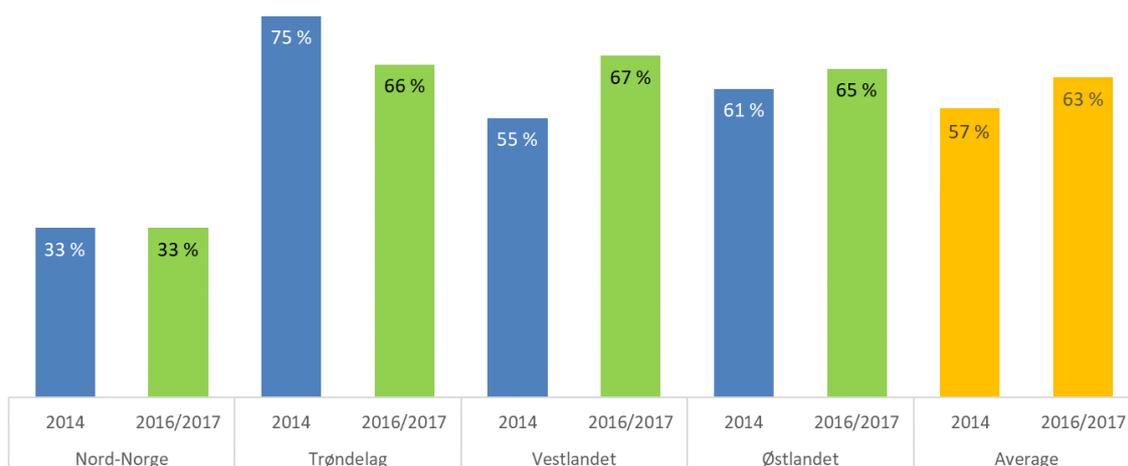


Figure 6.5: Share of MEAT by region

Table 6.3: Number of observations by region

Region	Year	Number of observations
Nord-Norge	2014	12
	2016/2017	18
Trøndelag	2014	12
	2016/2017	29
Vestlandet	2014	20
	2016/2017	58
Østlandet	2014	28
	2016/2017	119
Sum	2014	72
	2016/2017	224

Share of EC by region

With respect the share of EC in tenders, the regions are less homogenous than in terms of award method. The share in 2016/2017 ranges from 17% in Nord-Norge to 41% in Trøndelag. Østlandet has the second highest share with 37%, while Vestlandet with 26% is below the average of 33%.

There is an increase in the presence of EC in road transport related tenders in all four regions. The highest increase can be observed in Trøndelag with +142%. Nord-Norge and Vestlandet also experienced a noticeable increase in the use of EC with +113% and +73%, respectively. However, it should be taken into account that the number of observations in 2014 for Nord-Norge and Trøndelag is considerably smaller than that for Vestlandet and Østlandet.

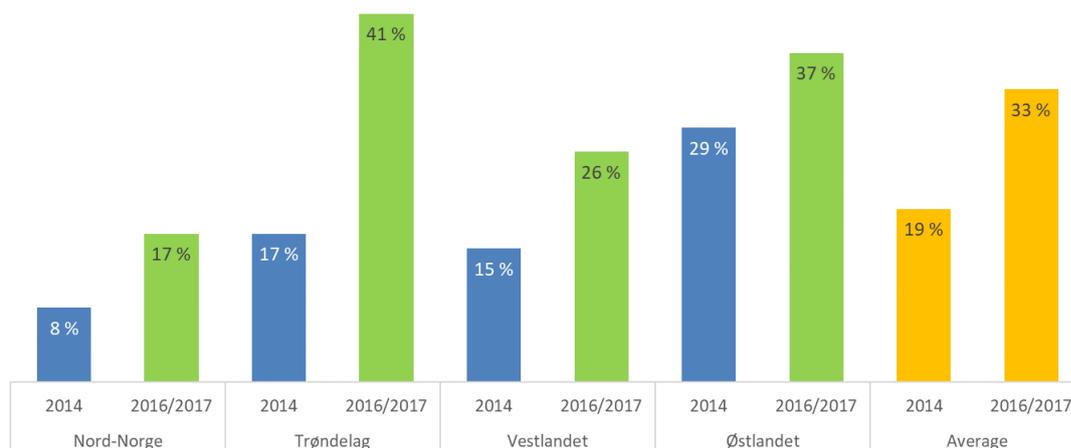


Figure 6.6: Share of EC by region

6.1.5 Contract types

Tenders can be specified either as a service or a product contract type. In our case, a service contract would be the procurement of a transport service, while a product contract would be the procurement of a road transport vehicle.

Contract type split

Table 6.4 presents the overall split of service and product contracts in 2014 and 2016/2017. In both periods, the majority of tenders posted on Doffin were made for service contracts, the share of which decreased from 83% to 64%, though.

Table 6.4: Share of tenders using service and product contracts

Contract	2014	2016/2017
Service	83 %	64 %
Product	17 %	36 %
Sum	100 %	100 %

Share of MEAT by contract type

Figure 6.7 presents the share of MEAT tenders by contract type. It can be observed in both datasets that service contracts have a noticeably lower share of MEAT than product contracts. While slightly more than half of all service tenders use MEAT, it is 76% in the case of product contracts. Overall, the share of MEAT service contracts increases slightly, while it decreases slightly for product contracts.

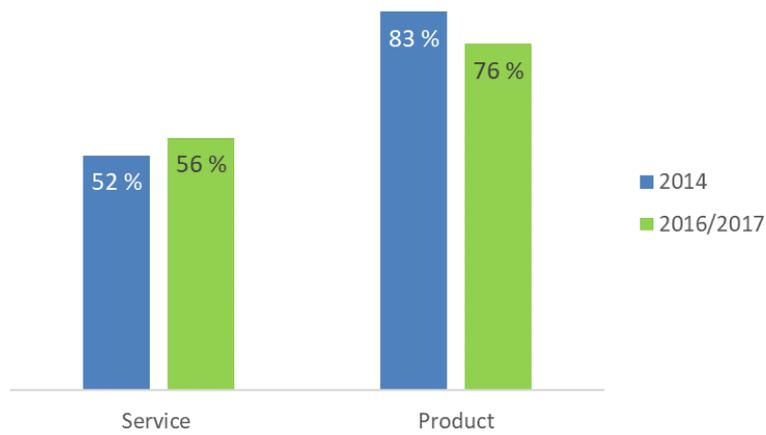


Figure 6.7: Share of MEAT by contract type

Share of EC by contract type

Service contracts have a higher share of EC than product contracts, with 36% compared to 28% (Figure 6.8). The difference was even more significant in 2014, with 22% compared to 8%.

A comparison of the MEAT and EC shares shows that product contracts have a higher share of MEAT, while service contracts have a higher share of EC. Considering that so far in our analysis a higher share of MEAT also implied a higher share of EC, we would have expected a higher share of EC in product tenders. This is further discussed in Chapter 7.

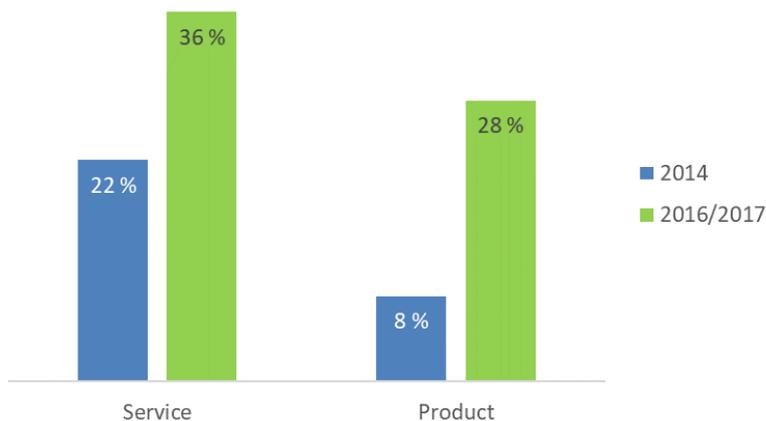


Figure 6.8: Share of EC by contract type

6.1.6 Public organisation levels

In Table 6.5 and Table 6.6, the distribution of tenders among public organisation levels for 2014 and 2016/2017 are shown. Doffin primarily uses four public organisation categories for tenders, which are stated below. Some observations are not allocated to a specific category, which is why additional information had to be obtained to find the matching category. We further categorize the four organisation levels into a *national* level and a *county/municipal* level. As shown below, the majority of the tenders are managed at a county or municipal level. The share increased from 67% in 2014 to 80% in 2016/2017.

Table 6.5: Number of tenders by public organisation level - 2014²

2014			
Public organisation level	National	County/Municipal	Total
Departement eller annen statlig myndighet	X		14
Offentligrettslig organ	X		2
Regional eller lokal myndighet		X	48
Statlig virksomhet	X		8
Sum	24	48	72
Share	33 %	67 %	100 %

Table 6.6: Number of tenders by public organisation level – 2016/2017

2016/2017			
Public organisation level	National	County/Municipal	Total
Departement eller annen statlig myndighet	X		4
Offentligrettslig organ	X		21
Regional eller lokal myndighet		X	180
Statlig virksomhet	X		19
Sum	44	180	224
Share	20 %	80 %	100 %

Share of MEAT by public organisation level

Figure 6.9 presents the share of MEAT tenders for the two public organisation levels. In both datasets, the MEAT share for *county/municipal* is higher than for that *national*, with 67% versus 38% and 65% versus 50% for 2014 and 2016/2017 respectively. The *national* level has increased its share of MEAT, while the *county/municipal* level has an almost constant share, decreasing with two percentage points.

² Departement eller annen statlig virksomhet includes local and regional departments

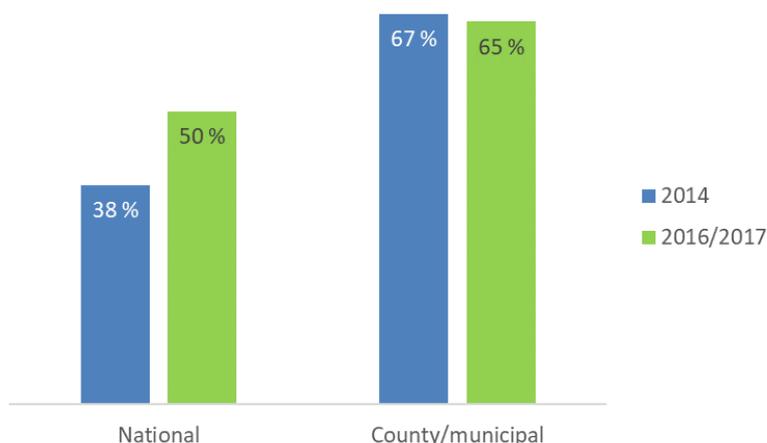


Figure 6.9: Share of MEAT by public organisation level

Share of EC by public organisation level

In Figure 6.10, we present the share of tenders that use EC based on the public organisation level. Similarly to the use of MEAT, it can be observed that the level *county/municipal* has a higher share of tenders with EC than *national* (35% versus 25% in 2016/2017). In fact, both in 2014 and 2016/2017 the share of tenders using EC for *county/municipal* was ten percentage points higher than for *national*. As for the increase rate of EC application, national's share grows faster (+92%) than county municipal (+52%).

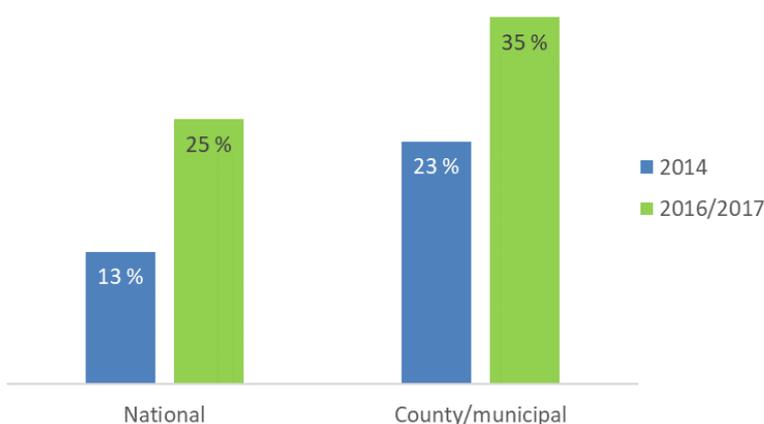


Figure 6.10: Share of EC by public organisation level

Furthermore, a relevant comparison of the two organisation levels is to examine the extent to which EC is used in MEAT tenders. In Figure 6.11, we can see that both in 2014 and in 2016/2017, the two levels have almost identical shares of EC in MEAT tenders and increased this share by roughly 50%.

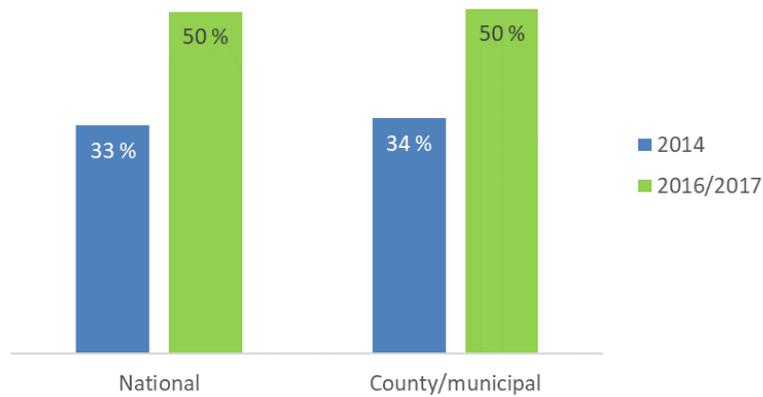


Figure 6.11: Share of MEAT tenders using EC by public organisation level

Weighting of EC by public organisation level

Finally, we discuss the weighting of EC by public organisation level in MEAT tenders. As presented in Chapter 2, the government recently introduced an optional regulation which stipulates that environmental quality aspects should be weighted at 30% in tenders where environmental aspects are relevant. This is why we include the exact weighting of EC in our analysis. Our findings are summarized in Table 6.7. In 2014, the average weighting of EC was 10% at the *national* level and 18% at the *county/municipal* level. This is consistent with our findings on the use of EC at all, where *county/municipal* seems to have a stronger environmental focus than *national* (see page 43). In 2016/2017, however, it can be observed that the applied weights of the two organisation levels are identical.

In terms of standard deviation, only three observations assessed EC at the *national* level in 2014. All of them had a weight of 10%, leading to a standard deviation of 0%. Because of this we do not infer that the variation in the weight has been levelled between the two organisational levels.

Table 6.7: Weight of EC

2014	National	County/municipal
Average	10 %	18 %
Standard deviation	0 %	13 %
Observations	24	48
2016/2017		
Average	18 %	18 %
Standard deviation	7 %	8 %
Observations	44	180

6.1.7 Weighting of EC

The last part of our analysis discusses the overall weighting of EC in all MEAT tenders. While the distribution seems to be somewhat different, the average weighting of the environment is almost identical, with a 17% weight in 2014 and 18% in 2016/2017 (Table 6.8). The standard deviation is higher in 2014 than in 2016/2017, with 12% compared to 8%. The most important implication from the table is that even though the use of EC has increased from 19% to 34% (Figure 6.2), the weighting of the environmental aspect has remained almost the same.

Table 6.8: Summary statistics for weighting of EC

Summary statistics	2014	2016/2017
Average	17 %	18 %
St.dev	12 %	8 %
Observations	14	74

6.2 Survey

This part of the thesis presents the six chosen cases from our public transport survey. All six organisations are aware of the aforementioned 30% regulation. Furthermore, the organisations all use internal guidelines for their procurement practices and state that they are planning on procuring more environmentally friendly in the future.

The table below summarizes the information provided by the chosen organisations. We focus on the preferred award method, LP versus MEAT, the application of EC and their weighting under MEAT, as well as the chosen scoring rules and the procurers' preferences for tenders. In the survey, the organisations were asked to rate their preferred tender features within the five categories *not important*, *slightly important*, *important*, *very important* and *extremely important*. The indicated values are transformed into a score from 0-3. We merge *not important* and *slightly important* to the value 0 to make the scoring compatible with the scale discussed in Chapter 4. The reason why we listed an additional category (0-4 versus 0-3) was to ensure that the organisations could find the suitable answer for their preference. By creating five options, the difference between the points were less extreme. Overall, it can be observed that the majority of the organisations primarily use MEAT and include environmental quality aspects in their tenders. Furthermore, it appears that alternative scoring rules with relative bid prices are preferred over simple scoring rules with reserve prices. The individual scoring rules of the organisations are discussed in Chapter 7 and compared with the aforementioned framework on scoring rules.

Table 6.9: Procurement practices in Norwegian public transport organisations, Source: own presentation based on information provided in the survey.

Organisation	Award method	Use of EC	Scoring rule	Tender feature preferences
Brakar AS	Always MEAT	Regularly 25% Criteria: <ul style="list-style-type: none"> • CO2 • NOx • Engine type 	Usually alternative rule: $Price\ score = nn * \frac{Highest\ bid - Price\ bid}{Highest\ bid - Lowest\ bid}$ Sometimes simple rule: $Price\ score = nn * \left(1 - \left(\frac{Price\ bid}{Reserve\ price} \right)^2 \right)$	Simplicity: 1 Predictability: 2 Competition: 2
Finnmark Fylkeskommune	Always MEAT	Always 30% Criteria: <ul style="list-style-type: none"> • CO2 • NOx • Engine type 	Only alternative rule: $Price\ score = nn * \frac{Highest\ bid - Price\ bid}{Highest\ bid - Lowest\ bid}$	Simplicity: 1 Predictability: 2 Competition: 2
Kolumbus	Mainly MEAT	Always 35% Criteria: <ul style="list-style-type: none"> • CO2 • Energy efficiency 	Only alternative rule: $Price\ score = nn - \frac{(Price\ bid - Lowest\ bid)}{Lowest\ bid} * 0.1$	Simplicity: 2 Predictability: 3 Competition: 2
Telemark Fylkeskommune	Mainly LP	Minimum requirements: <ul style="list-style-type: none"> • CO2 • NOx • Engine type • Energy efficiency 	Rarely alternative rule	Simplicity: 3 Predictability: 3 Competition: 1
Skyss	Regularly MEAT	Always 30% Criteria: <ul style="list-style-type: none"> • CO2 • NOx • Engine type 	Only alternative rule: $Price\ score = nn * \frac{Lowest\ bid}{Price\ bid}$	Simplicity: 3 Predictability: 3 Competition: 2
Opplandstrafikk	Always MEAT	Always 25% Criteria: <ul style="list-style-type: none"> • CO2 • Engine type • Energy efficiency 	Only alternative rule: $Price\ score = nn * \frac{Lowest\ bid}{Price\ bid}$	Simplicity: 1 Predictability: 2 Competition: 1

0 = min. level 3 = max level

6.3 Expert Interviews

This part of the thesis presents and summarizes the two expert interviews conducted with Difi and Kollektivtrafikkforeningen. The findings describe the organisations' overall goals with respect to GPP and state past and current procurement developments in the Norwegian road transport sector.

6.3.1 Difi

Diffi is the Norwegian public management agency and acts as an intermediary to modernise the public sector and supports the different public organisations along the way (Diffi, 2017). The agency focuses on several sectors, one of them being the transport sector. As discussed in Chapter 2, the government allocated NOK 15 million to Diffi in 2016 to improve GPP practices in Norway. The interview was conducted with two Diffi employees who focus on transportation and are currently involved in the process of optimizing GPP practices under the allocated budget.

Diffi is currently working on a framework to enhance public procurement practices and potentially increase GPP in Norway. As stated by the interviewees, the focus is on simplifying tender processes and guiding smaller organisations with scarce resources. They are working on solutions that simplify procurement in areas where the impact of such changes will be the greatest. That is why Diffi proposes a list of suitable criteria for procuring light vehicles. The list is divided into three sections: Minimum, advanced and visionary criteria. The minimum requirements will follow basic legal standards, whereas the advanced and visionary criteria will entail additional environmental benefits for the procurer. Examples of visionary criteria today are electric and hydrogen cars. By creating a criteria map for light vehicles, it will become easier for a large number of procurers to choose requirements suitable for their organisation. A small municipality with only one employee in charge of procurements might simply not be able to find its optimal procurement strategy in a complex legal framework while respecting environmental aspects. According to the interviewees, several organisations in Norway have difficulties in finding optimal scoring rules for MEAT tenders.

Diffi tries to harmonize Norway's procurement practices and the ones proposed by the EU to avoid a fundamentally different focus. In the past, they evaluated the EU guidelines and included the most useful aspects in their proposals. Diffi believes that the respective

procurement goals should be united, which could strengthen Norway's position. When asked about the new GPP regulation in Norway, the interviewees state that procurers are aware of the optional 30% inclusion of environmental quality regulation. However, lack of experience would make the implementation difficult.

As for future developments, Difi would like to add Life Cycle Cost (LCC) to their current criteria list. With the integration of LCC, the organisations would not only look at the minimum and other optional criteria in their bid evaluations, but would potentially increase the bid price offered fictitiously. The developed criteria map should have a wide and broad application and assist any procurer. That is why the interviewees believe that creating different tools for different state levels and organisations would not be efficient.

6.3.2 Kollektivtrafikkforeningen

Kollektivtrafikkforeningen is a national special interest organisation for public actors that organise, procure and execute public transport services. The organisation's members are both from the public and private sector. However, the core part of the organisation is comprised of 17 public transport members, who represent all public transport organisations in Norway. Kollektivtrafikkforeningen's aim is to create a network for its different members to enhance the quality of public transport (Kollektivtrafikkforeningen, 2017). The interview was conducted with two employees of the organisation.

Kollektivtrafikkforeningen currently collaborates with Difi on a network project that aims to increase GPP by allowing both public procurers and suppliers to interact. According to the organisation, increasing the dialogue between the different parties has the potential to decrease the financial risks greener technologies often entail. It is through this dialogue that the different parties can find cooperative solutions. On top of that, as stated by the interviewees, such a network also allows the different sides to communicate in a way otherwise possibly prohibited by competition laws.

Furthermore, the organisation's core role is to support its different public transport organisations in Norway, and to allow them to share their experiences with each other. In this way, the organisation can enhance the competences of the different member organisations. According to the interviewees, all public transport vehicles will become green in the long run. Politicians are increasingly interested in achieving that goal. However, the interviewees also state that currently it might still be too expensive to procure in a more environmentally friendly

way. In the organisation's opinion, there might thus be need for government funding for GPP. The individual organisations might have to decide whether to procure less but greener vehicles or more but polluting vehicles.

Kollektivtrafikkforeningen states that the network includes the collaborates with the supplier side. They believe that such approaches can make it easier to reach the goal of more GPP. A key partner for that purpose is NHO transport, the employers' organisation of the different transport companies in Norway. According to the interviewees, the interest of NHO transport is to standardize the tenders, which currently are quite complex and differ from region to region.

When asked about the 30% regulation and why it appears that there has not yet been a real increase, Kollektivtrafikkforeningen states that this can be due to a lack of time to adjust, and the complexity of larger tenders. Many tenders comprise numerous pages and files, and entail commitments for a period of up to 8-12 years. In particular, product tenders are published in larger batches and last for a longer period. That is why the public transport organisation Ruter in Oslo is considering only entering service contracts in the future under which they would not have to own the vehicles, as stated by the interviewees. They would thus be able to publish more flexible tenders. The interviewees also say that it is more likely to see more GPP on the regional level, since politicians are closer to organisations on regional levels than to national organisations.

Although Kollektivtrafikkforeningen wants to align the different procurement practices more, it is not their goal to propose one standard award method standard and/or one scoring rule to be used by all organisations. Contracts can differ, which is why the organisation does not consider one rule for all tenders optimal. Instead, the rules should be more flexible and allow different technologies to account for environmental specifics. Nonetheless, the organisation provides general guidelines with information on the procurement process and example tender designs. The focus is on knowledge exchange by allowing the different members to describe their respective award schemes and discuss their tenders. With respect to the award scheme used by the member organisations, the interviewees believe that there is a preference for MEAT under which price seems to be given an increasingly lower weight.

7. Discussion

The aim of this chapter is to discuss and combine the quantitative and qualitative findings in the light of our two research questions. The three data sources allow for different perspectives and help us identify the *what* and the *whys*. In the last part of this chapter, we present the limitations and weaknesses linked to our research.

7.1 GPP in Norwegian road transport related tenders

In the data analysis of the Doffin datasets from 2014 and 2016/2017, we identify the extent to which Norwegian road transport related tenders consider EC. Furthermore, the information obtained in our survey reveals sector specific procurement practices in public road transport. These findings answer our first research question.

7.1.1 Doffin data

Overall, we observe an increase in the use of EC in Norwegian road transport related tenders, from 19% in 2014 to 33% in 2016/2017. In terms of award method, the majority of the tenders in the datasets use MEAT, which increased from 57% to 63%. The share of EC in MEAT tenders is generally higher than EC overall with an increase from 34% to 51%. Hence, MEAT tenders are more likely to include EC than LP tenders.

Our analysis suggests that the tenders for some transport types are more likely to consider environmental quality aspects than tenders for other transport types. The highest use of EC can be found in *bus*, with a share of 46%, which is noticeably higher than the overall share of 33%. Almost all categories increased their share of tenders assessing EC. In particular, *heavy truck/other heavy vehicle* more than doubled their share of tenders with EC from 11% to 25%. Nonetheless, it remains the transport category with the lowest share of EC.

Furthermore, our findings indicate that there are regional differences regarding the considerations of the environment in tenders. The two regions with the highest share of EC tenders are Trøndelag and Østlandet, with 41% and 37%, respectively, whereas the lowest share can be observed in Nord-Norge with 17%. In terms of award method, our results indicate that Nord-Norge only bases every third tender on MEAT, while the other regions do so for two thirds.

As for the contract type, product contracts have a higher share of MEAT than service contracts. Based on this finding, one could expect that product contracts also have a higher share of EC than service contracts. However, this is not the case.

Furthermore, our analysis of the tenders sorted by the level of public organisation, *national* and *county/municipal*, shows that there is a higher focus on both MEAT and EC at the *county/municipal* level. The average weight EC is valued at (under MEAT), though, is identical on both organization levels (18%).

Finally, a relevant finding relates to the current and past weighting of EC in tenders. The average weighting of EC in MEAT tenders is 18%. Our analysis shows that even though there is an increase in the use of EC, there is no real increase in the weight of EC. Yet, one could have expected that the increase in the use of EC implies an increasing interest in the use of environmental aspects, which in turn would lead to a higher valuation.

7.1.2 Survey

For this part of the thesis we only analyse relevant information for the first research question that was obtained in our public transport survey. The findings on scoring rules and preferences are discussed in the next chapter. The information about the six public transport organisations in Norway reveals that the preferred award method for the procurement of public transport road vehicles is MEAT and that EC are usually included. Furthermore, we find that when MEAT is used, the weighting of EC is equal to or higher than 25%. It can also be found that all organisations that use MEAT include CO₂ as an environmental parameter, as can be seen in Table 6.9. Other parameters that are listed are related to NO_x, the engine type and energy efficiency.

7.1.3 General implications

We can use our findings from the Doffin analysis to draw more general conclusions on GPP practices in Norway. The combination of the Doffin analysis with the information obtained in the expert interviews helps understand why there are differences in the way Norwegian public organisations procure. Furthermore, we include the findings from our public transport organisation survey and compare them with the level of GPP found in the Doffin data.

Award method for GPP

According to Lundberg & Marklund (2011), there are four approaches a procurer can use to follow GPP (see Chapter 3). Either LP is used with green minimum requirements or MEAT. MEAT can be applied in the form of a *beauty contest*, where the price is given and the contract is awarded to the bidder with the highest environmental standard, or based on a score. In the case of a score, either the price and EC are transformed into a score, or EC are transformed into a price and added/deducted from the bid price. In our context, we cannot identify a single *beauty contest* tender in the datasets. Furthermore, only very few LP tenders included green minimum requirements. Hence, MEAT based on a score appears to be the most widely used award method for tenders that include some sort of green criteria.

Transport categories

The category *bus* is the most likely to include EC in tenders, while *heavy truck/other heavy vehicle* is the least likely to consider the environment. Possibly, some types of vehicles are considered more suitable for GPP than others. This assumption is supported by our survey findings, which reveal that the participating public transport organisations always consider EC when MEAT is used and this is the case for the majority of tenders published by these organisations. Since we asked specifically for road transport related tenders, we can expect that the majority of the organisation's tenders relate to the procurement of buses. Hence, the vehicle type *bus* might stimulate a higher focus on the environment.

Furthermore, when considering EC, organisations might prefer to focus on specific transport categories. As stated by Difi, the agency is currently creating a criteria map for light vehicles as part of their GPP strategy. In that way, they want to maximize the potential impact of their procurement strategy on GPP practices. Since light vehicles represent an important share of procurements, implementing a list of criteria for this transport category can have a high impact. In addition, we believe that the higher level of available technology makes it more convenient to procure green light vehicles than green heavy vehicles.

Regions

It appears that more densely populated areas in the south of Norway are more likely to focus on EC in their tenders. This observation might be linked to more opportunities in procuring greener and more technologically advanced vehicles thanks to the high level of infrastructure in such areas. Relevant examples include electric cars, which require a sufficient infrastructure of charging stations. As stated by Kollektivtrafikkforeningen, Ruter in Oslo is the most

progressive public transport organisation. By operating on a larger scale, Ruter can more easily access and potentially fund charging stations for either electricity or hydrogen than smaller organisations in the Northern Norway.

Contract types

Service contracts are more likely to include EC. In our expert interview with Kollektivtrafikkforeningen, it was mentioned that product procurements are made in large batches and published less frequently than service contracts. The underlying reason is that the vehicles purchased naturally last for a long period, whereas the term of service contracts can be held flexible. As a consequence, the public transport organisation Ruter is considering entering only service contracts in the future to allow for more flexibility. Considering that there is a higher level of EC in service contracts, this development might stimulate an even higher increase in GPP.

Public organisation levels

An interesting finding from the Doffin analysis is that *county/municipal* has a higher share of EC than *national*. Kollektivtrafikkforeningen suggests that a potential reason for this is that local politicians are closer to procurement decisions done by regional public organisations than national politicians are to national public organisations.

In contrast, Difi argues that the lack of competence in the procurement departments of smaller public organizations creates a need to simplify the award schemes to facilitate green procurement. Difi's statement does not specifically imply that the share of EC should be higher at a *national* level than at a *county/municipal* level, but suggests that the EC share at the *county/municipal* level can be increased further.

Weighting of EC

As seen in the Doffin analysis, the average weighting of EC is well below the optional 30% regulation set to force the 1st of May 2017. As the dates from the dataset accounts for the award notice, and not the publication of the tender, it seems reasonable to argue that there was not enough time for the procurers in our datasets to implement the optional regulation. The interviewees in the expert interview with Kollektivtrafikkforeningen suggest that even half a year to a year does not give the procurers enough time to adapt, due to the complexity of formulating tenders. We point out, though, that a non-mandatory regulation bears the risk that many organisations do not change their current practices.

According to our survey replies, the studied public transport organisations weigh EC at a level close to the new optional 30% regulation. The tenders included in the Doffin dataset were published by any type of public organisation/department. Hence, it appears that procurers with the sole purpose of providing public transportation are more likely to value EC at a higher level than organisations/departments where transport might only be one part of the service value chain. A potentially higher level of competence in such organisations/departments and more knowledge about award methods and EC are a possible reason for the difference in the observations.

EC under MEAT

As stated in the Chapter 1, the main emitter of GHG in Norway is the transport sector. All survey respondents include CO₂ emissions as part of their EC. Other criteria like NO_x or energy efficiency were only partially included. Hence, reducing CO₂ - the number one source of GHG - appears to be the main objective of all participating procurers who use EC. This observation supports the government's statement that public procurement can contribute to reaching the goal of becoming a zero-emission nation by 2050 (see Chapter 1). However, as discussed, this requires the application of suitable criteria. As discussed by Lundberg et al. (2015), procurers might find it difficult to identify relevant criteria. From a broader perspective, this issue could be sector specific. The transport sector, for example, might have more competence in assessing EC than other sectors. The nature of vehicles and the knowledge about their environmental impact might make it easier to develop suitable EC for such procurements.

Number of observations in the datasets

We would like to point out that the number of tenders in the 2014 dataset is significantly lower than in the 2016/2017 dataset (72 versus 224). A potential reason could be that fewer product contracts were announced in 2014 compared to 2016/2017 (13 versus 81). This explanation would be in line with our finding that product contracts are posted less frequently. Hence, this observation might be cyclical.

7.2 Optimal price scoring rules for Norwegian public transport organisations

This part of the thesis compares the survey findings with the theoretical framework on scoring rules presented in Chapter 4 to answer our second research question. Our second research question was “*Do Norwegian organizations apply optimal scoring rules in road transport related tenders given their preferences for price and quality?*”. We match the stated preferences of the different organisations (‘cases’) with the implied scoring rules to find the optimal scoring rule for the respective public transport organisations. The relevant price scoring rules from Chapter 4 and their features are presented below. The feature *sensitivity to bid distribution* is not assessed due to an insufficient number of answers in the survey.

Table 7.1: Relative scoring of price scoring rules for different features (Dini et al., 2006)

Feature	Scoring rule				
	Average	Lowest bid	Highest bid – lowest bid	Linear	Parabolic
Simplicity	0	3	1	3	2
Predictability	0	0	1	3	3
Competition	0	3	3	1	2

0 = min level 3 = max level

7.2.1 Cases

Buskerud – Brakar AS

Brakar AS always follows the MEAT approach and uses both simple and alternative scoring rules.

The most commonly used relative scoring rule by the organisation is determined by:

$$Price\ score = nn * \frac{Highest\ bid - Price\ bid}{Highest\ bid - Lowest\ bid}$$

Sometimes, however, Brakar AS also uses price thresholds and reserve prices and applies a simple scoring rule for that purpose:

$$Price\ score = nn * \left(1 - \left(\frac{Price\ bid}{Reserve\ price} \right)^2 \right)$$

The tender features the organisation values the most are predictability (2) and competition (2), followed by simplicity (1) (also see summary table in Chapter 6). Brakar's preferences are well aligned with the chosen scoring rules. Following the aforementioned framework, a procurer who values predictability and competition at the same or a higher level than simplicity is advised to choose the highest bid-lowest bid rule and/or the parabolic rule. Under the highest bid-lowest bid rule the implied indifference curve is convex and reflects a preference for aggressive bidding. Under the parabolic rule the opposite is the case. The indifference curve is concave and there is no particular preference for aggressive bidding.

Finnmark – Finnmark fylkeskommune

Finnmark fylkeskommune always evaluates bids based on MEAT and uses relative scoring, exclusively. The following rule applies:

$$Price\ score = nn * \frac{Lowest\ bid}{Price\ bid}$$

Like Brakar, Finnmark fylkeskommune states that it values predictability (2) and competition (2) over simplicity (1). Hence, the suitable scoring rules for Finnmark are the same as for Brakar. The organisation should either apply the parabolic simple scoring rule or the highest bid-lowest bid alternative scoring rule. However, Finnmark uses neither of the rules. Instead, the organisation applies the lowest bid scoring rule, which is more suitable for organisations that value simplicity over predictability.

Rogaland – Kolumbus

Kolumbus primarily imposes MEAT as award method and uses the following relative scoring rule:

$$Price\ score = nn - \frac{(Price\ bid - Lowest\ bid)}{Lowest\ bid} * 0.1$$

The organisation indicates the following preferences for tender features: Simplicity (2), predictability (3) and competition (2). Valuing simplicity and predictability over competition

should result in a scoring rule with a concave or linear indifference curve, where aggressive bidding is not rewarded.

The scoring rule that Kolumbus currently uses does not fully correspond to any of the five rules discussed in the framework. Since Kolumbus' rule is relative and uses the lowest bid as a base in the formula, however, it is comparable with the lowest bid rule. Hence, the current scoring rule used incentivizes aggressive bidding, reflected in a convex indifference curve. Still, taking into account Kolumbus' preferred tender features, literature suggests using simple linear scoring rules. Thus, Kolumbus' optimal scoring rule implies a linear indifference curve as opposed to the convex one actually applied.

Telemark – Telemark fylkeskommune

Telemark fylkeskommune rarely considers quality aspects in their tenders and instead, primarily uses LP with minimum standards as award scheme.

The organisation states that it values predictability (2) and simplicity (2) over competition (1). Based on the organisation's preferred tender features and the price scoring rule framework, Telemark fylkeskommune should implement a simple scoring rule when using the MEAT award method. However, the organisation states that they only use alternative scoring rules when relevant. The most suitable match for their preferences is a linear scoring rule with a linear indifference curve:

$$Price\ score = nn * \frac{(Reserve\ price - Price\ bid)}{Reserve\ price - Price\ threshold}$$

Since we were not provided with the exact scoring rule used, we do not compare the indifference curve reflected in the optimal scoring rule with the one reflected in the applied scoring rule.

Hordaland – Skyss

Skyss regularly uses MEAT as award method and applies a relative scoring rule:

$$Price\ score = nn * \frac{Lowest\ bid}{Price\ bid}$$

The organisation states that simplicity (3) and predictability (3) are valued at a higher level than competition (2). Based on these tender feature preferences, Skyss should follow a simple

scoring rule as opposed to the alternative scoring rule currently used. To be precise, the organisation should use a linear scoring rule:

$$Price\ score = nn * \frac{(Reserve\ price - Price\ bid)}{Reserve\ price - Price\ threshold}$$

We can observe that Skyss' preferences are represented by a linear indifference curve, but that the applied rule corresponds to a convex curve, which promotes aggressive bidding.

Oppland – Opplandstrafikk

Opplandstrafikk always applies the MEAT award method and currently uses relative scoring:

$$Price\ score = nn * \frac{Lowest\ bid}{Price\ bid}$$

The tender features that the organisation values the most is predictability (2), followed by competition (1) and simplicity (1). Based on the organisation's preferences, a simple scoring rule should be used as opposed to the relative one currently applied. The optimal scoring rule is a parabolic rule, where the price score is given by the following formula:

$$Price\ score = nn * \left(1 - \left(\frac{Price\ bid}{Reserve\ price} \right)^2 \right)$$

Yet, Opplandstrafikk chooses the lowest bid rule that represents a preference for aggressive bidding and is reflected in a convex indifference curve. Based on their preferences, they should choose a rule that reflects a concave or linear indifference curve.

7.2.2 General implications

Based on existing scoring rule literature, the analysis of the different scoring rules that Norwegian public transport organisations shows a general mismatch between the procurers' stated preferences and their revealed preferences. Overall, it appears that the applied scoring rules in our case studies do not always match the procurers' preferences. In fact, except for Brakar AS, none of the organisations that apply MEAT use a scoring rule that exactly correspond to the desired tender features. Potential reasons for this mismatch could be the differences in size of the organisations and their level of competence. As implied in the

interview with Difi, some organisations find it difficult to develop a procurement strategy under MEAT.

Furthermore, despite the disadvantages of using relative scoring rules, as discussed in Chapter 3, most of the organisations use them. In fact, all organisations state that they value the feature of predictability highly. Yet, they still use relative scoring rules, which are known for being less transparent than simple scoring rules. The preference for relative rules over simple rules might be linked to a lack of reserve prices, which you need to define the cap in simple scoring rules. Possibly, the individual organisations do not have enough market knowledge about suitable reserve prices and their number of procurements is too low for relevant experience.

Finally, we analyse the price-quality trade-off as indicated by the identified indifference curves. Although the participating organisations state a preference that would be reflected in the linear or concave indifference curve, they all use a scoring rule (either partly or solely) that implies a convex indifference curve. We see the same mismatch as in the choice of scoring rules. Figure 7.1 illustrates the implications of using a scoring rule that does not correspond to one's preferences (note: this figure does not show the indifference curves themselves). The marginal score return on price can be used to show how the indifference curves respond to the scoring rules in the figure. As seen before, the convex indifference curve implies an increasing marginal score return on price. This is illustrated by the lowest bid scoring rules in the figure. As shown, this rule incentivizes aggressive bidding, since the seller receives an increasing amount of points per unit of price reduction. On the opposite, the parabolic rule gives a decreasing amount of points per unit of price reduction. By using a rule corresponding to a convex indifference curve, despite a preference reflecting a concave indifference curve, an organisation might thus encourage bid prices lower than what is optimal. To better understand this price-quality trade-off, we can for example consider environmental quality: Encouraging very low prices will affect the environmental quality level negatively, and might lead to a suboptimal price-quality trade-off.

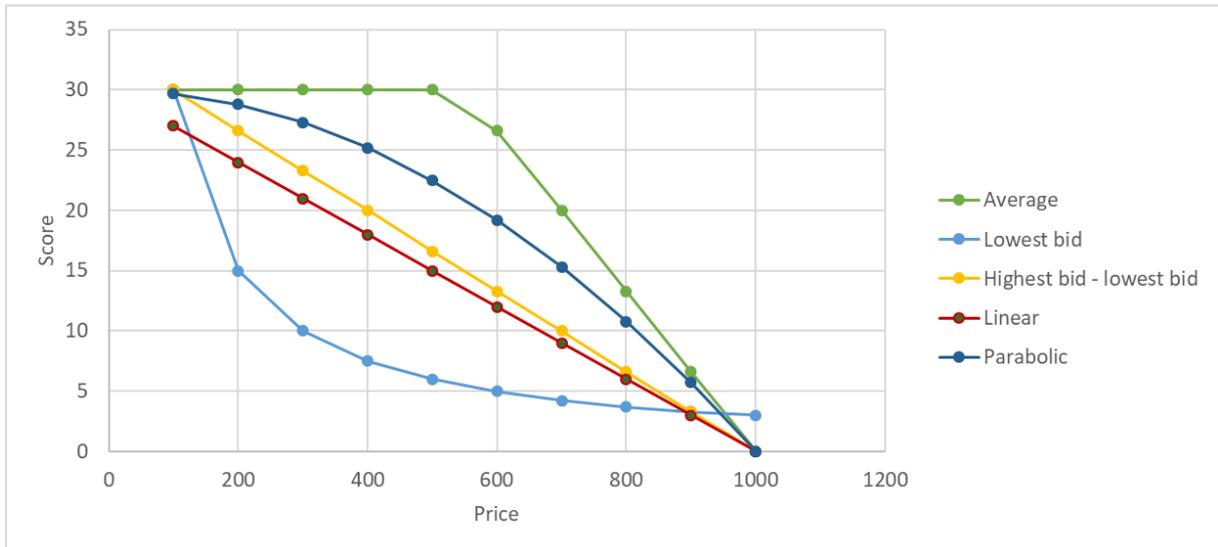


Figure 7.1: Example of price-scoring rules. Source: own illustration, based on Dini et al. (2006).

7.3 Limitations and weaknesses

Due to the diverse and partially limited pool of data sources, it should be noted that there are several limitations and weaknesses in our analysis, which have broader implications for the generalizability and accuracy of our findings.

The most apparent weakness in this thesis is linked to the incomplete information about tenders based on LP. Since the presence of EC was rarely indicated in LP tenders on Doffin, additional tender documents had to be accessed. Even though 83% of LP tenders in the 2014 dataset were linked to documents, only 11% of the LP tenders in the 2016/2017 dataset could be analysed in terms of EC with the help of additional documents. Hence, our analysis is likely to miss some LP tenders with EC. However, it is to be noted that none of the LP tenders with documents in the 2014 dataset assessed EC. Thus, the EC share of LP tenders in 2014 can be assumed to be close to zero. In the 2016/2017 dataset, however, our estimated 4% share (based on three LP tenders with EC) is likely not representative for all LP tenders. The real share is possibly higher, yet, likely not as high as the share of EC in MEAT tenders (51%).

In terms of data analysis and as mentioned in Chapter 6, the analysis of the Doffin datasets was limited to descriptive statistics due to the small number of observations. A more comprehensive statistical analysis would have been required to test the significance of our findings.

Regarding the survey, it should be noted that our results might not be entirely generalizable. For a higher level of accuracy, the findings of the survey would have benefited from a more in-depth analysis of the stated preferences with a third party. We were only in contact with one representative of each organisation. A confirmation of the information obtained by another person from the respective organisation could have added to the trustworthiness of our findings. Also, it is to be noted that the response rate was only roughly 50%, which possibly means that the seemingly high share of EC is not representative. Most of the organisations primarily followed GPP, which might be the reason why they were more willing to share their procurement practices with us.

8. Conclusion

The aim of this thesis was to identify the extent to which public organisations in Norway incorporate green criteria in their procurements, and whether optimal scoring rules are used by public transport organisations based on their stated preferences.

8.1 Main findings

Our first research question “*To what extent do Norwegian public organizations consider environmental criteria in road transport related tenders?*” is answered with the help of two datasets and additional sources of information. We found that there is an increase in the use of GPP and that there are differences with respect to the region, the type of transport and contract as well as the organisation level. Furthermore, the results showed that procurements based on MEAT are more likely to include green criteria.

Our second research question “*Do Norwegian organizations apply optimal scoring rules in road transport related tenders given their preferences for price and quality?*” is answered based on survey replies from public transport organisations in Norway. The findings suggest that the majority of the organisations do not apply optimal scoring rules based on their stated preferences. We also found that public transport organisations in Norway use relative scoring rules rather than absolute scoring rules. Finally, the result of the survey shows that the price-quality trade-off made by organisations is not optimal based on their stated preferences. The scoring rules used are reflected in a convex indifference curve despite the stated preferences for a linear and/or concave indifference curve. That is how suboptimal aggressive bidding might be stimulated, which can lead to bid prices that are lower than necessary (at the potential cost of lower environmentally quality).

8.2 Practical implications

The findings of this thesis have implications for both the public and the private sector. Relevant actors in the public sector are policy makers and organisations that participate in (green) public procurements. Knowing the current share of EC in Norwegian road transport related tenders helps policy makers to assess whether the current share is what is desired and if this is not the case, current policies should be revised. The results of our second research

question are particularly relevant for public transport organisations. The general mismatch between the stated and the revealed preference for tenders we identified might make the organisations consider revising their current scoring rules. Furthermore, suppliers that participate in tenders benefit from our findings. They might become aware of the increasing interest in EC and will thus know that bids with such features may be preferred over bids with no environmental considerations. Based on the identified differences regarding GPP practices, suppliers with a higher level of environmental consideration in their products or services may decide to target specific regions and contract types.

8.3 Contribution to literature

This thesis adds to existing literature by identifying a preference for MEAT as award method in Norwegian road transport related tenders, and an increase in the share of tenders with EC. Considering that Norway is member of the EEA, and therewith belongs to a single procurement market, it is striking that there are still more than one third of tenders in Norway that are based on LP. Yet, the EU states that MEAT should be used in tenders. In terms of the award method used for GPP, the type *beauty contest* is not used at all by public organisations in Norway for road transport related tenders. Our findings also suggest that LP is rarely used for GPP and that MEAT is the preferred award method for that purpose. Finally, regardless of the criticism of relative scoring rules based on economic principles, public transport organisations in Norway appear to prefer those to absolute scoring rules.

8.4 Future research

Future research on green public procurement practices in Norway should be based on a higher number of observations and a more longititude study. Considering the optional 30% regulation, a suggestion for future research would be to conduct a similar analysis in the next years and to test whether the weighting of environmental aspects has increased towards 30% or even exceeded it. Such a study could measure how effective optional regulation are.

This thesis was limited to tenders that concern road transport. To allow for sector comparisons, future research could include other types of tenders with respect to GPP. The analysis of other transport modes like trains and ferries, could allow an evaluation of a possible correlation between the transport mode and the consideration of environmental aspects. Furthermore,

procurements for goods and services other than transport could be compared with the results of this thesis to assess whether our findings are sector specific or more generalizable.

In particular, the difference between procurements made by organisations with a relevant background for such a service or product and procurements made by organisations for which the product or service is only part of the value chain should be further researched. The focus should lie on GPP and the ability of organisations to include relevant EC. When it comes to procurement strategies, such a research could also relate to the level of competence found in organisations.

With respect to applied scoring rules, an interesting topic for future research could be to evaluate the usefulness of absolute versus relative scoring rules for the procurement of newer and greener technology. The fact that the public transport organisations only score based on relative score, raises the research question to further discuss why that is the case and whether it is related to a lack of reserve prices. Regarding the aforementioned mismatch between the applied scoring rules and those suggested by literature, another topic for future research could be to investigate the underlying reasons. In particular, it could be examined whether the stated preferences reveal the organisations true preferences, or whether the revealed preferences are actually the true preferences.

Furthermore, a relevant research topic is to look at the correlation between tender value and the likelihood of a tender including EC. This thesis evaluated tenders regardless of monetary aspects. However, it could be argued that a higher tender value implies a higher impact on society and the environment, and should thus entail a higher consideration of the environment.

In broader terms, researchers could also discuss the cost effectiveness of using procurement in Norway as a policy tool to reach specific environmental objectives. Since the procurement nature in Norway is rather decentral and the individual organisations enjoy a high level of autonomy in their procurement strategy, their procedures are less standardized and more uncertain. One could thus argue that using GPP as a climate policy is a cost ineffective instrument.

Finally, future research can focus on examining the environmental effectiveness of the EC applied. This thesis only included a sample of specific EC through the survey, but did not have the equivalent information for the tenders published on Doffin. Hence, a better understanding of the actual environmental aspects considered might be required.

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Appendix A: Survey questions

Q1 What is the name of your organisation?

Q2 In which county (fylkeskommune) are you located?

Q3 Procurement budget

Q4 What were your annual expenditures for the procurement of road transport vehicles in the following years (rough estimate in NOK)?

Q5 How many road transport vehicles did you procure in the following years?

Q6 How many light vehicles (e.g. commercial vans) did you procure in the following years?

Q7 How many heavy vehicles (e.g. buses) did you procure in the following years?

Q8 How many road transport related tenders did you publish in the following years?

We would like to know more about the different parties involved in your procurements. The following questions are regarding the external parties involved in formulating your tenders and specifying their criteria.

Q9 Are your tenders **solely** initiated, formulated and influenced by your organisation?

Yes (1) No (2) Other (3) _____

Q10 If no, please rank the different parties based on their influence on the tender requirements / public procurement practises with 1 = no influence and 5 = great influence

	1 (1)	2 (2)	3 (3)	4 (4)	5 (5)
National level (central agency like difi) (1)	<input type="radio"/>				
County level (fylkeskommune) (2)	<input type="radio"/>				
Municipality level (kommune) (3)	<input type="radio"/>				

Q11 Do you have internal guidelines / policies to help you formulate tenders and their award criteria?

Yes (1) No (2) I don't know (3)

Official view

Vekting av miljøkriterier

Der du bruker miljø som tildelingskriterium bør du som hovedregel vekte det med **minimum 30 prosent**. Denne bestemmelsen kom inn i forskrift om offentlige anskaffelser § 7-9 den 1. mai 2017. Ved å vekte miljø med minimum 30% sender du et tydelig signal om at miljø er viktig. Det er ingen ting i veien for å vektlegge miljø sterkere der det er markedsmessig grunnlag for det.

Q12 Please read the lines above. Are you aware of this?

Yes (1) No (2)

Q13 Do your current criteria specified in your tenders follow this view?

Yes (1) No (2)

Q14 If no, are you planning on adding a 30% environmental weighting to your tenders?

Yes (1) No (2) Other (4) _____

Q15 How often do you consider quality aspects in a weighting scheme (where price and quality aspects are weighted against each other)?

Never (1) Rarely (2) Regularly (3) Most often (4) Always (5)

Q16 How often do you consider environmental quality aspects?

Never (1) Rarely (2) Regularly (3) Most often (4) Always (5)

Q17 When environmental quality aspects are taken into consideration, what is the average weighting (in percentage)?

Q18 When environmental quality aspects are taken into consideration, which of the following parameters do you consider? You can choose several.

CO2 emission (1) NOx emission (2) Other air pollutants (3) Energy efficiency (4) Engine type (e.g. diesel, hydrogen, electric) (5) Other (6) _____

Q19 When environmental quality aspects are taken into consideration, what is the share of the individual environmental parameters (e.g. CO2 50% and energy efficiency 50%)?

Choices should total 100 and only refer to the environmental quality aspect.

Leave blank if not relevant for your organisation.

CO2 emission : _____ (1)

NOx emission : _____ (2)

Other air pollutants : _____ (3)

Energy efficiency : _____ (4)

Engine type : _____ (5)

Other : _____ (6)

Total : _____

Q20 How satisfied are you with your current procurement practices in terms of bid evaluation and award schemes?

Very unsatisfied (1) Unsatisfied (2) Rather unsatisfied (3) Rather satisfied (4) Satisfied (5) Very satisfied (6)

Q21

Do you think that your organisation is capable of setting suitable evaluation criteria for tenders?

I strongly doubt it (1) I doubt it (2) I don't know (3) I believe so (4) I strongly believe so (5)

Q22 Are you considering revising your current procurement practices?

Yes (1) No (2) Maybe (3)

Scoring rule features

This part of the questionnaire is supposed to help us better understand your bid evaluation approaches.

Q23 How often do you use price thresholds in road transport related tenders (e.g. a minimum price to prevent abnormally low bids)?

Never (1) Rarely (2) Regularly (3) Most often (4) Always (5)

Q24 How often do you use a reservation price in road transport related tenders (e.g. a maximum price you are willing to pay that is specified in the tender description)?

Rarely (1) Sometimes (2) Regularly (3) Most often (4) Always (5)

Q25 If you use a reservation price, which of the following absolute price scoring schemes do you use?

nn = Total points allocated to the price parameter

- Price score = $nn * [(Reserve\ price - Price\ bid) / (Reserve\ price - Price\ threshold)]$ (1)
- Price score = $nn * [1 - (Price\ bid / (Reservation\ price))^2]$ (2)
- Both (3)
- Other (4) _____

Q26 If you don't use a reservation price, do you use a relative scoring of price in your tenders?

Explanation: In relative scoring a score depends on other bids.

Yes (1) Other (2) _____

Q27 If you use relative scoring, which of the following relative price scoring schemes do you use?

nn = Total points allocated to the price parameter

- Price score = $nn * (Lowest\ bid / Price\ bid)$ (1)
- Price score = $nn * [(Highest\ bid - Price\ bid) / (Highest\ bid - Lowest\ bid)]$ (2)
- Both (3)
- Other (4) _____

Q28

How important are the following features of a scoring rule for you in general?

Simplicity - Is the rule easy to understand for bidders (communicate, assess and compare the bids)?

Predictability - How easy is it for the bidder to know his score before the bid is submitted (is it easy to calculate a score ex ante for the bidder)?

Competition - How important is price competition for you? Remember that (aggressive) price competition can affect the quality in the bid

	Not important (1)	Slightly important (2)	Important (3)	Very important (4)	Extremely important (5)
Simplicity (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Predictability (9)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Competition (10)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q29 What is the average price difference percentage between the highest and lowest bids?

0% (1) 20% (2) 40% (3) 60% (4) 80% (5) 100% (6) >100% (7)
Zero-emission road vehicles

Q30 Do you plan to procure more environmentally friendly in the future?

Yes (1) No (2) I don't know (3)

Q31 Does your organisation currently own any zero-emission road vehicles?

Yes (1) No (2) I don't know (3)

Q32 If no, are you considering buying some in the near future?

Yes (1) No (2) I don't know (3)

Q32 How likely is it that your organisation will procure a **zero-emission bus** in the next 5-10 years? (this does not imply that your bus fleet as a whole should be emission free)

Very unlikely (1) Unlikely (2) Rather likely (3) Likely (4) Very likely (5)

Appendix B: Expert interview questions

Expert interview with Difi

- Is Difi's objective to increase GPP in Norway?
- What has been your focus in the past years to improve / increase GPP? Ask for a timeline of events
- What will be the major changes originating from the 15m NOK budget?
- How are you planning on implementing the standards?
- What measurements do you consider the most effective when it comes to bid evaluation?

Expert interview with Kollektivtrafikkforeningen

- What is Kollektivtrafikkforeningen's role in the transport sector with regards to procurements?
- How can Kollektivtrafikkforeningen shape current practices? What influence does the organisation have on the different members?
- What parties shape your topics / recommendations / guidelines? (government, suppliers, environmental groups, difi, transport organisations etc.)
- Are you interested in promoting GPP?
- If so, what has been your focus in the past years to improve / increase GPP? Ask for a timeline of events
- Are the different organisations satisfied with their current procurement practices? Do they know how to procure more environmentally friendly?
- Are you currently trying to identify best practices?
- What do you think about the recently introduced 30% regulation? Should it apply to all transport related procurements considering their environmental impact?
- What do you think about LP vs. MEAT? Is there a preferred award scheme?
- If MEAT, do you think that there is a preferred / optimal scoring rule for the evaluation of bids?
- What future environmental standards and practices do you anticipate? (more emission free buses etc.)