



# Strategic use of green public procurement in the bus sector: Challenges and opportunities



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## ABSTRACT

Green public procurement is believed to have the potential to contribute to environmental improvement and diffusion of green technologies. The aim of this paper is to compare and analyse how two Swedish regions use public procurement to promote the introduction of renewable fuels in their public bus transport systems. The method is a qualitative comparative case study, based on interviews and document studies. The paper addresses the questions of what the strategic motivations are for using public procurement to stimulate renewable fuels, and what the practical challenges have been in relation to five important factors identified from previous research: strategies, requirements, costs, size and knowledge. In one region, procurement is used in a strategic way to create a local market for biofuels, which poses higher demands on political backing, information and knowledge, the way requirements are set, and an acceptance of increased costs. In the other region, procurement is used instrumentally to increase the share of biofuels in a cost-effective way that gives room for more flexibility and reduces the demands on the procurers. This paper highlights the importance of context when assessing green public procurement schemes and analyses the case-specific influence of factors on the outcome of green public procurement.

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## 1. Introduction

Today, transport systems are fraught with many problems and cannot be considered sustainable. Transport is a large contributor to greenhouse gas emissions while other problems include local pollution, noise, accidents and resource depletion (Hickman and Banister, 2014). A major problem is the dependence on fossil fuels and a crucial question is how new technologies and alternative fuels in the transport sector can develop and diffuse (Bongardt et al., 2013). Cities and regions are important providers of public transport with large bus fleets. In this capacity, they have the ability to take the lead in a transition to low carbon fuels and technologies. A shift to alternative fuels in the public bus sector has direct impacts by reducing greenhouse gas emissions, as well as possible indirect impacts, since public transport can act as a testbed or niche market for new green propulsion technologies and fuels.

Public transport is often carried out by private transport

operators on public tenders, and green public procurement is therefore a main tool to promote change. Comparative analyses have studied the extent of green public procurement in cities and regions, and have identified various factors fostering or hindering its effective use (Von Oelreich and Philip, 2013; Bratt et al., 2013; Grandia et al., 2013; Günther et al., 2013). However, there is a lack of detailed studies of how specific regions and cities use public procurement in a strategic way to promote environmental goals, and what challenges this implies. This paper will complement previous research with an in-depth case study of how public procurement is used as a strategic tool in two regions, demonstrating the way in which regional preconditions influence the applicability of general procurement models and advice.

In Sweden, regional public transport authorities have used environmental criteria in public procurement for some time, and there has been a remarkable increase in the use of renewable fuels in public bus transport in recent years. In 2014, around 58% of vehicle kilometres in public bus transport in Sweden were driven with non-fossil fuels, compared to only 8% in 2007 (Xylia and Silveira, 2017). Despite this successful development, we know fairly little about the actual experiences in Swedish regions of using public procurement as an environmental policy instrument.

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The aim of this paper is to compare and analyse how two Swedish regions use public procurement to promote the diffusion of renewable fuels in their public bus transport systems. The questions addressed are what the motivations are for using public procurement to stimulate renewable fuels, and what the practical challenges have been in relation to strategies, requirements, costs, size and knowledge.

The outline of the paper is as follows. First, a review is presented over how previous research has analysed the experience of green public procurement in cities and regions with a focus on five factors: strategies, requirements, costs, size of public agency and knowledge. Then, the Swedish case studies are introduced. This is followed by a comparative analysis of the two cases based on the five factors identified in the literature review.

## 2. Factors affecting green public procurement

The purchase of goods and services from an external source by a public organisation is termed public procurement. Procurement can be used as a policy instrument for reaching environmental quality objectives (Von Oelreich and Philip, 2013), referred to as green public procurement (GPP). In the literature, 'sustainable public procurement' is often used to describe the same activity. However, sustainable public procurement can aim broader and include all pillars of sustainability - economic, social and environmental. Other differences occurring can be the replacement of the word 'procurement' with 'purchasing'. GPP is defined by the European Commission (2016b) as:

"a 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 procured."

The use of GPP is voluntary within the EU and each member state decides to which extent it will be implemented. In 2008, the EU set a target that 50% of all public tenders should be green by 2010. However, in 2009–2010 only 26% of the signed contracts in the EU included all core GPP criteria (Renda et al., 2012). The differences in implementation between the member states are large and in Sweden, as an example, GPP criteria were applied in 40–60% of the contracts (Renda et al., 2012). In 2014, new directives for public procurement were adopted by the EU (European Commission, 2016b). One addition is that all procuring authorities within road transport must consider energy use and environmental effects based on a commonly decided method to calculate life cycle cost (European Commission, 2016a).

In previous research, Bratt et al. (2013) argue that the position in the value chain and the volumes concerned give public procurement a great potential to drive the sustainability agenda. In Sweden, for example, public authorities consume 16–22% of GDP (Edquist, 2014). According to Marron (2003) GPP can have both direct and indirect effects. Direct effects, for example on emission reductions, can be significant when the public purchaser accounts for a large share of the market. Indirect effects from GPP include things such as induced innovation, niche market creation, cost reductions and example setting (Marron, 2003).

Reports show a rising trend for GPP, where the number of environmental requirements stipulated in procurements is increasing (Nissinen et al., 2009; Von Oelreich and Philip, 2013). Still, the progress is patchy and there are significant differences between local and regional authorities, as well as within authorities (Preuss, 2007). Much previous research does not go into sector detail, nevertheless the public transport sector is repeatedly

mentioned as a good example (Von Oelreich and Philip, 2013; Preuss, 2007; European Commission, 2016a). Much of prior research aims to identify factors which have an effect on the outcomes of GPP (Bratt et al., 2013; Grandia et al., 2013; Günther et al., 2013; Günther and Scheibe, 2006; Lundberg et al., 2015; Marron, 2003; Von Oelreich and Philip, 2013; Preuss, 2007). The following sections will discuss five of the most important factors (strategy and goals, requirements, costs, size and knowledge and information) commonly occurring in previous research.

### 2.1. Strategies and goals within GPP

The aim of GPP can differ between regions, this study of the Swedish bus sector will demonstrate two examples of different strategies. In previous research, the importance of an active top-management (e.g. politicians and high-level staff) is commonly seen to influence the extent to which GPP is incorporated in planning strategies and goal target settings (Brammer and Walker, 2011). It shows that, in regions where directives are more voluntary, priorities other than sustainability often dominate the procurement process (Von Oelreich and Philip, 2013). Also, the European Commission (2016b) identifies that lack of political support leads to a lack of resources devoted to GPP.

### 2.2. Different ways to set the requirements

The European Commission (2016a) has developed guidelines and procedures for implementing GPP and designing the requirements of contracts. A distinction can be made between minimum compliance criteria and award criteria (European Commission, 2016a). Minimum compliance criteria stipulate the minimum level of environmental performance that is needed from the bidder in order to be applicable for the contract. Award criteria are environmental criteria that can give additional points to the bidder in the tender (European Commission, 2016a). When it comes to requirements on renewable fuels in the Swedish bus sector, minimum compliance criteria are almost exclusively used. These can further be expressed in different ways. In the cases analysed in this article, two ways to set minimum compliance criteria were found: 'functional requirements' (e.g. a limit to the maximum amount of CO<sub>2</sub> released) and 'specific requirements' (e.g. demanding a specific type of fuel).

A report from the environmental consultant company WSP (2014), studies the outcomes in public transport for functional and specific requirements. It was seen that functional requirements usually come with lower operational and capital costs, but leave more room for interpretations and misunderstandings between regional public transport authorities and operators, making it harder for the regional public transport authorities to endorse technical development (WSP, 2014). Specific requirements on the other hand can endorse technical development and give increased control over the service production by the public sector, but may also lead to expensive technical development, restrict the competition in tenders and lead to increased costs (WSP, 2014). In general, more detailed contracts in the bus sector seem to have driven rising costs (Vigren, 2015; Lidestam et al., 2016), and some of this seems to be due to environmental requirements (Hultén, 2015).

### 2.3. GPP and costs

In previous research, cost is one of the strongest and most commonly identified factors influencing to what extent GPP is used, which is confirmed in this study. A main goal of procurement is to find an optimal balance between quality and low costs, which is related to New Public Management perspectives that give

politicians a goal-setting role where service production should be carried out in a market-like structure (Pollit and Bouckaert, 2011). Previous research has identified a common perception among public procurers that it costs more and takes longer to carry out purchasing when environmental requirements are included (Brammer and Walker, 2011; Günther et al., 2013; Von Oelreich and Philip, 2013; Preuss, 2007; Walker and Brammer, 2009). The institutionalised focus on low costs does not marry easily with sustainability goals and calls for a strategic perspective when public procurement is used as an environmental policy instrument (Transform, 2014).

According to Lundberg and Marklund (2013), there is a lack of economic research on the potentials of GPP. Marron (1997) and Lundberg et al. (2016) analyse the objective effectiveness of GPP (i.e. whether the instruments leads to environmental objectives being reached) and argue that the effectiveness is uncertain and depends on the specific market conditions. In a theoretical analysis, Lundberg and Marklund (2013) come to the conclusion that public procurement in general does not work as a cost effective environmental policy instrument, which means that it will not lead to emissions being reduced at the least cost to the society. Cogburn (2004) presents a more positive conclusion on the possible objective effectiveness and cost-effectiveness of GPP and concludes that it can be an important complement to other policies. There is still a lack of empirical studies of to what extent GPP increases costs or whether the way to design environmental requirements can have differing effects on socio-economic cost-effectiveness.

While increasing costs is certainly an issue, GPP could also contribute to lowering costs. The European Commission (2016a) has discussed GPP as a way to save money if the costs are looked at from a life-cycle perspective, for example by saving materials and energy and reducing waste and pollution. Procurement designs that lead both to improvements in environmental performance and lower cost, should always be encouraged. However, in the case when GPP leads to better environmental performance with higher direct costs, it is necessary to evaluate whether the increased costs are justified, including an assessment of the full costs of environmental impacts and the role of the indirect effects of GPP (Marron, 2003).

#### 2.4. Size influence on GPP

The differences in size between regions can be one explanation for the variations in success of GPP. Size is also one of the main aspects differentiating the regions in this paper from each other, foremost when it comes to the bus fleet and population density. A study of Norwegian municipalities and regions showed that GPP is significantly more established in larger municipalities, while smaller municipalities need to collaborate with each other (Michelsen and de Boer, 2009). Larger municipalities also to a greater extent have a purchasing department and a purchasing strategy, which is seen as important in order to develop effectual GPP (Michelsen and de Boer, 2009). In a Swedish study by Ottander and Söderström (2005), it was found to be common for organisations to cooperate in formal and informal networks to increase the amount of procured goods and to make it possible to set more ambitious requirements. By cooperating they also increased their knowledge and competence, pushed down prices and made the procurement process more effective (Ottander and Söderström, 2005). Marron (1997, 2003), argues that the potential of GPP to contribute to environmental outcomes is higher when the public sector is a large co-ordinated purchaser of products, and when the public organisation is the primary source of demand.

#### 2.5. Knowledge and information

Lastly, the role of knowledge and information is seen as an important factor affecting the outcome of GPP (Bratt et al., 2013; European Commission, 2016a; Grandia, 2016; Meehan and Bryde, 2011; Von Oelreich and Philip, 2013; Testa et al., 2016; Witjes and Lozano, 2016). The European Commission (2016a) points at the lack of knowledge when it comes to life cycle costs and benefits of environmental products, as well as uncertainties when it comes to the legal rights of applying environmental criteria in procurement. Bryde (2011) and the European Commission (2016a) suggest that sharing knowledge and experience between different areas could be one solution to the lack of knowledge, while Witjes and Lozano (2016) point to the importance of increased collaboration between procurers and suppliers of goods and services. Bratt et al. (2013) identify a need for guidance and a clear definition of sustainability in the selection of criteria. Von Oelreich and Philip (2013) highlight the need for easier and more accessible tools, such as concrete help to formulate and identify criteria, as well as better training for procurers on sustainability criteria. This conclusion is supported by Testa et al. (2016) who, in their study, also find that lack of knowledge and training seems more important than availability of economic resources and budget flexibility.

In the remainder of this paper the analyses will focus on how the above factors influence GPP in the bus sector in Sweden by a comparison of two regions.

### 3. Method

The method used for this study is a comparative qualitative case study analysis of the two divergent Swedish regions Skåne and Jämtland. Skåne is a metropolitan region with a dense public transport system, while Jämtland is a mainly rural region with comparatively less public transport. The geographical and organisational differences between the regions were central in order to explore the influence of context on the challenges and opportunities with public procurement. Further characteristics of the regions are elaborated in the next section. With the differences between the regions in mind, it was of interest to find out how the public purchasers and other actors view the use of public procurement as a strategic tool to support the development of renewable fuels in the bus sector. The choice of conducting a qualitative study was motivated for two reasons. First, since the use of green public procurement has not been studied earlier for the Swedish bus sector, an exploratory and open-ended study was seen as useful in order to identify the most important factors influencing its use. Second, many previous studies of GPP have used a quantitative survey design. The intention is to complement these studies by a more detailed and contextually based study of the procurement process and the reasoning of procurers and other actors.

The empirical material for the case studies comes from a combination of document studies and semi-structured qualitative interviews. The study took its point of departure in the reading of existing policy documents concerning public transportation goals and the use of public procurement in the two regions. Eight semi-structured interviews were conducted in the two regions, five in Skåne and three in Jämtland (see Table 1). The interviews were between 40 and 80 min long. The reason for conducting more interviews in Skåne is the larger size of the region, resulting in more staff being involved in the process.

In Skåne the interviewees were three civil servants from the public transport authority (one procurer, one environmental strategist and one public transport strategist), one elected representative at the regional public transport board and one representative from a private transport operator. In Jämtland, the

**Table 1**  
Interviews for the study.

	Position	Interview carried out
Interview A.	Environmental Strategist, Regional Public Transport Authority, Skåne	27 February 2015
Interview B.	Procurement Manager, Regional Public Transport Authority, Skåne	27 February 2015
Interview C.	Public Transport Strategist, County Administration, Skåne	26 March 2015
Interview D.	Market Director, Public Transport Operator, Skåne	21 April 2015 (telephone)
Interview E.	Politician Green Party, Regional Public Transport Board, Skåne	30 March 2015
Interview F.	Procurement Manager, Regional Public Transport Authority, Jämtland	28 April 2015 (telephone)
Interview G.	Public Transport Strategist, County Administration, Jämtland	30 April 2015 (telephone)
Interview H.	Managing Director, Public Transport Operator, Jämtland	3 May 2015 (telephone)

interviews were conducted with two civil servants from the public transport authority (one procurer and one public transport strategist) and one representative from a private transport operator. The selection of interviewees was based on an aspiration to cover different perspectives on the role of public procurement when environmental demands are made.

An interview guide was used to ask about the interviewee's background and role in the public procurement process, the public transport policy, the strategic role of public procurement, the requirements when procuring public transport, the public procurement organisation, and barriers and drivers for stimulating renewable fuels in the bus sector.

The interviews were recorded and transcribed. The method used for analysing was meaning condensation; that is, each transcript was read through, and passages from it were condensed into shorter statements (Kvale and Brinkman, 2009). These statements were then categorised into thematic descriptions of issues and factors of importance in the public procurement process. The statements were then analysed in relation to how public procurement was perceived and used as a tool for greening the bus fleet. The statements from interviewees were compared to statements of the other interviewees and to information in policy and procurement documents.

The validity and reliability of the study has been addressed by interviewing respondents from different perspectives, using different data sources (interviews and documents), adopting a systematic analysis procedure (meaning condensation) and by a continuous discussion on interpretations between the involved researchers.

## 4. Introduction to the cases

### 4.1. Public transport in Sweden

Public transport in Sweden is organised around the regional level and there are 21 regional public transport authorities (PTA) (Lidestam et al., 2016). The PTA can consist of either the county, municipality, or a combination of the two, and is responsible for creating a regional transport supply programme covering targets for both commercial and contracted services (SFS 2010:1065). Hence, the PTA is the organisation closest to the politicians and they foremost work with the overall visions for public transport and how the goals should be reached. The transport business, in turn, can be organised in different ways; either the PTA administers it or it is run by a company owned by the PTA.

The deregulation of public transport in Sweden has meant that public transport is organised on the basis of a comprehensive competitive tendering regime, with public procurement as the central mechanism, and the length of the contracts varying between 5 and 10 years (van de Velde, 2014; Sveriges Bussföretag, 2016). The deregulation has also opened up for purely commercial traffic, but so far this has only been realised to a very limited extent (Trafikanalys, 2015). Today, around 90% of regular bus traffic in Sweden is procured by PTAs (Sveriges Bussföretag, n.d.). The Swedish laws for public procurement are based on the EU directive and the main criterion of procurers in procurement tenders has been to achieve cost-efficient public transport with good service. A main requirement is that all suppliers should compete on equal terms in the tender, and prioritising based on location or previous tenders is not permitted (National Agency for Public Procurement, 2016).

When it comes to including environmental criteria, the Swedish law states that “procured units should take into account environmental concerns and social concerns in procurement if the nature of the procurement motivates this” (SFS 2007:1092 3 §). The Swedish Public Transport Association (Svensk Kollektivtrafik) has taken the initiative to develop a common sector standard for the procurement of public bus services, called Buss 2014, which includes guidelines on environmental requirements. Representatives of PTAs, transport operators, bus manufacturers and other stakeholders are jointly involved in the development of the standards.

The guidelines for environmental requirements stipulate three ambition levels regarding renewable fuels (minimum, basic, extended) ranging from 30% to 70% reduction of emissions compared to diesel (Partnersamverkan för en fördubblad kollektivtrafik, 2013a). In recent years, there has been a rapid development of renewable fuels in the Swedish bus sector, the most common fuels being biodiesel (34%), biogas (17%) and ethanol (7%) (Xylia and Silveira, 2017). The goal set by the Swedish Public Transport Association and partners is that 90% of bus transport should be fossil-fuel free by 2020 (Partnersamverkan för en fördubblad kollektivtrafik, 2013b).

### 4.2. The two cases; Skåne and Jämtland

Skåne and Jämtland have been chosen as comparative cases because of their differences, both geographically and in their choice of fuel and strategy in public transport. Below follows a presentation of the two regions and in Table 2 an overview of the regions can be seen.

Skåne, located in southern Sweden, is an example of a large metropolitan region with a dense public transport system, including around 30 different bus contracts divided into city traffic and regional traffic (Skånetrafiken, 2014). In Skåne, procurement has been used strategically as a part of a wider goal to promote the development of a regional biogas market and to push the development of renewable fuels (Region Skåne, 2015a). In 2014, Skåne was also the county in Sweden with the largest total production of biogas (Energimyndigheten, 2015). The overall goal is to have a fossil free bus fleet by 2020 (Region Skåne, 2015a) and until 2015, there was a requirement for gas buses as the preferred choice in contracts (Region Skåne, 2012). However, in the latest regional transport plan from 2015, there has been a gradual shift in focus from biogas alone towards a more diversified approach to renewable fuels (Region Skåne, 2015a), and in the newest tender from 2015 the requirement was that all buses must be fuelled by 100% renewable fuels, while it was not stated which type of fuel (Skånetrafiken, 2015). In 2015, renewable fuels were used for 53.7% of the vehicle kilometres, with the main renewable fuel being biogas (47.6%). The share of fossil fuel is today mainly covered by



**Table 2**

Overview of the geographical conditions, share of renewable fuels and biogas production in the two studied regions (Svensk Kollektivtrafik, 2016; Energimyndigheten, 2015; Trafikanalys, 2015).

	Population [inh/km <sup>2</sup> ]	Number of buses	Share of renewable fuel 2015 [vehicle km/fuel]	Tot. biogas prod. 2014 [GWh]	Bus cont. 2013
Skåne	119	1027	Total share: 53.7% Biogas: 47.6% Biodiesel: 5.8% Electricity: 0.3%	351	32
Jämtland	2.59	202	Total share: 41.7% Biodiesel: 38.5% Ethanol: 3.1%	10	8

natural gas (37.4%) (Svensk Kollektivtrafik, 2016). In a recent tender from 2015, the contract was won by buses that will use different types of biodiesels such as RME and HVO (Skånetrafiken, 2015). RME is a biodiesel produced from rapeseed oil, while HVO (Hydrogenated Vegetable Oil) is a biodiesel that has been treated so that it has similar characteristics to fossil diesel.

Jämtland, located in northern Sweden, is an example of a mid-sized region with a fairly large geographical area and low population density (Regionförbundet Jämtlands län, 2012). In Sweden, many regions share these characteristics. Jämtland has fewer than 10 bus contracts covering one mid-sized city, some smaller towns and regional traffic (Trafikanalys, 2015). Procurement has mainly been used as a tool to increase the share of renewable fuels and reduce CO<sub>2</sub> emissions in a cost-effective way and targets for public transport are primarily based on national transport policies (Region Jämtland Härjedalen, 2015). In 2009, there was a large bus tendering process in which the environmental requirements were based on the guidelines developed by the Swedish Public Transport Association and other actors (Länstrafiken i Jämtlands län, 2012). The tenders included requirements of 30–50% renewable fuels by the end of 2014, depending on the contract area. In 2015, renewable fuels were used for 41.5% of the vehicle kilometres, with biodiesel being most common (38.5%). In contrast to Skåne, there are no gas buses in use and the production of biogas was in 2014 among the lowest of all counties in Sweden. The dominant fuel in Jämtland is still diesel (58.3%) (Svensk Kollektivtrafik, 2016).

## 5. Factors influencing GPP in the two regions

The following section presents results from the analysis of the use of green public procurement in the public bus sector in Skåne and Jämtland. The interviews conducted show that the factors discussed in previous research on GPP are also represented in the specific case of public transport.

### 5.1. Strategy

The choice of strategy influences how public procurement is used, for example how the requirements are set and how increased costs are perceived. When comparing Skåne and Jämtland, it is clear that different priorities have guided the use of public procurement for the introduction of renewable fuels in public bus transport.

In Skåne, there has been a broad strategy among a network of actors to promote a regional biogas market. This has included measures such as a biogas network group, a road map for biogas, the promotion of R&D, infrastructure for production, distribution and fuelling (Region Skåne, 2015b). There has been broad political support for the strategy, and there is a strong perception among key

civil servants that the public sector has to be in the forefront and lead the development (Interviews A, B, C, E).

“As the public sector, it is our task to push the market and set requirements that are leading change in the market” (Interview A)

Also a representative of the private public transport operators in Skåne shares the opinion that the public sector has an important role in the development.

“I would say [...] that it is absolutely necessary that the public promotes these questions. We only have to look at the truck [heavy duty vehicle] market which is maybe fully commercial. There are very few who use any kind of renewable fuel; rather you take what is most cost-effective instead” (Interview D)

The experience of the strategic focus on biogas has been mixed. All the interviewees agree that the demand for biogas from public transport has been crucial for the development of biogas production in Skåne (Interviews A, B, C, D, E). Despite the efforts, the economic conditions for biogas producers are tough at present (Region Skåne, 2015b) and economic support from national policy initiatives is important in order for biogas to be competitive. In Skåne, there has been a gradual shift in focus away from biogas alone to a more diversified approach to renewable fuels (Skånetrafiken, 2015).

In Jämtland, the county administration and the regional transport authority have a much more instrumental view of GPP, and it is used mainly as a way to improve environmental performance and introduce biofuels into the bus fleet in a cost-effective way. The targets for public transport are based on the national transport policies and there is no regional strategy to support new fuels or push for the development of technology. According to the civil servants interviewed, this is not something the region can or should do.

Interviewer: If we look at this about setting requirements for renewable fuels in public transport. This is mainly to reach the environmental goals?

Respondent: Yes, and this is a national goal.

Interviewer: Ok, and not so much to contribute to the development of renewable fuels or technology?

Respondent: No, we cannot be in the forefront of such things.” (Interview G)

The general perception in both regions is that decisions to support a transition to renewable fuels are not taken fast enough at the national level. In Skåne, this has accentuated the need for the region to take its own initiatives, while the representative of the transport authority in Jämtland would rather prefer general economic instruments and national action (Interviews A, B, F).

In a comparison of the cases the two different strategies imply different challenges and put different demands on the use of GPP, but neither can, per se, be deemed more or less appropriate.

### 5.2. Different types of requirements

In both Skåne and Jämtland minimum compliance criteria on renewable fuels are used in tenders, which the operators need to fulfil to be qualified for the contract. From the interviews and procurement documents it was seen that two types of requirements have been used in the two cases: specific and functional

requirements.

In Skåne, specific requirements on the use of gas buses were employed in order to promote biogas and the development of a biogas market. However, in the latest procurement there has been a shift towards functional requirements in the effort to diversify the renewable fuel portfolio and get away from the focus solely on biogas (Skånetrafiken, 2015). In Jämtland, functional requirements have been used from the start, stipulating that some type of renewable fuels should be used, without specifying which one. The representative of the public transport authority in Jämtland argues in favour of functional requirements and against too many detailed requirements since this tends to drive up costs.

“If we can decide we prefer functional procurements, we set a goal saying you cannot emit more than this [...] and then we let the operators and bidders find the solution to the problem” (Interview F).

From the perspective of the private transport operators in both regions, specific requirements are seen as problematic, and they clearly prefer functional requirements (Interviews D, H). The representative of the private transport operator in Skåne states that:

“what has been driving costs is the biogas trip. There is no doubt that this has cost more than with functional requirements in procurement” (Interview D)

Apart from increasing costs, interviewee D also points to the problem that there has not been enough biogas on the market, which has created problems for transport operators.

### 5.3. Costs

The choice of strategy and requirements is closely linked to how the importance of cost is perceived in public procurement. Both in the literature and in this study the concern of increased costs can be seen as one of the strongest incentives to use softer functional requirements. However, this study clearly shows that the influence of cost considerations is context-dependent and relates to the strategic approach towards public procurement in the region.

A more innovative strategy with specific requirements needs a greater political acceptance of increased costs compared to when GPP is used as an instrument to reduce the use of fossil fuels with the help of functional requirements. In Skåne, the politicians were accepting of the increased costs that came with the introduction of biogas in order to gain environmental benefits and a positive long-term development (Interview B). This, together with government subsidies through municipal climate investment programmes, enabled the promotion of biogas buses (Interviews A, B). The experience showed that the greatest increase in costs took place during the early stages of development. According to the representative of the regional transport company, “each biogas bus cost approximately SEK 1 million more than a normal diesel bus in the beginning” (Interview B). With time these costs have gone down, but, according to a recent Swedish study, gas buses are still somewhat more expensive than diesel buses (WSP, 2014).

From the interviews in Jämtland, it was clear that there is a strong awareness among transport planners of the potential conflict between environmental requirements on biofuels and increasing costs, and there is a reluctance to pose requirements that might increase costs (Interview G, F). There is a perceived risk of conflict between environmental requirements and increased public transport both among the authorities and bus operators in

Jämtland. The procurement manager of the regional PTA states:

“But the consequence is that this traffic will be very clean and very nice but so expensive, and then we need to raise the prices or cut down on services” (Interview F).

The views of costs at the regional level are interesting in relation to the welfare economic studies of public procurement by Lundberg and Marklund (2013). Lundberg and Marklund find that public procurement is in general not to be considered a cost-effective environmental policy instrument and that this argument should be used sparsely to advocate GPP. While the regional public actors are clearly cost-aware, they see public procurement as the main instrument that they can use to influence the fuel composition in the bus fleet. Furthermore, especially in the case of Skåne, they see it as their responsibility to do this, not the least because of the perceived lack of strong national policies.

### 5.4. Size

The public sector constitutes a large part of the public transport market and the potential to use public procurement to affect the choice of fuel is therefore large. However, the volume of procured goods and the size of the region were seen to influence the use of GPP. In Sweden, central guidelines on environmental requirements have been developed with the aim of avoiding a fragmentation of requirement criteria. In both Skåne and Jämtland, the requirements are based on the guidelines, which is also the case in all 21 regional PTAs in Sweden (Xylia and Silveira, 2017).

Even though the two studied regions differ geographically, GPP is used actively in both Skåne and Jämtland to put requirements on renewable fuels. However, while the results of the interviews are not conclusive there seems to be a connection between size of the bus fleet and the type of strategy chosen. In Skåne, politicians and civil servants express a confidence that they have an opportunity to affect market development, while this is not the case in Jämtland (Interviews A, B, F, G). There is also an agreement among the respondents in the two regions that ‘more and bigger’ is often better. However, interviewee B points out that there are risks when an organisation is too large and the procurement department is separated from the market, since it might result in the procurer having inadequate knowledge of the procured goods and its area of use. According to a respondent from the public transport authority in Skåne, they have found a good balance in their organisation so that they are both large and close at the same time:

“We know our colleagues and co-workers. We know who to ask, and we work in the sector with sector issues and help drive things forward.” (Interview B)

The closeness between environmental and procurement knowledge within the organisation is exemplified by the fact that the environmental strategist and procurement manager took part in the interview together and showed a thorough understanding of each other's issues.

### 5.5. Knowledge and information

The common guidelines on requirements provide important support and knowledge to the regional PTAs, and have been used in both Jämtland and Skåne. The need for knowledge is perceived differently in the two cases, and is related to the two different ways of setting requirements. In Jämtland, where the strategy has been to use functional demands, the responsibility of choosing the right

technology and fuel is shifted to the bus operators, which requires less knowledge of the market on the part of the procurers.

“If you talk to the sector, they say ‘just make functional demands, for example 90% fossil free fuels and we will fix it’. So you can either work with the question alone or just point with the whole hand, and you will get an answer.” (Interview G)

In Skåne, on the other hand, the biogas strategy and the specific requirements on biogas in procurement have demanded a high level of knowledge and information gathering. It has been necessary to study the development of the biogas market in order to ascertain whether there is enough biogas to fuel the buses, and at what cost. In contrast to the quotation from Jämtland above, the respondent in Skåne does not see their role as passive, but rather highlights the benefits of two different actors looking for the best solutions:

“When we make our requirements the transport operators do their market analysis on which is the best fuel. What has the highest energy efficiency, largest CO<sub>2</sub> reduction and so on? This market analysis is, of course, made by ourselves also, but they do it once again. So we have an additional actor who analyses, and we can get the sharpest and best bids” (Interview A)

It is not only important to have knowledge of the market and fuels before the procurement process. Interviewees in Skåne and Jämtland agree that follow up is needed to make sure the requirements are fulfilled (Interview A, B, F, G). In Skåne, the focus on biogas has called for the development of a strict monitoring system, since what is going into the tank is a mix of biogas and natural gas, and there is a need to ascertain that the operators actually use as much biogas as they account for (Interview A). In Jämtland monitoring is carried out to a lesser extent, both due to a lack of resources and since they do not consider themselves to have major problems with quality (Interview F).

## 6. Discussion and conclusions

In this paper, a comparative case study was used to carry out an in-depth analysis of how green public procurement is used in two Swedish regions to promote the introduction of renewable fuels in their public bus transport systems. The focus was on the strategic motivations for using public procurement to stimulate renewable fuels, and what the practical challenges have been in relation to requirements, costs, size and knowledge. Besides presenting examples of these challenges, the findings in this paper clearly show the importance of looking at the general recommendations for GPP in relation to individual cases in order to understand the motivations for different choices and the ways in which specific challenges are being addressed.

When it comes to the influence of top-management, the literature evidence clearly pointed at the need for more support, in order for sustainability requirement to play a significant role in the procurement. The importance was confirmed in both studied regions, but there were differences in the two cases. In Skåne, the high acceptance and political backing on the regional level enabled them to build up a market for biogas, but more support from the national level would have facilitated the development. Jämtland's regional targets, on the other hand, have been less far reaching and more focused on the most cost-efficient way to introduce renewable fuels. This results in a more direct influence from the national goals on the ambition level of the GPP-scheme.

Closely connected to the strategy is how strictly the regions

choose to set the requirements. Most common within the bus sector in Sweden is to set minimum compliance criteria. The two studied cases exemplify two different ways to set these criteria; specific and functional. Skåne, for a long time, set specific requirements on biogas which has helped them develop a biogas market, but also resulted in high costs and lack of availability, which has resulted in them changing to functional requirements. In Jämtland these challenges were seen as reasons for using functional requirements in the first place. Also the operators preferred functional requirements for the same reasons. From this experience, it may seem obvious that functional requirements should be the preferred way to go. However, if the public actor wants to push for a specific fuel or technology it is hard to see how this will be done without the use of specific requirements, or very detailed functional requirements.

Concerns over increased costs were identified in previous literature as an important reason to set less far reaching requirements. However, this study shows that the importance of cost as a barrier is context dependant and related to the strategic approach. In Skåne, costs were not perceived as a main barrier and higher initial costs were politically accepted in order to create a market for biogas. Previous literature also claimed that GPP is more established in larger regions. Nevertheless, GPP was used in both studied regions, but Skåne, as a large metropolitan area, saw themselves as having a larger possibility to influence the development of the market.

The last factor influencing the use of GPP which was looked at in this paper is access to knowledge, which is seen as a key issue in the literature. However, in our study we saw that the need for knowledge differs and seems to be connected to how the requirements are set. With functional requirements, as in Jämtland, the need for knowledge was shifted to the bus operators and national guidelines. In Skåne, on the other hand, the procurers felt that both knowledge of the market as well as monitoring was important, in order to manage the biogas strategy.

To sum up, two different strategic approaches to GPP were identified in this study, which gave rise to different opportunities and challenges. In the case when procurement is used in a strategic way to create a local market for biofuels, it required greater demands on political backing, information and knowledge and acceptance of increased costs. Nevertheless, specific requirements, or very detailed functional requirements, seem to be necessary if the public wants to push for a specific renewable fuel or new technology. In the other case, procurement is used instrumentally to increase the share of biofuels in a cost-effective way which provides scope for more flexibility, reduces the demands on the procurers and leaves the choice of technology to the operators. However, the lower costs and less responsibility for the procurers can be seen to go hand-in-hand with a less far-reaching use of GPP.

These findings add to previous research by an in-depth and qualitative analysis of how the factors play out in specific cases. The differences seen between the regions highlight the importance of context when assessing green public procurement schemes and the influence of factors on success or failure. Important contextual factors seen being size, regional political strategies and availability of renewable fuel. When the complexity increases and the factors become entangled, it is difficult to develop generalised guidelines for how GPP should be carried out. This study opens up for new research questions and a need for further case studies of GPP in different contexts. To strengthen and verify the findings of this study, future research might benefit from making a systematic study of all Swedish regions so as to investigate the importance of context and choice of strategy as well as the need for additional policies to support the transition towards new fuels and technologies.

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## References

- Bongardt, D., Creutzig, F., Hüging, H., Sakamoto, K., Bakker, S., Gota, S., Böhler-Baedeker, S., 2013. Low-Carbon Land Transport: Policy Handbook. Earthscan Routledge, London, Great Britain.
- Brammer, S., Walker, H., 2011. Sustainable Procurement in the public sector: an international comparative study. *Int. J. Oper. Prod. Manag.* 31, 452–476.
- Bratt, C., Hallstedt, S., Robért, K.-H., Broman, G., Oldmark, J., 2013. Assessment of criteria development for public procurement from a strategic sustainability perspective. *J. Clean. Prod.* 52, 309–316.
- Cogburn, J.D., 2004. Achieving managerial values through green procurement? *Public Perform. Manag. Rev.* 28 (2), 236–258.
- Edquist, C., 2014. Public Procurement and Innovation (Offentlig upphandling och innovation). Report 2014:5. Swedish Competition Authority, Stockholm, Sweden.
- Energimyndigheten, 2015. Production and Use of Biogas and Digestates Year 2014 (Produktion och användning av biogas och rötrestar år 2014). ES 2015:03. Statens Energimyndighet, Eskilstuna, Sweden (in Swedish).
- European Commission, 2016a. Buying Green! A Handbook on Green Public Procurement, third ed. SEC, Brussels, Belgium.
- European Commission, 2016b. Green Public Procurement. [http://ec.europa.eu/environment/gpp/index\\_en.htm](http://ec.europa.eu/environment/gpp/index_en.htm) (Accessed 10 October 2016).
- Grandia, J., 2016. Finding the missing link: examining the mediating role of sustainable public procurement behaviour. *J. Clean. Prod.* 124, 183–190.
- Grandia, J., Groeneveld, S., Kuipers, B., Steijn, B., 2013. Sustainable procurement in practice: explaining the degree of sustainable procurement from an organisational perspective. In: Decarolis, F., Frey, M. (Eds.), *Public Procurement's Place in the World: The Challenge towards Sustainability and Innovation*. Palgrave MacMillan, Basingstoke, pp. 37–62.
- Günther, E., Scheibe, L., 2006. The Hurdle analysis. A self-evaluation tool for municipalities to identify, analyse and overcome hurdles to green procurement. *Corp. Soc. Responsib. Environ. Manag.* 13 (2), 61–77.
- Günther, E., Hueske, A.-K., Stechemesser, K., Buscher, L., 2013. The “Why Not”-perspective of green purchasing: a multilevel case study analysis. *J. Change Manag.* 13 (4), 407–423.
- Hickman, R., Banister, D., 2014. *Transport, Climate Change and the City*. Routledge, London, Great Britain.
- Hultén, S., 2015. Contracts and Competition I the Regional Public Bus Traffic (Kontrakt och konkurrens i den regionala kollektiva busstrafiken). Report 2015:7. Swedish Competition Authority, Stockholm, Sweden (in Swedish).
- Kvale, S., Brinkman, S., 2009. *Interviews: Learning the Craft of Qualitative Research Interviewing*. SAGE, London, Great Britain.
- Länstrafiken i Jämtlands län, 2012. Annual Report for the County Traffic in Jämtland's County (Årsredovisning för Länstrafiken i Jämtlands län). Länstrafiken i Jämtlands län, Östersund, Sweden (in Swedish).
- Lidestam, H., Johansson, A., Pydöke, R., 2016. Kontraktsformer Och Dess Inverkan På Svensk Kollektivtrafik. K2 Outreach 2016:3. K2, Lund, Sweden.
- Lundberg, S., Marklund, P.-O., 2013. Green public procurement as an environmental policy instrument: cost effectiveness. *Environ. Econ.* 4 (4), 75–83.
- Lundberg, S., Marklund, P., Strömbäck, E., Sundström, D., 2015. Using public procurement to implement environmental policy: an empirical analysis. *Environ. Econ. Policy Stud.* 17 (4), 487–520.
- Lundberg, S., Marklund, P.-O., Strömbäck, E., 2016. Is environmental policy by public procurement effective? *Public Finance Rev.* 44 (4), 478–499.
- Marron, D., 1997. Buying green: government procurement as an instrument of environmental policy. *Public Finance Rev.* 25 (3), 285–305.
- Marron, D., 2003. Greener public purchasing as an environmental policy instrument. *OECD J. Budg.* 3 (4), 71–105.
- Meehan, J., Bryde, D., 2011. Sustainable procurement practice. *Bus. Strategy Environ.* 20 (2), 94–106.
- Michelsen, O., de Boer, L., 2009. Green procurement in Norway; a survey of practices at the municipal and county level. *J. Environ. Manag.* 91 (1), 160–167.
- National Agency for Public Procurement, 2016. About the Rules for Public Procurement (Om regler för upphandling) (in Swedish). [www.upphandlingsmyndigheten.se/upphandla/om-upphandlingsreglerna/](http://www.upphandlingsmyndigheten.se/upphandla/om-upphandlingsreglerna/) (Accessed 07 October 2016).
- Nissinen, A., Parikka-Alhola, K., Rita, H., 2009. Environmental criteria in the public purchases above the EU threshold values by three Nordic countries: 2003 and 2005. *Ecol. Econ.* 68 (6), 1838–1849.
- Ottander, P., Söderström, M., 2005. Environmentally Friendly Public Procurement. A Survey Study 2004 (Miljöanpassad offentlig upphandling. En enkätstudie 2004). Rapport 5445. Naturvårdsverket, Stockholm, Sweden (in Swedish).
- Partnersamverkan för en fördubblad kollektivtrafik, 2013a. Environmental Requirements in Transport Procurement – Bus (Miljökrav vid trafikupphandling – Buss). Svensk Kollektivtrafik, Stockholm, Sweden (in Swedish).
- Partnersamverkan för en fördubblad kollektivtrafik, 2013b. Sector-wide Environmental Program (Branschgemensamt miljöprogram). Svensk Kollektivtrafik, Stockholm, Sweden (in Swedish).
- Politt, C., Bouckaert, G., 2011. *Public Management Reform: a Comparative Analysis: New Public Management, Governance, and the Neo-Weberian State*. Oxford University Press, Oxford, Great Britain.
- Preuss, L., 2007. Buying into our future: sustainability initiatives in local government procurement. *Bus. Strategy Environ.* 16 (5), 354–365.
- Region Jämtland Härjedalen, 2015. Regional Transport Supply Program 2016–2020 (Regionalt trafikförsörjningsprogram 2016–2020). Region Jämtland Härjedalen, Östersund, Sweden (in Swedish).
- Region Skåne, 2012. Regional Transport Supply Program for Skåne 2012 (Trafikförsörjningsprogram för Skåne 2012). Region Skåne, Kristianstad, Sweden (in Swedish).
- Region Skåne, 2015a. Regional Transport Supply Program for Skåne 2015 (Trafikförsörjningsprogram för Skåne 2015). Region Skåne, Kristianstad, Sweden (in Swedish).
- Region Skåne, 2015b. Skåne's Roadmap for Biogas: Strategic Part 2015 (Skånes färdplan för biogas: strategisk del 2015) (in Swedish). [utveckling.skane.se/siteassets/publikationer\\_dokument/skanes\\_fardplan\\_for\\_biogas\\_strategisk\\_del.pdf](http://utveckling.skane.se/siteassets/publikationer_dokument/skanes_fardplan_for_biogas_strategisk_del.pdf) (Accessed 29 April 2016).
- Regionförbundet Jämtlands län, 2012. Regional Transport Supply Program 2013–2015 (Regionalt trafikförsörjningsprogram 2013–2015). Regionförbundet Jämtlands län, Östersund, Sweden (in Swedish).
- Renda, A., Pelkmans, J., Egenhofer, C., Schrefler, L., Luchetta, G., Selçuki, C., 2012. The Uptake of Green Public Procurement in the EU27. Submitted to the European Commission, DG Environment. Centre for European Policy Studies, College of Europe.
- Skånetrafiken, 2014. Operational Plan 2014–2017 (Verksamhetsplan 2014–2017). Skånetrafiken, Kristianstad, Sweden (in Swedish).
- Skånetrafiken, 2015. Procurement of Bus Traffic 2015 (Upphandling av Busstrafik 2015). dnr 357/2014 Bilaga Buss och Miljö. Skånetrafiken, Kristianstad, Sweden (in Swedish).
- Svensk Kollektivtrafik, 2016. The Environmental and Vehicle Data Base Frida (Miljö- och fordonsdatabasen Frida) (in Swedish). [frida.port.se/hemsidan/default.cfm](http://frida.port.se/hemsidan/default.cfm) (Accessed 04 May 2016).
- Sveriges Bussföretag, n.d. Procured regular traffic [Upphandlad linjetrafik]. (in Swedish). [www.transportforetagen.se/ForbundContainer/sveriges\\_bussforetag/Branschfragor/Upphandlad-trafik/](http://www.transportforetagen.se/ForbundContainer/sveriges_bussforetag/Branschfragor/Upphandlad-trafik/) (Accessed 19 September 2016).
- Sveriges Bussföretag, 2016. Statistic about the Bus Sector (Statistik om bussbranschen) (in Swedish). [www.transportforetagen.se/Documents/Publik\\_F%C3%B6rbunden/BuA/Rapporter/Statistik%20om%20bussbranschen%202016.pdf](http://www.transportforetagen.se/Documents/Publik_F%C3%B6rbunden/BuA/Rapporter/Statistik%20om%20bussbranschen%202016.pdf) (Accessed 04 May 2016).
- Testa, F., Annunziata, E., Iraldo, F., Frey, M., 2016. Drawbacks and opportunities of green public procurement: an effective tool for sustainable production. *J. Clean. Prod.* 112, 1893–1900.
- Trafikanalys, 2015. The Contracts for the Procured Public Transport 2013 (Avtalen för den upphandlade kollektivtrafiken 2013). Trafikanalys, Stockholm, Sweden (in Swedish).
- Transform, 2014. Policy Brief No 2: the Role of Innovation Procurement to Help Accelerate the Transition towards Low Carbon, Zero Emission Transport in Cities. Lessons from the FP7/Transform project. [http://www.transform-europe.eu/wp-content/uploads/2015/09/TRANSFORM-2nd-Policy-Brief\\_final.pdf](http://www.transform-europe.eu/wp-content/uploads/2015/09/TRANSFORM-2nd-Policy-Brief_final.pdf) (Accessed 04 May 2016).
- van de Velde, Didier, 2014. Market initiative regimes in public transport in Europe: recent developments. *Res. Transp. Econ.* 48, 33–40.
- Vigren, A., 2015. Costs in Swedish Public Transport: an Analysis of Cost Drivers and Cost Efficiency in Public Transport Contracts. Licentiate Thesis. KTH, Stockholm, Sweden.
- Von Oelreich, K., Philip, M., 2013. Green public Procurement - a Tool for Achieving National Environmental Quality Objectives. Report 6600. Swedish Environmental Protection Agency, Stockholm, Sweden.
- Walker, H., Brammer, S., 2009. Sustainable procurement in the United Kingdom public sector. *Supply Chain Manag. Int. J.* 14 (2), 128–137.
- Witjes, S., Lozano, R., 2016. Towards a more Circular Economy: proposing a framework linking sustainable public procurement and sustainable business models. *Resour. Conserv. Recycl.* 112, 37–44.
- WSP, 2014. The Importance of Specific Requirements for Bus Traffic Costs (Särkravens betydelse för busstrafikens kostnader). WSP, Stockholm, Sweden (in Swedish).
- Xylia, M., Silveira, S., 2017. On the road to fossil-free public transport: the case of Swedish bus fleets. *Energy Policy* 100, 397–412.