

# Master's Thesis – Master Sustainable Business and Innovation

“Towards better public procurement of sustainability: Standardization strategies for contracting authorities”



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# ProRail

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## Abstract

**Introduction:** Due to slow uptake of Green Public Procurement (GPP), contracting authorities are making developments regarding sustainability in their procurement processes. However, these developments need broader application to eventually reach organizational sustainability goals. Standards and standardization can help foster such broader application. Through standardization strategies, which address barriers to standardization, public procurers could improve their procurement of sustainability. As the concept of standardization strategies not supported in literature, it is important to understand what these strategies look like and how they can help improve public procurement of sustainability.

**Theoretical underpinnings:** In the public procurement process, requirement specifications and awarding criteria are the procurement instruments which most commonly can include standards. Standardization refers to the shift of limitely applied innovative GPP-instruments, in this research referred to as future standards, to broadly applied ones, making them standards. Barriers occur in this process, drawn from barriers to the GPP uptake, public sector innovation and sustainability in the public sector. Strategy serves as a solution to overcome these barriers, as strategy generally involves, setting goals and priorities, determining actions to achieve the goals, and mobilizing resources to execute the actions.

**Methods:** Following an Engaged Scholarship approach, the procurement processes of Dutch contracting authority ProRail were analyzed. Four projects incorporating procurement of sustainability served as case-studies, and resulted in nine semi-structured interviews with relevant employees. Together with literature and related procurement documents, this qualitative data was coded in Nvivo using the constant comparison method.

**Results:** The broader application of future standards, technical and procurement standards, is obstructed by eight identified barriers. These barriers hinder the standardization process in different ways, some are specific to standards and others are more general. Yet, eleven strategies for overcoming these barriers are identified. A couple strategies apply to several barriers, while some barriers are addressed by multiple strategies. The standardization strategies can be used by contracting authorities when setting up procurement or firm strategies, to improve procurement of sustainability.

**Conclusion/discussion:** Public organization's GPP efficacy could increase if the standardization of innovative GPP instruments is deliberately incorporated in the overall procurement strategy. Since such standardization efforts are likely to encounter various barriers, upfront formation of a standardization strategy to evade these barriers enhances the chance of successful innovative GPP instruments to eventually become standardized.

# 1. Introduction

Public procurement practices are playing an increasingly important role in stimulating the demand for environmentally-friendly products and services (Testa et al., 2016; Alvarez & Rubio, 2015). The procurement of sustainability is often referred to as Green Public Procurement (GPP) (EC, 2020b). Contracting authorities are actively engaging in these GPP practices to meet their long-term circular and climate-neutral procurement goals such as increasing circularity and reducing CO<sub>2</sub> emissions (Gelderman et al., 2017; ProRail, 2020b).

However, several studies point to the uptake of GPP by public organizations being slow and that innovative solutions are weakly supported (Foray et al. 2011; Bratt et al. 2013). Public procurers tend to stick to past practices and environmental evaluation criteria are rare (Palmujoki et al., 2010). As a result, public procurers are more recently trying to make developments towards increasing sustainability in the procurement process, through the creation of new instruments/tools or other developments in the procurement process (Wesseling & Edquist, 2018). These 'innovations' are needed to improve the GPP practices of contracting authorities, as they increase the impacts of sustainable purchasing and help reach national or organizational goals.

Such new developments, or innovative GPP-instruments, can have large potential if they are successful. Such instruments lack broad application, as they are used in a handful of projects, when they could be used in all similar (future) projects (Cheng et al., 2018). Broader application results in greater sustainability impacts (Pouikli, 2021). The use of standards and standardization can aid this broader application, as this standardization supports GPP by increasing the availability and stringency of environmental criteria and holding markets to higher standards (EC, 2008a). In practice, GPP requires the use of environmental criteria, which include eco-labels and standards for energy efficiency, emissions intensity, or noise thresholds, and environmental management system certification (Rainville, 2017). These criteria serve as voluntary standards as they set specifications above what is required by regulation (Breyer, 1982). Standards including GPP criteria are created through a process of standardization: the development of "technical specifications based on consensus amongst the interested parties," (EC, 2008b, p.2) including industry, relevant interest groups, and public authorities. This research therefore assumes procuring agencies in part depend on their uptake of standardization of (successful) innovative GPP-instruments, to be able to reach their sustainability goals.

Nevertheless, the standardization process, like most processes, is likely to encounter barriers (Cotton et al., 2012). Especially within GPP, where research has shown many barriers exist to its uptake (Testa et al., 2012), this is expected. Similarly, the literature on barriers to public sector innovation and barriers to sustainability in the public sector indicates that barriers to standardization will occur (Taylor, 2018; Leal Filho et al., 2019). With this in mind, it would make sense if these barriers are dealt with through the use of a strategy aimed at consciously setting up the process of standardization. Strategy can overcome the barriers by determining actions/plans (or strategies) to achieve priorly set goals (overcoming barriers) through the mobilisation of resources to execute the actions (Freedman, 2015). A standardization strategy for GPP includes ways of creating new standards of sustainable purchasing through increased and better use of available tools/instruments and developments. It does this by focussing on overcoming the barriers in place that impede this broader use. Ideally, these new standards

are eventually adopted not only within the organization's own suppliers, but in the whole sector or industry.

Interestingly, the current literature does not elaborate on the concept of 'standardization strategies'. Although the same terminology is used in one other article (Ernst, 2011), in which it refers to a different conceptualization, the literature fails to provide guidance to clarify this new concept. As the introduction of strategies for standardization seems straightforward for reasons described above, this gap of academic guidance is curious. Yet, it presents an opportunity to research what exactly standardization strategies are and how they can aid contracting authorities in improving their GPP practices. By addressing this gap, public procurers are eventually offered practical recommendations for bettering their procurement of sustainability, leading to societal benefits in the form of increased sustainability.

Therefore, the goal of this research is to understand what a standardization strategy for a contracting authority would look like and how it can help reach its sustainability goals. To accomplish this, the focus lies on examining an organization that is active in GPP and analyzing its sustainable public procurement projects as case studies. An Engaged Scholarship (ES) approach (Holland, 2005) is used to analyze several tenders and procurement processes of a Dutch contracting authority including over 4300 employees: ProRail. As a government task organization in the Netherlands that takes care of maintenance and extensions of the national railway network infrastructure, and being one of the largest contracting authorities within the country, ProRail is active in all sorts of procurements (ProRail, 2020a). Due to recent climate-neutral and circular infrastructure strategy goals set by the Dutch government (MVIW, 2019), improving GPP is becoming of increased importance regarding ProRail's agenda.

The question this research will answer is as follows:

*How can ProRail use standardization strategies to improve the procurement of sustainability?*

To answer this question in a complete and comprehensive way, it is necessary to divide it into three sub-questions:

*Sub-question 1: Which future standards does ProRail use in the procurement of sustainability?*

First, it is necessary to identify the recent developments, in this research referred to as future standards, within ProRail with respect to GPP. Determining what ProRail is doing in their procurements regarding sustainability, provides an overview of the tools/instruments they are using and want to have standardized. Also, it helps in narrowing down the research scope.

*Sub-question 2: Which barriers do employees face in applying future standards for procurement of sustainability?*

The identified future standards are likely to face several barriers to becoming standards, as otherwise they would be standardized already. By analyzing which barriers employees are facing in the standardization process, the focus points of an eventual standardization strategy can be derived; the barriers directly specify what needs to be overcome to reach standardization of future standards.

*Sub-question 3: What are strategies that ProRail can use to overcome these barriers?*

Lastly, the ways of overcoming the barriers are determined and formulated in a strategy. The standardization strategy includes plans or initiatives to get rid of the aforementioned barriers, to be able to reach the intended sustainability goals.

The ES approach is used to support practitioner-meaningful research by providing scientific and practical relevance, through the inclusion of multiple stakeholders - most importantly, those practitioners grappling with problems (such as ProRail's lack of coordinated/standardized GPP) on a daily basis in organizations and communities (Van de Ven, 2007). Not only does this research contribute to the bodies of literature on standardization and GPP, ProRail and similar contracting authorities can use the practical outcomes to better their procurement practices. In general, the increased uptake of GPP through standardization is a positive social advancement, as not only sustainability is enhanced, but also the market is shifted towards incorporating more sustainable and innovative solutions (Brammer & Walker, 2011).

## **2. Theoretical underpinnings & literature review**

To understand how standardization strategies can help improve the procurement of sustainability, some theoretical clarifications are needed. The following segments explain the domain of sustainable procurement and GPP, after which the link to standards and standardization are made. Next, the standardization process which contracting authorities are expected to realize is illustrated, including the barriers known in literature that could hamper this process. Finally, the (procurement) strategy literature is touched upon, to explain what elements a strategy could consist of.

### **2.1 Public procurement and its process**

Public procurement is the process by which central, regional, and local governments, governed by law and regulations, purchase goods and services (Lloyd & McCue, 2004; EC, 2020a). The public procurement process involves several steps from requirement identification to contract awarding (Patrucco et al., 2017). Simply put, the process works in a way where a procurer places a certain need/question (call for tender) in the market, on which interested suppliers can bid. Usually, only one supplier can win the contract, demonstrating that distinctiveness is a key factor in the process. In public procurement, procurement instruments are used. These include documents (templates), methods and (sub)systems aimed at shaping the procurement process (Plantinga, 2020). Documents can refer to for example requirement specifications; the list of, often technical, specifications that a product or service needs to conform to according to the procurer. References to other documents (like specific product specifications) can be made in these lists. An example of a method is the Most Economically Advantageous Tender-method (MEAT); a method of assessment in which not only price, but other aspects like quality can be included in the selection procedure. At last, (sub)systems refer to for example the pre-qualification system, which ensures bidders have the right qualifications to enter a tender.

Some of the most characteristic procurement instruments are the awarding criteria (Patrucco et al., 2017). Awarding criteria define on which facets a bidder can gain advantage over others in winning the tender. They serve as 'desires' rather than 'requirements'; the better a bidder can adhere to those desires, the more chance he has in winning the bid. Awarding criteria are essential for creating distinctiveness in the selection procedure.

### **2.2 Sustainability in public procurement**

Next to its primary policy objectives of efficiency and cost-effectiveness, public procurement holds secondary policy objectives including the development of social benefit in the form of environmental improvement and innovation stimulation (OECD, 2020). Moreover, given its economic significance, public procurement has the potential to influence markets in terms of sustainability development (Brammer & Walker, 2011). A central practice to this is GPP: purchasing which reduces environmental impacts across product or service life cycles (Rainville, 2017). The lack of academic literature indicates that GPP is a relatively nascent field of study (Chersan et al., 2020). Cheng et al. (2018) are one of the first to synthesize the literature on GPP and point out the relevant research topics; most articles focus on the specific impacts of GPP implementation (Testa et al., 2016; Cerutti et al., 2016; Roman, 2017). Chersan et al. (2020) and Cheng et al. (2018) both indicate that a slight majority of academic literature concerns the uptake of GPP.

More precisely, they noticed how several studies point out the different challenges that limit the uptake of environmental considerations into public sector procurement. It appears that authorities are experiencing difficulties with the implementation and maintenance of greener purchasing policies (Cheng et al., 2018). Proof for this comes from the fact that GPP implementation or uptake is known to be problematic for many public organizations (Ahsan & Rahman, 2017). This is also made clear by ProRail, which is aiming to improve its sustainable procurement practices and increase the uptake of GPP (ProRail, 2021). Although some articles identify the drivers and barriers influencing the uptake of GPP (Testa et al., 2012; Walker & Brammer, 2009; Uttam & Roos, 2015), academic papers on this field have not been numerous (Chersan et al., 2020). Adding on, Rainville (2017) is the first to synthesize GPP with the literature on standards and standardization, suggesting future research on the roles for standards and standardization to promote environmental improvement through GPP should consider procurer capabilities. Ultimately, the potential benefits from GPP stem from its ability to be conducted in practice (Rainville, 2017). Building on her research, this study aims to understand standards and standardization with regard to the uptake of GPP, with the goal of providing strategies that can help practitioners increase their GPP uptake.

## **2.2 Standardization and standards**

As GPP requires the use of environmental criteria (i.e. touchstones) in practice, the development and application of these criteria makes standardization an area of critical importance to the success of GPP (Rainville, 2017). Standardization refers to the development of voluntary standards (including GPP criteria and instruments), and is in this research explained as the process of moving from limited application to broad application of new (promising) developments. Hereby, standardization sets specifications based on consensus among different parties. Chesbrough (2004) even describes it as an open innovation strategy; engagement in standardization is a form of outbound open innovation, where technical information is revealed, but is also a source for inbound open innovation where organizations learn from each other. The term open innovation means a situation where an organization does not only rely on their own internal knowledge, sources and resources, but also uses multiple external sources to drive innovation (Chesbrough & Bogers, 2014).

Applicable standards can help procurements to include specifications or performance criteria beyond those which are required by regulation, with a high potential to support social welfare goals such as improving environmental or labor conditions (Rainville, 2017). By injecting such knowledge into the public procurement process, the availability and stringency of environmental criteria is increased and markets are held to higher standards (EC, 2008a).

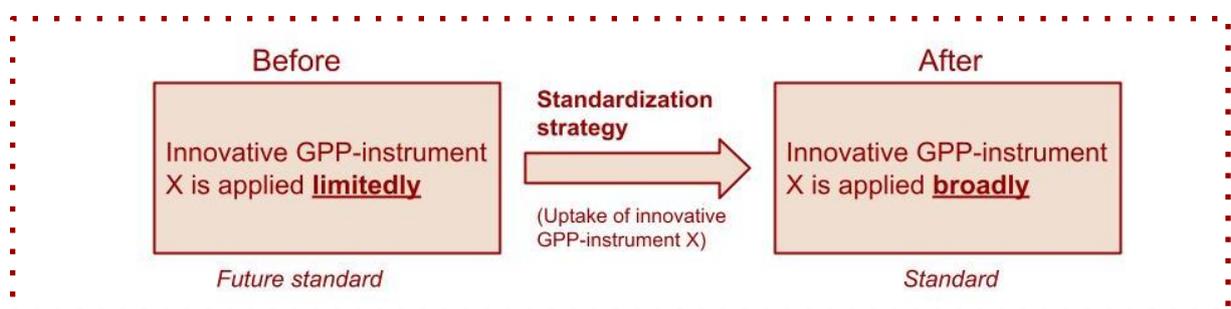
Voluntary standards (hereafter referred to as 'standards') are those which set specifications above what is required by regulation (Breyer, 1982). In public procurement, a variety of types of standards may be used provided that they are based on "scientific information" (meaning they are accurate/unquestionable) and multi stakeholder input (EC, 2014). More specifically, within call for tenders, standards can be applied or developed in the technical requirement specifications or award criteria (Nissinen et al., 2009). While the concept of a standard can be unpacked in different ways (Swann, 2000), for the sake of this research a distinction between 'technical standards' and 'procurement standards' is proposed. Technical standards, in this research, refer to the standards and norms that represent technical requirements and are intended as knock-out criteria (if you can not comply to the requirements you are knocked out), while procurement standards refer to tools/instruments in award criteria that can stimulate

suppliers' voluntary performance improvements (on sustainability) and open tenders to more solutions and potential suppliers. An example of a technical standard for sustainability is ISO/TC 287, which involves sustainable processes for wood and wood-based products and could therefore be included in the list of requirements. For procurement standards, the CO2PL represents an example (see also the box below).

### 2.3 Future standards

In the light of this research, another distinction in standards is proposed, regarding the diffusion rate of the standards discussed above. A standard requires a certain amount of adoption by users to be called standard and is often repetitive (used often) in nature (Mitchell, 2005). Consequently, this study assumes that standards are called standards if they are applied broadly. Still, as the goal of standardization strategies lies in producing a standard through standardization, the developments/innovations the strategies adres (before they are standardized) encompass no clear terminology. This research therefore introduces the term 'future standards', to refer to such developments/innovations that have the goal or potential to become standards in the future through the process of standardization. Standardization strategies aim at turning future standards to standards.

Looking at the literature, it can be seen that the terminology of future standards is used in two articles (Karapetrovic, 2002; Gold & Schneider-Gold, 2008). In both articles no clear definition is given, as the term only refers to the difference between the present and future of certain standards. The concept this research introduces focuses more on describing what comes before a standard, underlining a more developmental relationship. Following this conceptualization, through the process of standardization, future standards can turn into standards, increasing the eventual uptake of GPP-developments. Future standards are in this sense, the contracting authority's desired standards for the future. Turning them to standards in the procurement process helps contracting authorities to reach their (sustainability) vision and goals. Figure 1 offers an illustration of this. In the figure, 'X' is used to indicate that there are different kinds of innovative GPP-instruments; the standardization process applies to each of them.



*Figure 1: Standardization process for innovative GPP instruments*

What exactly limited and broad application is, can differ between contracting authorities. In general, limited application refers to lack of application frequency of a certain innovative GPP-instrument, when the possibilities of more frequent use are there. If such an instrument is used once in one specific project, but could be used in similar projects as well, its application is limited. Correspondingly, broad application refers to such an instrument being used in all the projects it can be used in. In other words, limited application here refers to the application of

something that has the potential to be applied more. Broad application is then the realization of the potential.

## 2.4 Standardization strategies

The process illustrated in Figure 1 does not occur spontaneously, as many scholars have noticed the different challenges that limit the uptake of environmental considerations into public sector procurement (Uttam and Roos, 2015; Thomson and Jackson, 2007; Günther and Scheibe, 2006; Swanson et al., 2005). To overcome these challenges a strategy is needed, as strategy generally involves setting goals and priorities, determining actions to achieve the goals, and mobilizing resources to execute the actions (Freedman, 2015). As the goal in this research is to standardize future standards, the term ‘standardization strategy’ is used. This concept is new in the literature, as only one other article utilizes the same terminology (Ernst, 2011). This article examines defining characteristics of the evolving Chinese innovation and standards system and explores possible impacts for China as well as the global economy. The meaning of standardization strategy in Ernst’s (2011) article differs from the interpretation this study gives to the concept. In this research, a standardization strategy for GPP includes ways of creating new standards of sustainable purchasing through increased and better use of available or new tools/instruments (developments). Ideally, these new standards are eventually adopted not only within the company’s own suppliers, but in the whole sector or industry. To give a better illustration of what a standardization strategy could be, the box below elaborates on a what could be called a successful standardization strategy for what now is the CO2PL standard.

**Example of a standardization strategy for procurement instruments:** The CO2PL (CO2 Performance Ladder) is a procurement instrument developed by ProRail in 2009 (Rietbergen & Blok, 2013). It is a staged certification scheme for energy and CO2 management. Achieving certification gives companies a competitive advantage in the contract awarding process. The CO2PL was introduced to encourage climate friendly and energy-efficient performance by the companies in ProRail’s supply chain. In March 2011, a total of 88 companies were already participating in the CO2PL scheme, meaning it was received positively by ProRail’s suppliers (Dorée et al., 2011). The fast growing number of certified companies and the adoption of the scheme by other commissioning parties showed that the CO2PL was becoming a well developed and widely accepted instrument for GPP (Rietbergen & Blok, 2013). Currently, it is widely accepted and used as a tool within the procurement processes of many public organizations (Rietbergen et al., 2017). For ProRail specifically, the tool is such a success that almost all companies in ProRail’s supply chain are certified, as ProRail includes the ladder in most procurement projects (ProRail, 2020b). From introduction to the market in 2009, the tool has become a standard green public procurement instrument in the Netherlands in fields such as civil and hydraulic engineering, in which GPP concerns the reduction of CO2 emissions from energy and material use (Dorée et al, 2011). From the beginning, the goal was to find a way to include more sustainability in the procurement process (in light of the CO2 reduction goals) by developing a standard instrument that other entities could implement easily and could therefore make a great sustainable impact. This goal, together with the plan which was set out to achieve it, could be called a standardization strategy for GPP.

The standardization strategy for GPP focuses on overcoming the barriers to the standardization process in contracting authorities, by proposing plans of action and initiatives that aim at neutralizing them. Therefore, it is important to understand these barriers and what causes them.

## 2.5 Barriers to standardization

When analyzing the literature, no specific ‘barriers to standardization’ are found. To identify the possible barriers that can arise in the standardization process, it is therefore useful to draw upon other literature concerning similar fields of study. As explained above, the standardization process for GPP concerns mainly the uptake of new GPP developments, but it also concerns more general issues on sustainability within procurement and issues in public sector innovation. Developments in GPP are characterized by their newness, indicating they can be viewed as innovations in the public sector. Hence, the fields of study include: barriers

to public sector innovation (Bloch & Brugge, 2013; Taylor, 2018; Cinar et al., 2019), barriers to sustainability in public procurement (Gelderman et al., 2017; Leal Filho et al., 2019) and barriers to the uptake of GPP (Keaveney & Butler, 2014; EC, 2021). The literature on these disciplines is more embellished, serving as a lead in formulating eventual standardization barriers. Synergizing these disciplines provides guidance for possible standardization barriers as, together, they encompass important aspects of the standardization process of new developments/innovations in GPP. The most important barriers, meaning the ones that are dominant in the literature (identified by more than one article), are elaborated on below.

### **2.5.1 Lack of finance**

Financial constraints are often identified as a major challenge for GPP uptake or sustainability and innovation in the public sector in general. The cost of sustainability, whether it be through new costly products/services or new methods/instruments in the procurement process, in the public sector has always been a barrier for engagement in sustainable practices; environmentally sound products are deemed to be more expensive or require considerable capital investments (Leal Filho et al., 2019). Especially within public procurement, where the objective of obtaining goods at the best possible price/quality ratio is often crucial and tight budget constraints exist, it remains an important barrier (Lysons & Farrington, 2006; Chari & Chiriseri, 2014). Furthermore, financial considerations play a role in other types of barriers, such as lack of awareness, lack of capacity or lack of training. Budgetary decisions often establish to what extent solutions to these barriers are present (Keaveney & Butler, 2014).

### **2.5.2 Lack of top management support**

Another barrier evident in the literature involves a lack of top management commitment. Members of top management are instrumental in encouraging organizations to evaluate their role in society and are responsible for the organizations' environmental management leadership (Giunipero et al., 2012). Failure of strong leadership can result in less incorporation and adoption of sustainability, as top management is responsible for directing sustainability efforts (Anderson & Bateman, 2000). Specifically for GPP, Cheng et al. (2018) note that public officials need to be confident, well qualified and committed in order to be successful at it. Further evidence for this barrier comes from the fact that a strong top management often serves as an important driver for innovation and sustainability in the public sector (Bloch & Bugge, 2013).

### **2.5.3 Regulation issues**

Regulatory issues can hinder the uptake of sustainability and innovation in the public sector. Bloch & Bugge (2013) point out how a lack of flexibility in laws is perceived as a barrier to innovation in the public sector. Gelderman et al. (2017) and Vluggen et al. (2019) mention regulation as a possible barrier to sustainable public sector practices. Moreover, the knowledge on specific GPP regulations is insufficient (Cheng et al., 2018), hampering organizations' ability to adopt GPP practices. More precisely, there is a lack of legal expertise in applying environmental criteria (EC, 2021). Nonetheless, many scholars mention (correct) regulation to be an important driver for sustainability and innovation uptake (Giunipero et al., 2012). Motivation for environmental initiatives often centers around compliance to legislation. Governments have the ability to drive the uptake of GPP by implementing specific regulations and legislations (Keaveney & Butler, 2014). This stresses the notion that a lack of such regulations obstructs an effective uptake of GPP.

#### **2.5.4 Lack of awareness**

Another common barrier mentioned in the literature is the lack of awareness on sustainable practices or GPP. McMurray et al. (2014) identify the lack of awareness to be the main barrier in implementing sustainable procurement, while Keaveny & Butler (2014) name a lack of awareness as an inertia to GPP. Furthermore, Testa et al. (2012) state that the awareness of GPP initiatives and tools is highly significant in determining both the choice to adopt GPP and the number of tenders that are adopted with the inclusion of environmental criteria. Procurement professionals' knowledge on sustainability together with organizational awareness are important instruments in the support of sustainability initiatives (Gelderman et al., 2017).

#### **2.5.5 Lack of experience**

Closely related to the barrier of lack of awareness, is the barrier of lack of experience. A survey of GPP practices by Bouwer et al. (2006) indicated that one third of the respondents struggled with a lack of competence in environmental matters and in establishing environmental criteria. Leal Filho et al. (2019) indicates that many public procurers are unfamiliar with fundamental principles of sustainable procurement, such as full-life costing (or life-cycle costing) and the appraisal of externalities. They also support the perception that public procurers lack knowledge on how to incorporate social and environmental criteria in tender specifications. Even the EC (2021) confirms this; in some cases purchasers still struggle to define what an "environmentally and/or socially preferable" product or service is, and how to include appropriate criteria to identify these in tendering. Adding on, staff responsible for carrying out specific procurement tasks do not always have the skills, or are not provided with the appropriate training (EC, 2021)

#### **2.5.6 Lack of time and organizational capacity**

Some other barriers relate to the time constraints and shortage of incentives public organizations face. As indicated by Testa et al. (2012), apart from money, time, together with promotion policies, are considered organizational resources that are often absent for implementing GPP. Vluggen et al. (2019) argues that smaller organizations often struggle to facilitate the necessary capacity for sustainable procurement. Specific to GPP, the requirement of a wider knowledge and skill scope results can exceed the capacity of procurement departments (Daugaard, 2016). What is more, McMurray et al. (2014) classify time pressures as a barrier to sustainable procurement. In public sector innovation, 'inadequate time' and 'lack of organizational capacity' are emphasised by Bloch and Bugge (2013) as the two important barriers to innovation.

#### **2.5.7 Risk averse culture**

Lastly, a risk averse culture was uncovered as a barrier to innovation in the public sector (Cinar et al., 2019). Risk aversion or the fear of failure has often been assumed to be a key barrier to innovation in the public sector and also to be one of the largest contrasts between the public and private sector in terms of innovation (Koch et al., 2006). Incorporating sustainability in the procurement process, through the diffusion and uptake of GPP, brings along multiple risks; public sector organizations therefore struggle with the diffusion and uptake of sustainable innovations, as they have less to gain from taking risks and less to lose if not taking risks (Bloch & Bugge, 2013).

## **2.6 Strategy**

Contracting authorities need to overcome barriers like the ones mentioned above to be able to reach their sustainability goals. As resources to accomplish this are not unlimited, a well defined-strategy is important (Freedman, 2015). A strategy describes how the ends (goals) will be achieved by the means (resources) (Simeone, 2020). In other words, strategy generally involves, setting goals and priorities, determining actions to achieve the goals, and mobilizing resources to execute the actions (Freedman, 2015). The strategy concept is wide-ranging, as it can be interpreted in different ways. Henry Mintzberg (1987) described five definitions of strategy, in which strategy is viewed as a different mechanism each time: 1) strategy as a plan, 2) strategy as a pattern, 3) strategy as a position, 4) strategy as a ploy and 5) strategy as a perspective. This research makes use of the first interpretation of strategy as a plan, as the goal is to formulate a plan, or multiple plans, to overcome the identified barriers to standardization.

### **2.6.1 Procurement strategy**

As the eventual standardization strategies in this research are intended for contracting authorities and their procurement department, it is necessary to examine the literature on purchasing strategies. The scientific community has devoted substantial effort to study decisions and activities of groups or individuals to improve purchasing performance (Nollet et al., 2005; Glas et al., 2017). Most importantly, it is clear that formulating a single overall strategy for the purchasing function is a difficult task; rather, a diverse set of strategies and tactics for a diverse set of purchases and suppliers may apply (Hesping & Schiele, 2015). A hierarchy of stages emerges when general strategy is disaggregated into executable and controllable activities: 1) firm strategy, 2) purchasing strategy as a particular functional strategy, 3) category strategies for the multitude of supply markets, 4) effectuation by a set of tactical sourcing levers and 5) strategies for each supplier within a sourcing category (Hesping & Schiele, 2015).

Standardization strategies for procurement, as a part of purchasing strategy, are therefore expected to encompass multiple levels of analysis and implementation. Standardization strategies relate to procurement strategy in that they can support the strategic choices involved. Through standardization strategies, the organization's strategic considerations for procurement are influenced, with the goal of improving the procurement of sustainability in mind. Even the firm strategy could be altered with the help of standardization strategies, as some identified barriers the strategies address, such as 'risk averse culture', are organization wide and therefore concern more than procurement strategies.

Although ProRail is a contracting authority rather than a company, the term 'firm strategy' can be understood as the organizations' main strategic direction. Having this main strategy, ProRail and other contracting authorities are as applicable to this literature as normal (private) firms/companies. The difference is private firms will have a strategy aimed at maximizing profits, unlike public organizations (Alford & Greve, 2017).

### 3. Methodology

This research was conducted in line with the Engaged Scholarship approach. ES is a type of research that can be directly applied to social problems and issues faced by individuals, local communities, organizations, practitioners, and policymakers (Small & Uttal, 2005). It is the integration of research and community development (Van de Ven, 2007). The development of standardization strategies for public contracting authorities reflects the solution to a (social) 'community' problem and makes this approach a suitable one; the problem here referring to the limitations of public procurement of sustainability. The goal of ES is to create practitioner-meaningful research (McKelvy, 2006; Shawcross & Ridgman, 2019). In this case, that meant not only the added value of a scientific contribution to the body of knowledge on GPP, but also the practical added value belonging to practitioners within organizations such as ProRail. Three kinds of ES can be distinguished, based on different relationships of knowledge (or information) and action (the process of doing something): 1) practice research: knowledge about action, 2) design research: knowledge for action, and 3) action research: knowledge through action (Voordijk & Adriaanse, 2016). This research incorporated practice research, as its goal was to make scientific knowledge explicit about actions and also their context in terms of actors and conditions for and results of actions. This correlated with the research aim of understanding how standardization strategies can improve GPP practices.

The research focussed on qualitative data regarding the future standards applied in a number of case studies involving GPP of ProRail. As the aim was to get an in-depth and detailed view of GPP practices, case study research is useful (Yin, 2011). ProRail is a government task organization in the Netherlands that takes care of maintenance and extensions of the national railway network infrastructure, allocating rail capacity, and traffic control (ProRail, 2020a). They did not employ a standardization strategy at the time that this research was conducted and expressed interest in cooperating in this research because they saw the need of having one. Their goal was to improve current GPP practices by better directing the projects towards the organization's sustainability targets (ProRail, 2020b) and gradually 'raising the bar' for all procurement projects, as opposed to achieving individual successful projects. This was in line with ProRail's vision, as a result of both (international) governmental policies like the climate agreement of Paris (UNFCCC, 2015) or the 'Klimaatakkoord' of Dutch government (Klimaatakkoord, 2019), and strategic considerations. To be able to derive strategies for ProRail, it was important to select the right projects to investigate as case studies. Therefore, the case studies included procurement projects strongly involving sustainability, as the goal was to understand why GPP developments are not standardized in the organization. After examining the possibilities, and in accordance with ProRail, the cases shown in Table 1 were selected; these four projects all included clear goals and ambitions towards sustainability. Moreover, they were the only sustainability-orientated projects whose employees involved in them were available for interviews. The projects were either completed or ongoing, to ensure enough usable data such as contracting plans and tender documentation. To form a complete picture of GPP practices, cases from both the railway domain and the facilitative domain were chosen.

Table 1: Case elaboration

Procurement projects (Cases)	Description (with regard to sustainability)	Domain
1. Testing ground sustainable railway sleepers	Because of its sustainability vision ProRail is looking for sustainable railway sleepers. The traditional sleepers they use are made from concrete, which has a very high CO2 footprint. They are therefore looking for sleepers made from more sustainable materials. Such sleepers already exist in the market, but are only used in special applications. This mostly concerns more sustainable synthetic sleepers, which are in some cases already used in bridges and railway switches.	Railway
2. Sustainable office furnishing	The project's ambition included: 1) find a partner who realizes and manages the office furnishing as sustainably as possible, at which the facility department's ambitions, pillars and requirements (eco neutral business operations in 2027) are met, while growing with and unburdening the facility department, and 2) give maximum interpretation to the sustainability pillar of ProRail, next to the pillars of 'vitality and wellbeing' and 'identity and brand'.	Facility
3. Foods and drinks services with sustainability targets	The goal of the project was to find a new 'Food Director', who ensured ProRail's offices would provide foods & drinks that were in line with the organization's vision and ambitions. This included ProRail's sustainability ambitions. Foods and drinks could induce sustainable impact and help achieve these ambitions; by looking at the whole supply chain they touched upon with foods and drinks (from raw material use, the offered product range, logistics and social impact), but also with increasing the awareness of colleagues on sustainable choices with the help of storytelling and nudging.	Facility
4. Railway renovation with sustainability targets	The project's ambition was to serve as a 'role-model project' for ProRail to perform sustainable railway renovations. The goal was to achieve maximum circularity, by fully making use of reused materials and achieving maximum material value retention through the design, installation and documentation of railway renovation that maximizes lifespan and minimizes maintenance.	Railway

### **3.1 Data collection**

The data collection consisted of literature, documents related to the procurement projects like contracting plans and list of specifications, and nine (1 hour-long) semi-structured interviews with practitioners of ProRail. Semi-structured interviews involve open-ended questions that allow for a discussion with the interviewee rather than a straightforward question and answer format (Edwards & Holland, 2013). This type of interview is useful when interviewing experts. Furthermore, any relevant (internal) documents were requested from ProRail, and once received they were reviewed; these included contracting plans, tender bids, internal guidance documents, standards, policies, and best practice recommendations. These documents added context and provided useful information, especially regarding the conduction of interviews; the researcher used relevant learnings from reviewing the materials to improve the questions and thereby the quality and relevance of information obtained from the interviewees.

Purposive sampling was used, as the amount of candidates was limited and very specific. The interviewees consisted primarily of the available ProRail employees who have been involved in the selected projects as either tendermanagers, project managers or 'contracting managers', and other employees active in managing sustainability or procurement activities. Through the process of snowballing, any other relevant respondents were found, such as technical specialists, employees designated with sustainability in the procurement department and employees of the LJV department (sustainability department). Some employees interviewed were involved with more than one project, so interviews applied to multiple cases on some occasions. The interviews focussed on identifying the (future) standards used in the procurement of sustainability (Sub-question 1), while also taking into account general routines or best-practices. Moreover, the interviews aimed at pointing out barriers that impede the standardization of GPP (Sub-question 2). Lastly, questions were asked regarding dealing with those barriers, in order to formulate specific strategies (Sub-question 3). Together, the answers to the sub-questions provided the foundations for answering the main research question. For the interview guide see Appendix A.

### **3.2 Data analysis**

For analyzing the data Nvivo was used. This qualitative data analysis software allowed for an efficient examination of the transcribed interviews (Hilal & Alabri, 2013), which were transcribed by hand. Through the use of coding, the data was organized and efficiently analyzed. The analysis was done using the constant comparative method (Glaser, 1965). This entailed coding and analyzing simultaneously in order to develop concepts or themes; by continually comparing specific incidents in the data, the researcher refines these themes, identifies their properties, explores their relationships to one another, and integrates them into a coherent explanatory model (Taylor & Bogdan, 1984). Through the process of thematic analysis, following a deductive approach, all transcripts were coded and eventually themes were generated (Vaismoradi et al., 2016). The existing barriers in literature served as guidance in the analysis with regard to themes. Still, the analysis also focused on finding new themes or concepts that could help answer the research question. Important themes that were expected included use of (future) standards, barriers to standardization and strategies for overcoming barriers to standardization.

### **3.3 Reliability & validity**

Validity in qualitative research means “appropriateness” of the tools, processes, and data (Leung, 2015). To increase the validity of the research the use of triangulation was helpful. Triangulation refers to the use of multiple data sources (or methods) to develop a comprehensive understanding of phenomena (Patton, 1999). It addresses the issue of internal validity by using more than one method of data collection to answer a research question (Barbour, 2001). Triangulation of the 1st tier involves the use of more than one investigator, interviewer, observer, researcher or data analyst in a study (Leung, 2015). The ability to confirm findings across investigators, without prior discussion or collaboration between them, can significantly enhance the credibility of the findings. It is viewed as a qualitative research strategy to test validity through the convergence of information from different sources. Although different types of triangulation exist (Carter et al., 2014), this research applied data source triangulation. The use of empirical results of interviews, findings from document review, and prior literature ensured this. The reliability of qualitative research refers to exact replicability of the processes and the results (Leung, 2015). Silverman (2013) identifies constant comparison as an approach to enhance the reliability of qualitative research. As constant comparison was rooted in the analysis of this research, reliability was strengthened. Moreover, theoretical saturation was used to determine when there was adequate data from a study to develop a robust and valid understanding of the study phenomenon (Hennink et al., 2019). Often, saturation is linked to the amount of interviews a qualitative study incorporates; the more interviews, the higher the chance of saturation. Lastly, respondent validation could have increased research quality by cross checking interim research findings with respondents, as respondents' reactions to emerging findings could have helped refine explanations (Barbour, 2001).

### **3.4 Ethical considerations**

All participants in the research were subject to the following; 1) due to the COVID-19 pandemic all interviews were conducted online, to minimize direct contact, 2) the protection of privacy of each participant was ensured, as no names were used and other identifying information (title or position) was only used with informed consent, 3) the participants signed an informed consent form, in which was explained how the data would respectfully be used for the research (see Appendix B) and 4) respect for the dignity of each participant was ensured as the research was voluntary and participants had the right to withdraw from the study at any stage. Conducting the research ethically is essential to any research of quality.

## 4. Results

The analysis of the interviews, together with the examination of relevant documents, allows for an understanding of the GPP efforts of ProRail's procurement department. The answer to the research question this paper aims to answer, follows from the perception and thoughts of ProRail's employees on the procurement of sustainability within the organization. In accordance with the sub-questions, first, the (future) standards that are used in the sustainable purchasing process are highlighted. Thereafter, the identified barriers to standardization are elaborated on, explaining how they impede the application and uptake of future standards. Lastly, the strategies to overcome these barriers are described, representing the standardization strategies this research aims to bring to light. Eventually, the three sub-questions together lead to the answer of the main research question.

### 4.1 Standards for sustainable procurement

Assessing the current use of standards for sustainable purchasing served to indicate which developments were already a standard and which ones could be labeled future standards, indicating that their uptake was not optimal. As mentioned before, the procurement process can incorporate many different procurement instruments. The analysis demonstrated that the only areas in the procurement process containing future standards were 'requirement specifications' and 'awarding criteria'. More specifically, for requirement specifications the technical specifications have the potential to become sustainable standards. Regarding the awarding criteria instrument, methods/instruments like the MKI have the potential to become standards for sustainability. These two procurement instrument areas were expected, following from the notion of Rainville (2017) that standards can be applied in the technical specifications and awarding criteria. As mentioned before, this research therefore uses the taxonomy of 'technical standards' and 'procurement standards' to specify the standards in each area of the procurement process. The next sections elaborate on the standards found in each of these areas. Although the intention was to find what the future standards of ProRail are and where in the procurement process they are found, the standards that are currently in place are also shown to offer better insights of what future standards aim to become.

#### 4.1.1 Technical standards

##### *Current technical standards*

When looking at technical standards used within the procurement processes of ProRail, the place where these standards are applied is in the SPC's (product specifications). Technical specialists working in Asset Management (AM) draft these SPC's for all railway products such as, for example, railway sleepers, to ensure minimal quality and safety specifications. They are then utilized within procurements as technical requirements. Within these SPC's, several references to standards are made: often European wide, such as NEN 6008, NEN 6720, NEN 6722, NEN 8005, NEN-EN 10138, NEN-EN 197-1, NEN-EN 206-1, NEN-EN 13230-1, NEN-EN 13230-2 and NEN-EN-ISO 1461 in the case of the railway sleepers. These standards include specifications for performance requirements of concrete, general requirements of concrete railway sleepers and bearers, and requirements regarding thermic expansion. For projects that do not directly relate to the railway or its infrastructure and focus more on the (ProRail) facility domain, almost no technical standards were found. Within these projects, a PvE (Program of requirements) incorporated all requirements and desires of that specific project. Some references to standards are made here, such as NEN-EN 1335 1, 2 and 3;

NEN-EN 16139; NEN-EN 527 1, 2 and 3; NEN-EN 3087 and NEN 3140 as technical specifications for office furnishment. These standards refer to specifications for dimensions and adjustability of office chairs.

#### *Future technical standards*

Still, most SPC's do not contain specific standards for sustainability. An interviewee stresses this: *"Now, the SPC's are purely technical"*. In order to incorporate more technical standards for sustainability, ProRail has recently started using special 'testing ground projects'. In these, new and more sustainable products can be tested to see if the accompanying SPC can be changed towards incorporating sustainability requirements in technical standards. Accordingly, such new developments following from these testing grounds can be called future technical standards. Similar reasoning applies to the facility domain projects; there were almost no standards for sustainability incorporated in PVE's. Some examples of requirements regarding sustainability in the 'sustainable food & drinks project' were: the use of reusable tableware, the use of responsible animal products and the use of recyclable packaging. Although these do contribute to the sustainability of the procurement project, no reference to standards were used. Elaborating on this, one interviewee stated: *"Those are market-used standards, they are not standards we could incorporate ourselves, it's just a quality mark that is proportional in the food sector. That's why we incorporated it, because we know the whole sector can comply with it"*.

In general, it appears that sustainability is not yet well represented through technical standards in the requirements and specifications. A reason for this may be that using sustainability in the awarding criteria is deemed more successful by ProRail's employees, as *"this allows for better competition and stimulates the market more"*.

### **4.1.2 Procurement standards**

#### *Current procurement standards*

In procurement projects with clear sustainable ambitions, there are two instruments that ProRail uses to help tenderers distinguish themselves in their level of sustainability: CO2PL and MKI. Both these instruments allow the client to make a calculated decision on which tenderer would achieve the most sustainable outcome in the project. All respondents mentioned these two instruments as the go-to procedures in sustainable purchasing, as both have the power to distinguish tenderers on sustainability performance. The CO2PL focuses on reducing CO2 emissions within companies, by defining 5 levels of CO2-performance. The higher one is on the ladder, the better the CO2-performance and the higher the discount on the tender amount. Moreover, the CO2PL has been used since 2009 and has grown over the time to be applied broadly. The CO2PL is used more broadly, as it concerns a company certification and is often not specifically applied at the project level. As explained before, it serves as an example of what a procurement standard is.

#### *Future procurement standards*

The MKI follows a different approach: this instrument translates the outcomes of an LCA to euros. This way, all environmental effects are accounted for in one single value. Lower values are preferred over higher ones; the lower the value is, the less the environmental costs, resulting in a higher discount on the tender amount. The MKI is a much newer instrument, as it was introduced within ProRail in 2018 (Kruidhof, 2018). Unlike the CO2PL, it is still in

development and has not been applied broadly throughout all procurement projects. Nevertheless, it has the potential to do so, as indicated by several respondents. Therefore, the MKI is identified as a future procurement standard. The MKI is mostly used in the railway domain such as in construction projects, as they usually deal with materials.

Furthermore, other awarding criteria for sustainability exist. In the facility domain, sustainability is warranted through the use of a Plan of Action (PvA). A PvA consists of tenderer's ideas and suggestions on how to achieve ProRail's ambitions (including sustainability) within a specific project. They are evaluated by ProRail on the level they contribute to ambitions; the higher the score, the more discount on the tender cost. Although the use of PvA's is not new, it is a development within sustainable purchasing that is not yet standardized within the organization. Therefore it could be called a future standard.

Lastly, one interviewee mentioned another sustainability focused awarding criterion that was in development at the time of this research. This criterion works in a similar way as the MKI, but it only concerns the associated emissions on a construction site instead of the product life-cycle. A respondent clarifies this by stating: *"Within the MKI you focus on materials and emissions, but the emissions are often a small share compared to the materials. But the theme of emissions is growing in importance, so we want to make advancements in that"*. The same respondent believes it is going to be an important criterion in the future. Although it is not yet implemented and tested this new criterion could be called a future standard, as the goal is to broadly implement it within ProRail and thereby increase its uptake. An overview of the identified standards is given in Table 2.

Table 2: identified standards for GPP within ProRail

Type of standards	Technical standards	Procurement standards
Current standards	None (NEN 6008, NEN 6720, NEN 6722, etc.. are examples of technical standards, but do not address sustainability)	CO2PL
Future standards	Sustainable SPC's: technical specifications with sustainability requirements	MKI, PvA, Emission Criterion

## 4.2 Barriers to standardization

After identifying the most important future standards, the barriers to standardisation of these standards show which difficulties arise in broadly applying them. Following the literature, the same barriers as described prior were found within this research. Yet, some new barriers were added, following the analysis. Some barriers apply more to either technical standards or procurement standards.

### 4.2.1 Lack of finance

As indicated by multiple interviewees, financial issues are one of the key obstacles to standardization of future standards. The cost of sustainability for ProRail and its suppliers is evidently causing problems on several facets. When looking at the most promising future standard, the MKI, a common problem associated with it is its cost of use. As one respondent argues: *“Contractors who want to distinguish themselves with the MKI have to have an LCA made; it just costs a lot”*. Although an environmental database exists, bidders often have to make considerable cost when calculating the MKI within a certain project. Having to do this for every (new) tender does not help; especially when such investments do not guarantee winning the tender. The margins bidders have are not that big: *“The costs are stacking up. If they (contractors) have a margin of 2,3 or 4% and the cost of doing the tender is already 2%...”*. The same goes for the new awarding criterion being developed for emissions in the construction site. Furthermore, when looking at technical standards, lack of finance is named as an argument to further testing of new products to change SPC's. The budget for these testing ground projects comes only from government subsidies, making it difficult to execute testing ground projects for all critical railway parts. Lastly, some interviewees mentioned financial barriers with regard to increasing sustainability in procurement projects in general. One tender manager puts it like this: *“The most heard argument when you say: we want to do something with sustainability, is that it takes longer and costs more, if you talk about procurement trajectories”*. Others stress the fact that sustainable products simply cost more, suggesting contractors are not going to include them in their bids if the price is too high. A reason one of the interviewees gives for this comes from the fact that new and sustainable products are often produced on a small scale and therefore not benefit from economies of scale.

### 4.2.2 Lack of top management support

Another important barrier almost all respondents mention is the lack of top management control and support. Although some interviewees are more positive than others, they all agree that there is not enough control and guidance on sustainability issues. An important indicator of this is the use of the 'MVI Framework'. This policy framework, specific for ProRail's procurement department, describes how to incorporate sustainability in the procurement process on the basis of 23 leading principles. However, its use is not always perceived as mandatory, as some interviewees refer to it as a *“voluntary framework”*. Others do recognize its obligation, but admit the lack of strictness: *“If you ask certain people within the department it is obligatory, but as you probably found out yourself already, it is not being applied a lot yet”*. A reason for this may lay in the newness and complexity of its use: *“Now the attitude is: procurement develops some nice leading principles, but it is too complicated, forget it..”*. Moreover, the framework offers only guidance and does not represent strict rules.

Regarding specifically the broader uptake of future standards, management also plays a key role. Incorporating new technical standards for sustainability in SPC's is not a mandatory job assignment for technical specialists. The lack of steering by top management is evident for one technical specialist: *“I think our sustainability goals and their implementation should get some more levers”*. Similarly, the use of MKI can be increased and decided through management decisions. Developments on this are ongoing according to several respondents. A proposal has been presented to the 'development table', in which is proposed to expand the

use of MKI across procurement projects. Declining such proposals accentuates the lack of managerial commitment and support.

### **4.2.3 Regulation issues**

To foster the uptake of future standards and sustainability in general, regulation issues can play an important role. This is especially true for technical standards in SPC's, which serve as requirements in the tender. Bidders have to comply with these specifications, unlike in the awarding criteria. Adjusting the SPC's with technical standards for sustainability may cause regulatory problems; if such adjustments lead to only one contractor being able to win the tender, they are not possible, as it is forbidden by law to exclude all-but-one contractors. On top of that, patents can play an obstructing role in this. A new development, for example a sustainable railway sleeper, is often patented by the inventor to capture its value. This results in other parties not being able to produce it, complicating the aforementioned problem even further. One interviewee further explains this: *"When we purchase something, it is all about fair competition. If there is only one party in the market able to provide what you want (by requirement), we can not ask it that way"*. Another points out the issues with patents: *"Getting new and innovative things into ProRail is hard, especially if patents are involved; ProRail often struggles with patents"*. Patents often obstruct new technologies to be shared and broadly adopted, making it difficult to ask for these technologies in procurements as they can only be provided by one supplier.

Regulatory issues can also be witnessed within the organization itself in a more general sense. To incorporate more sustainability in the procurement process, ProRail's vast numbers of rules and guidelines can sometimes have a negative impact. All the regulations and guidelines that ProRail uses in its procurement processes cause innovative/sustainable projects to be challenging in their own way: *"We are challenging the market for sustainable ideas, while at the same time handcuffing them with restrictions and regulations"*.

### **4.2.4 Lack of awareness**

The lack of awareness on sustainability issues also impedes future standards to be applied more broadly (standardized). Implementing more and new awarding criteria instruments for sustainability in procurement projects requires not only the awareness of the instruments themselves, but also the belief and mindset that sustainability implementation is necessary. Especially the latter is still lacking, despite substantial effort over the years: *"Sustainability is on the mind of a lot of people, but it is far from being in everyone's mind"*. Several interviewees give reasons for this; not only is the company size an important factor, but the average age may also play a role. Sustainability not being top-of-mind for many people had important implications for the uptake of future standards. Regarding technical standards, the lack of awareness of sustainability importance may result in less technical specialists that look for ways to incorporate technical standards for sustainability in the SPC's. One specialist confirms this by stating: *"One of the main problems is the belief that change towards sustainability is really necessary"*. Moreover, the choice to actively engage in such sustainable endeavors usually lies with one person when talking about the technical domain: *"For a certain object or part of the railway you usually end up at one specific person, it can depend on him/her to do something about sustainability"*. Furthermore, not all tendermanagers are actively thinking about sustainability in the procurement process, which may lead to less use of procurement

standards for sustainability. According to some respondents, sustainability in general is too often viewed as an add-on, instead of a must.

#### **4.2.5 Lack of experience**

The relative newness of some practices that help in increasing the uptake of procurement of sustainability can hinder the standardization process. The testing ground projects that eventually can lead to the incorporation of technical standards for sustainability in the SPC's are new for ProRail. ProRail employees have not had the time to fully learn from them yet; they lack experience in reaping the benefits of these kinds of projects. For awarding criteria instruments such as the MKI and CO2PL, there is no lack of experience. Both instruments have demonstrated their effectiveness in numerous projects, although the MKI is newer and sometimes less applicable due to its focus on materials. In general, there seems to be an ongoing transformation in the last two years towards sustainable practices in Procurement. Multiple respondents indicated that the procurement department is in transition; new people in new positions with new tasks regarding sustainability. This implies that these people still lack the right experiences to effectively perform their sustainability-orientated tasks.

#### **4.2.6 Lack of time and organizational capacity**

Another important barrier mentioned by multiple interviewees is the lack of capacity in some important organizational areas. Clinging to that is the high workload resulting in time pressures. In the area of technical standards for sustainability this represents a problem, as changing SPC's to incorporate standards for sustainability requires lots of effort. The amount of employees in the technical department able to make such adjustments are limited and they often have enough other work to think about. A technical specialist elaborates on this referring to sustainability in projects: *"Capacity is also a problem; I sometimes do things for which in reality I do not have the time"*. But also the Procurement department struggles with a lack of personnel focussed on sustainability. One of the two employees designated with the task of overseeing sustainability within procurement confirms this: *"Some things I insufficiently get around to, there are too many subjects, Procurement deals with all kinds of projects, so yeah, capacity is a problem."* Similarly, some tendermangers felt like they already had enough work to think about, leaving *"no time to think about sustainability, due to time pressures of projects"*. Like this, the uptake and standardization of future standards could be hindered. Additionally, most of the interviewees indicated that adding sustainability in procurement projects often significantly increases the time needed. The argument here is that procuring sustainability often requires additional market research and evaluation for the tender requests. On top of that, projects that are not repetitive in nature, like a lot of the projects in the facility domain, often require tailored approaches with regard to sustainability. Tailoring the approaches for each project results in more time spent. As such, this serves as motivation for standardization of future standards

#### **4.2.7 Risk averse culture**

The next barrier concerns the risk averse attitudes within the organization, impeding future standards to standardize faster. This applies especially to technical standards for sustainability. The SPC's are very rigid, as they concern the essential parts of the railway. The fear of possible accidents on the railway causes technical specialists to be very careful when writing the product specifications. A specialist emphasizes this: *"As to taking risks, we just want to be safe, so there actually can not be any risks in that regard"*. This entails that

incorporating technical standards for sustainability into SPC's can be very slow, to ensure all safety and quality specifications stay intact. It is not strange technical specialists show this reserved or cautious behavior, as it is part of the reason they were hired, according to one respondent. In fact, this behavior is deemed somewhat typical for the whole organization and sector. Several respondents recognized this, stating that *“ProRail is a risk averse organization”* or *“the goal of many employees of ProRail and the Procurement department is to avoid risks”*. Not taking risks can slow down the development and uptake of future standards, as risk taking can often accelerate such processes.

#### 4.2.8 Shortcomings of specific future standards

The data showed another possible barrier to standardization, relating to the future standard of MKI specifically and its shortcomings. Some respondents indicated that there exists a certain distrust in the instrument, as it is known to be prone to manipulation; the calculations are often based on assumptions, which can lead to different outcomes. The contractors are pushing the boundaries of the possibilities, because they want to win the tender. According to one respondent: *“The whole story of the MKI not being reliable does not help in creating support”*. In addition, some interviewees stress the fact that MKI does not take into account circularity very well. Circularity is part of sustainability, so neglecting this could result in circular products not being chosen, even though they might be the most sustainable option. Lastly, a shortcoming of the MKI instrument is that it is not always applicable. Several interviewees acknowledged this: *“Not everything has a MKI value”* and *“They need to be projects with a material intensive component”*. Unlike the CO2PL which often functions on company level, the MKI can not be applied to all projects, forming an obstacle for increasing its use/uptake.

Table 3 summarizes the barriers to standardization that were identified within ProRail. These identified barriers need to be considered when establishing strategies for broader uptake of GPP developments.

Table 3: Overview of identified barriers to standardization in ProRail

Barriers	Description
1. Lack of finance	The cost of sustainability, for both ProRail and its suppliers, is one of the key obstacles to standardization of future standards. The use of MKI results in extra costs for suppliers, while sustainable SPC's require high cost for testing. Lastly, sustainable products often cost more.
2. Lack of top management support	There is not enough control and guidance on sustainability issues by top management. Mandatory sustainability issues are not being controlled and technical specialists are not being steered towards incorporating sustainability in SPC's.
3. Regulation issues	Rules can get in the way of future standard uptake. If SPC adjustments (for sustainability) lead to only one contractor being able to win the tender, they are not possible, as it is forbidden by law to exclude all-but-one contractors.

4. Lack of awareness	There is a lack of the awareness of the instruments themselves, but also belief and mindset that sustainability implementation is necessary is lacking. Not all tendermanagers are actively thinking about sustainability in the procurement process, which may lead to less use of procurement standards for sustainability
5. Lack of experience	As the future standards are new, the lack of experience on how to implement them can cause less uptake. Testing ground projects for sustainable SPC's are new; employees lack experience in reaping the benefits of these kinds of projects.
6. Lack of time and organizational capacity	Time pressures and lack of organizational capacity obstruct the broader uptake of future standards as such standards require large amounts of time and effort to be implemented.
7. Risk averse culture	Due to risk averse mindsets, incorporating technical standards for sustainability into SPC's can be very slow. In general, severe risk aversion does not help sustainability developments.
8. Shortcomings of specific standards	Specific standards can have shortcomings that only apply to them, such as proneness to manipulation, causing distrust by suppliers and slowing broader uptake down.

### 4.3 Strategies for overcoming barriers to standardization

Following the interviews, several suggestions were made to deal with the obstacles described above. The interviewees indicated what they deemed possible solutions and points of improvement, which in turn can be incorporated in a strategy for standardization. The strategies encompass the ways of overcoming the identified barriers, and provide specific procedures and initiatives that could contribute. The strategies are in line with the barriers, although for some barriers no clear strategies were found.

#### 4.3.1 Reimburse more costs

The first strategy to increase the uptake of procurement of sustainability is perhaps the most straightforward: by reimbursing more costs the bidders make with incorporating sustainability in their bids, for example through the use of the MKI, more bidders will be likely to enter the tender with sustainable solutions. Although ProRail already has a general policy on reimbursement of tender costs, there seems to be no specific policy about tender costs regarding sustainability. Taking into regard the costs associated with instruments like the MKI or writing up a PvA, it would be reasonable to have specific policies for reimbursement on these matters. An interviewee acknowledges this: "They (contractors) are already making a lot of costs, and we actually reimburse very little, we do not actually compensate that much". Reimbursing more costs specific to sustainability commitments would increase the uptake of future standards like the MKI, as it invites more bidders to use such standards in their bids.

### **4.3.2 Move from non-commitment to obligation**

The next strategy most respondents pointed out involves dealing with non-commitment. To increase sustainability in procurement, which helps increase the uptake of future standards for sustainability, management needs to be more strict in their steering. Many respondents indicate that it would help if there would be more strict control on obligations. For example, the use of the 'MVI Framework' is mandatory for every project, but in practice this is not the case. One respondent even referred to it as a voluntary framework. An explanation for this imbalance is given by another respondent: *"It is still dependent on the intrinsic motivation of individuals, those who find it (sustainability) interesting incorporate it in their projects, while those who do not find it interesting do not"*. A strategy would be to more strictly impose obligations regarding sustainability; employees that do not follow the commitments need to be judged or checked by management. All employees should at least show how they thought about incorporating sustainability in the procurements, and thoroughly explain why, if they do not intend to incorporate it. Currently, no real supervision of this exists within the procurement department. One of the two employees appointed with sustainability within the department admits this: *"The thing is that I do not have that much time, but we should be after it more"*. Such control is needed in order to increase the uptake of sustainability and its future standards.

### **4.3.3 Revision of specifications, guidelines and regulations**

Another useful strategy would be to revize ProRail's own specifications, guidelines and regulations to allow for more sustainability. It may be hard to change rules, as they are often nation or European wide. Still, it may help decrease the regulatory barriers present in the organization. Especially regarding specifications, this can have an important impact on the uptake of future standards. Several interviewees indicate that SPC's should focus more on functionality, rather than for example specific material required. This would leave more room for alternative and more sustainable solutions. One interviewee elaborates on this: *"My attention would go to reducing the limitations in the SPC's, making more things possible with regard to sustainability"*. The same employee acknowledges that people in the organization think differently on this matter, probably as a result of the conservativeness of some employees. However, even a technical specialist agrees that the SPC's and regulations should be reconsidered. He sees a role for both the technical department and the LJV department to come together and see how sustainability can be incorporated in each SPC or regulation. Currently, most SPC's do not include even one line or heading on sustainability and that should be changed. This will allow for an easier implementation of possible new technical standards for sustainability. Ofcourse, to be able to change the SPC's to include technical standards for sustainability, it is also necessary to perform enough tests to ensure safety and quality. Increasing the amount of testing ground projects could establish this; beginning with the products that have the most impact on the environment.

### **4.3.4 Increase awareness**

Increasing awareness on sustainability can also help in standardization of future standards. Although most respondents do agree the organization is on the right path, they also admit the process of implementing sustainability in the procurement procedures is slow. By broadening the awareness among the employees, acceleration of this process is achieved. According to one employee, a way to accomplish this is through constant repetition: *"There have been sessions last year (about the MVI Framework), but for it to get through to everyone.. repetition, repetition, repetition"*. Another way of increasing awareness, suggested by another

interviewee, is to make the goals and ambitions on sustainability more concrete: *“What does sustainability mean for me as an employee? What can I do? What is the strategy? What is the policy? Those things are not quite settled yet”*. A mentioned problem with raising awareness is that often those interested in sustainability attend awareness raising campaigns, while it is the contrary group that needs to be reached. A strategy for increasing awareness should focus on the latter group; the awareness will grow even more, resulting in more use of future standards.

#### **4.3.5 Share success more**

Another important strategy most respondents indicated was the sharing of successful examples regarding new procurement developments. Future standards that are successfully applied or implemented in projects should be highlighted more. Several interviewees explained that having good examples to draw from would trigger more people to adopt the instruments and procedures for procuring sustainability: *“I think having good examples can enthuse people and show them that things can be done differently”*. Moreover, such examples can demonstrate how such procedures can be applied and what kind of results it can yield. Accentuating these examples and displaying them for everyone to see is essential. Currently, it can be hard for some employees to find (the right) examples, as explained by one respondent: *“If we have to look at which projects we have done that really followed a sustainability orientated approach, it can take a while to find good examples”*. Additionally, the introduction of a best-practices library is discussed. Especially for the facility domain, where projects are not that repetitive in nature and often require tailor-made approaches, best-practices serve well. One interviewee elaborates on this: *“I really believe in best-practices; how do you translate sustainability to the projects, which questions do you ask and how do you evaluate?”*. She goes on to clarify that the process of making a ‘best-practices library’ is ongoing. Such a library should include all successful examples of awarding on sustainability. Adding such a library for the projects of the railway domain as well could help procurers incorporate sustainability in their projects; eventually increasing the uptake of future standards for sustainability.

#### **4.3.6 Bring in the right people**

To allow the increased uptake of future standards, it is helpful to reconsider the hiring policies of ProRail as well. Bringing in sustainability minded people into the organization could provide an impulse to all departments to consider sustainability in their tasks and projects. One respondent gives an example on how to accomplish this: *“I think it would help if there would be more young people employed, as they look at it from different perspectives”*. Also, within specific departments such as Asset Management (AM) it would help to invest in sustainability minded people in key positions. More specifically, another interviewee suggests: *“If there would be a point of contact on sustainability matters within AM, it would benefit the collaboration about sustainability matters”*. Nevertheless, according to some employees, ProRail is already trying to achieve these recommendations but has until now not completely managed to do so. Therefore, increasing the attention for hiring policies like described above represents a strategy for achieving standardization.

#### **4.3.7 Improve collaboration**

The next strategy focuses on bettering the collaboration within the organization, especially between departments. Improving the collaboration of LJV with AM especially, could result in

more and faster developments with regard to incorporating technical standards for sustainability in SPC's. Although the collaboration between AM and LJV is increasing, it is not yet implemented procedurally within some departments of AM. According to one employee active in AM, the contact between the two departments depends on the employee: *"It is that I know people of LJV, but if there were someone else in my position, he/she maybe would not even have thought about approaching LJV"*. Also from the perspective of LJV the problems are evident: *"AM is a 'multi-headed monster', which makes it difficult to be well connected with them"*. Solutions for both these problems lie in the structural collaboration between the two departments; on the one hand, LJV could structurally be involved in the formulation of SPC's, and on the other hand there need to be clear points of contact for sustainability in the AM department (as also mentioned above). A new structural collaboration of LJV and AM could draw from the collaboration between LJV and Procurement, of which most employees speak positively about. Although even there, things could improve: *"If the collaboration between LJV and Procurement was not good, we would not be at the point we are now, but at the same time we are not quite there yet"*. Developing the collaborations between departments can foster the diffusion and uptake of (technical) future standards for sustainability.

#### **4.3.8 Keep improving (future) standards**

Another identified strategy consists of adjusting the current and future standards over time, in order for them to keep their strengths. The best example to illustrate why this is necessary is the CO2PL. Most respondents acknowledged that despite its success in the past, the CO2PL is losing its power to distinguish in procurement projects; most of ProRails core suppliers conform to the highest level on the ladder, meaning they can not distinguish themselves anymore in tenders through this instrument. However, the employees argue that this does not mean that the instrument is not valuable for the procurement of sustainability, as the ladder still triggers its users (the suppliers) to incorporate sustainability in their process and goals. Nevertheless, employees agree that the instrument can and should be revised or improved: *"The instrument (CO2PL) itself could indeed be changed or innovated"*. Luckily, according to the employee responsible for this instrument, there are plans of doing just this. Together with the most important stakeholders, including ProRail, a plan for renovating the ladder is being developed by the organization that stewards the instrument. Improving standards also refers to the constant increase of 'strictness' in the way the standards are used, especially in light of the MKI. Several respondents stress the importance of continual developments regarding MKI use: *"If we establish a certain standard on MKI use, we can not just lean back; we eventually want to get to a MKI value of zero, ensuring maximum sustainability"*. Getting there is viewed as a process of small steps, in which constant revision and development of MKI use is crucial. For all future standards it is important not to forget to keep improving, even when they show success. Improvements could lead to more sustainable outcomes, as explained above. This could result in higher levels of uptake.

#### **4.3.9 Try out different ways of procuring**

A solution to the problem of setting technical standards that lead to only one contractor being able to win the tender, lies in changing the way of procuring. One interviewee suggested trying out buying the most sustainable alternative on the market in bulk, instead of having the contractor choose with what products they enter the tender. Consequently, all contractors are forced to use that sustainable alternative, which they can just recollect at ProRail. This eliminates regulatory barriers mentioned above. With this type of procurement, it is easier to

set technical standards for sustainability in procurements. Further benefits of this approach are elaborated on by the interviewee: *“With this approach ProRail can also guarantee large amounts of sales, allowing that supplier to scale up, eventually leading to lower prices”*. Similarly, another respondent suggested moving from lots of small contracts to less and larger contracts when procuring for sustainability: *“I believe in longer contracts, as it offers the possibility to set the scope and sustainability goals together with the contractor; this way we create a real partnership”*. These two suggestions prove that it can be helpful to try out different ways of contracting, in order to better and standardize the procurement of sustainability.

#### **4.3.10 Increase rewarding on sustainability of employees**

Better rewarding of employees who incorporate sustainability in their projects is another identified strategy. By praising these individuals, they are given a podium and are more likely to tell about it and share their knowledge. This could lead to better diffusion/uptake of future standards. Even people who are less interested in sustainability can be incentivised like this: *“If content wise they are not interested in sustainability, they could still be interested and motivated to get praised by their managers for reaching sustainability goals”*. So managerial attention in the form of compliments and praise could help severely. Thankfully, there are enough employees within the procurement department who are very active in the sustainability domain, so there are enough chances to show gratitude and offer a stage. It is the task of management to see to this and make sure it is done accurately. Eventually, the knowledge on use of future standards for sustainability can be dispersed more, leading to increased uptake.

#### **4.3.11 Involve procurement strategists**

Lastly, a useful strategy would be to involve the procurement strategist more on the theme of sustainability. ProRail has seven procurement strategists, whose employment activities involve strategically thinking about procurement processes and procedures. According to several interviewees, these strategists should implement more sustainability in their strategies. On the other hand, it is indicated that these strategists are relatively new within the organization and the conversations about sustainability are slowly starting to spring. Still, some improvements are suggested: *“Now we are only bringing the information to the strategists, it would help if they would also come get it”*. Moreover, some respondents suggest the introduction of an 8th strategist specifically focussing on sustainability. This would help implement sustainability within procurement strategy, although it needs to be stressed: *“Sustainability is not only his/her responsibility, otherwise the rest would do nothing. In that sense I could imagine some sort of ‘chief sustainability strategist’ who guides all other strategists on sustainability”*. The addition of more sustainability knowledge among procurement strategists could allow future standards to be used more broadly in projects (increased uptake), following specific procurement strategies.

Table 4 summarizes the strategies that were identified within ProRail. It creates an overview of possible ways of overcoming the barriers to standardization.

Table 4: Overview of identified strategies for standardization in ProRail

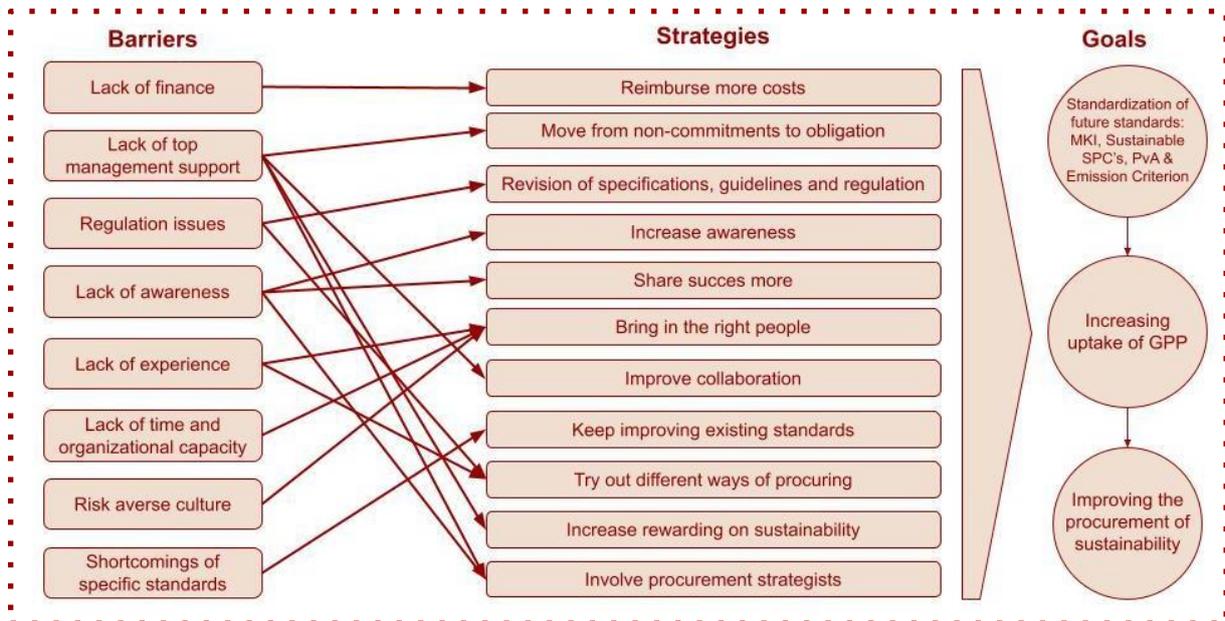
Strategies	Description
1. Reimburse more costs	Reimbursing more costs the bidders make with incorporating sustainability in their bids, for example through the use of the MKI, makes more bidders likely to enter the tender with sustainable solutions (use of future standards).
2. Move from non commitment to obligation	Strictly impose obligations regarding sustainability; employees that do not follow the commitments need to be judged or checked by management. To increase sustainability in procurement, which helps increase the uptake of future standards for sustainability, management needs to be more strict in their steering.
3. Revision of specifications, guidelines and regulation	Revise ProRail's own specifications, guidelines and regulations to allow for more sustainability. SPC's should focus more on functionality, rather than for example specific material required. This would leave more room for alternative and more sustainable solutions. Both the technical department and the LJV department should come together and see how sustainability can be incorporated in each SPC or regulation.
4. Increase awareness	Increasing awareness on sustainability can also help in standardization of future standards. Ways to accomplish this are through constant repetition and to make the goals and ambitions on sustainability more concrete.
5. Share success more	Future standards that are successfully applied or implemented in projects should be highlighted more. Having good examples to draw from would trigger more people to adopt the instruments and procedures for procuring sustainability. Also, making it easy to find such examples is important.
6. Bring in the right people	Bringing in sustainability minded people into the organization could provide an impulse to all departments to consider sustainability in their tasks and projects. Key-positions are especially important to take into consideration.
7. Improve collaboration	Improving the collaboration of LJV with AM especially, could result in more and faster developments with regard to incorporating technical standards for sustainability in SPC's. LJV could structurally be involved in the formulation of SPC's, while on the other hand there need to be clear points of contact for sustainability in the AM department.

8. Keep improving future standards	Adjusting the current and future standards over time, in order for them to keep their strengths, can lead to more use. Improving standards also refers to the constant increase of 'strictness' in the way the standards are used.
9. Try out different ways of procuring	Different ways of procuring can lead to bypass of regulatory barriers and could lead to guarantee of sales for suppliers, allowing for economies of scale.
10. Increase rewarding on sustainability of employees	By praising individuals that successfully incorporate sustainability in procurement projects, they are given a podium and are more likely to tell about it and share their knowledge.
11. Involve procurement strategists	ProRail's procurement strategists should implement more sustainability in their strategies. Additionally, the introduction of a strategist specifically focussing on and managing sustainability could be beneficial.

#### 4.4 Synthesis of results

After identifying the future standards, the barriers to standardization and the standardization strategies, their interconnection and their link with the research aim are demonstrated. The synthesis of the results explains how the different concepts relate to each other and presents the causal links that were determined.

The identified barriers and strategies and their connections are illustrated in Figure 2. As can be seen, some strategies can address multiple barriers. Similarly, some barriers have multiple strategic solutions. Following from this, it can be suggested that ProRail employees primarily have a high need for better top management support in order to improve sustainable purchasing. Regarding the strategies, bringing in the right people can be viewed as an important strategy, as it addresses three barriers at the same time: lack of experience, lack of time and organizational capacity and risk averse culture. Eventually, all strategies should be taken into consideration for standardizing future standards, increasing GPP uptake and therefore improving the procurement of sustainability.



*Figure 2: Relationships of barriers, strategies and goals in ProRail's procurement of sustainability*

ProRail and other contracting authorities can utilize these outcomes in their own strategies. Standardization strategies serve as plans to achieve the goal of improving the procurement of sustainability. They can be involved in both the firm level strategy and the purchasing strategy as a particular functional strategy, in terms of hierarchical stages. For example, bringing in new people to foster a culture change can be a firm level strategy, while trying out different ways of procuring is part of a purchasing strategy.

Moreover, Figure 2 illustrates the main question this research aims to answer, synthesizing the results following from the three sub-questions. Standardization strategies can improve procurement of sustainability by increasing the uptake of future standards through addressing the barriers to standardization in place. The future standards that are identified include: MKI, Sustainable SPC's, PvA and Emission Criterion. These consist of both technical standards and procurement standards, as defined by this research. The barriers that impede these future standards to be applied more broadly, despite their potential, cause the necessity to incorporate ways of overcoming them through what this study presents as standardization strategies. Contracting authorities can use such strategies within their procurement strategy, or even firm strategy, to reach their sustainability vision and goals.

## 5. Discussion

This research is built on the assumption that contracting authorities need strategies for standardization to improve their procurement of sustainability. This assumption follows from the existing lack of GPP uptake observed in literature (Foray et al. 2011; Bratt et al. 2013), and the notion that standards and standardization can aid the broader implementation of sustainable purchasing practices (Rainville, 2017). More specifically, it was assumed, on the basis of similar literature (Taylor, 2018; Leal Filho et al., 2019), that certain barriers impede this standardization. The results demonstrate that such barriers exist and that strategies for overcoming them can lead to improvements of procurement of sustainability. Therefore, the introduction of the 'standardization strategy' concept has been found useful. By explaining how standardization strategies can improve the procurement of sustainability within contracting authorities, this research does not only add to the literature of standards and standardization, but also addresses the missing link in literature of standardization and lack of GPP uptake. The results explain how standardization strategies, by addressing barriers to standardization, can lead to the increased uptake of GPP, laying the (new) link between the two fields of research.

Furthermore, this research presents the new concept of future standards and utilizes it to refer to both technical and procurement developments that are not yet broadly applied. Standardization is brought into a new light: as the process of shifting future standards to standards. Such terminologies helped guide and clarify the research; through the simplification of different interpretations of standards it was simpler to explain concepts such as standardization strategies and barriers to standardization. As in this research these concepts relate to the procurement of sustainability, further research could explore their applicability to other domains. Also, further research could focus on smaller contracting authorities struggling with procurement of sustainability, to test if the same barriers and strategies apply.

The research was conducted on the basis of three sub-questions: 1) "*Which future standards does ProRail use in the procurement of sustainability?*", 2) "*Which barriers do employees face in applying future standards for procurement of sustainability?*" and 3) "*What are strategies that ProRail can use to overcome these barriers?*". Regarding the first sub-question, the main future standards for sustainability that were found included the MKI, PvA and Emission Criterion as procurement standards, while standards for sustainability incorporated in SPC's were identified in the domain of technical standards. Both types of standards were shown to have an impact on the procurement of sustainability. Thereafter, using constant comparison and thematic analysis, ProRail's barriers to and strategies for standardization of sustainable procurement were established.

Adding on, the results focus on two specific areas of the procurement process: requirement specifications and award criteria. As no (future) standards were found in other areas, standardization strategies in this research mainly concern only these two areas. However, it can be implied that the barriers and strategies, in some cases, do not directly deal with the broader uptake of future standards. Some barriers and strategies, regarding for example the sustainability awareness/mind-set, address sustainability more generally. This indicates that they could also affect other parts of the procurement process that are not discussed in this study, such as the contracting for example. As such, other procurement instruments of the procurement process could provide an interesting suggestion for future research regarding

standardization possibilities for better procurement of sustainability. Conducting research specifically for such areas of the procurement process could contribute to the academic understanding of sustainable purchasing improvements.

Regarding the methods, conducting an ES approach resulted in better understanding of practicalities. Constant contact with practitioners allowed the researcher to not lose sight of the practical implications of the study. Moreover, the approach granted the necessary comprehension of practical processes like ProRail's procurement process and of organizational relationships. Additionally, the interviews being semi-structured, sparked discussions and provided interesting new research directions.

Standardization strategies can be useful for contracting authorities like ProRail to implement in practice, as they have the potential to improve sustainable purchasing. These improvements are needed, as contracting authorities have set high sustainable ambitions and are generally bound to national or international sustainability goals (ProRail, 2020b). Therefore, the results bear societal relevance; the increase of GPP uptake issues improvements for society in the form of less emissions and other negative factors influencing the environment. Although this study is conducted with data specific to ProRail and the results in part connect with this large contracting authority specifically, other contracting authorities may draw from the presented conclusions as most formulated barriers and strategies are not specific to the organization. Still, generalizability of case-study research is usually secured through analytical generalization (Yin, 2013). Analytical generalization involves comparing results of a single case-study to previously developed theory. This research is not founded on a clear and proven theory. As such, the results are not completely generalizable. In fact, generalizability of qualitative research findings is usually not an expected attribute (Leung, 2015).

Regardless, this study faced some limitations that need to be addressed. First of all, theoretical saturation must be discussed. Although this study only incorporates 9 interviews, little new data was found during the last interviews. Additionally, almost no new participants were found towards the end of the study, despite the use of snowballing. Still, other interviews, with for example procurement strategists, could have contributed to the findings. Similarly, interviewing top-management or one of ProRail's suppliers may have added new insights to the research. As the standardization strategies are quite relevant for top-management, their views would have strengthened the feasibility of certain strategies. A supplier's perspective could have resulted in additional supplier-related barriers. Although this was not in the scope of the research, such 'barriers from outside the organization' could have offered better understanding of the barriers within ProRail. Also, comparing ProRail with other contracting authorities would have been interesting, to confirm (or contradict) results. Unfortunately, time-constraints and availability problems played a part in these.

The next limitation concerns the lack of confirmation or refutation of interpretations through the use of responded validation. This would have been easier to do if the researcher was in close proximity with the interviewees. However, due to COVID-19, all employees and the researcher himself had to work from home. Moreover, some participants had tight schedules and high workloads that caused planning difficulties, leading to time constraints and making it difficult to discuss results.

Another limitation stems from having one researcher analyzing the data; it concerns the lack of multiple coding. It can be useful to have another person cast an eye on segments of data or coding frameworks, allowing for different interpretations and therefore alerting researchers to all potentially competing explanations (Barbour, 2001). As the study was carried out by one researcher, the use of multiple coding was unattainable. Nevertheless, supervision sessions with experienced researchers helped in refining interpretations and coding frameworks. Hence, the rigor of this research was improved. Similarly, having one researcher impeded the use of 1st tier triangulation. To address this limitation, the use of 2nd tier triangulation was used; the use of a variety of data sources, as explained in the method section.

Lastly, due to the COVID-19 pandemic it was not possible to hold the interviews face-to-face. This meant the interviews were held in Microsoft Teams, in which connectivity problems on occasions made it difficult to hear what a respondent was saying. Still, Microsoft Teams allowed for an effective recording of the data, including recorded physical expressions. Besides, connection problems were scarce due to the use of cable internet.

## 6. Conclusion

This research question this study has aimed to answer is: “*How can ProRail use standardization strategies to improve the procurement of sustainability?*”. Following an Engaged Scholarship approach, nine interviews with ProRail Employees were conducted on the basis of 4 case-studies relating to the procurement of sustainability. Previous to that, a literature review demonstrated the applicability of standardization mechanisms to increase GPP uptake and therefore improve sustainable purchasing. The link between standardization and lack of GPP implementation was laid, addressing the lack of literature combining the two fields of study. As a result, the concepts of future standards, barriers to standardization and standardization strategies were introduced, clarifying the possibilities for improving the procurement of sustainability by contracting authorities.

As to the main research question, the answer is as follows: this study indicates that a public organization’s GPP efficacy could increase if the standardization of innovative GPP instruments is deliberately incorporated in the overall procurement strategy. Since such standardization efforts are likely to encounter various barriers, upfront formation of a standardization strategy to evade these barriers enhances the chance of successful innovative GPP instruments to eventually become standardized. Innovative GPP-instruments that were identified include for example MKI and sustainable SPC’s; these have the potential to be applied more broadly and thus to become standards. In this research they are referred to as future standards. Identified barriers like lack of time and organization capacity or lack of top management support obstruct the standardization of future standards. Yet, strategies such as moving from non-commitments to obligation or revising the organization’s hiring policy could provide ways of overcoming these barriers.

The strategies in theory allow ProRail to apply their future standards more broadly, making them standardized and therefore creating standards for sustainability that can be used in and outside of the organization. As these standards for sustainability lead to more extensive use and uptake of sustainability within procurement practices, the organization’s procurement of sustainability is improved

The implications for practitioners are that the identified standardization strategies are important to consider when making strategic decisions on public procurement of sustainability. Public procurers may use these strategies as part of their own procurement strategy, if they want to improve their sustainable purchasing. Increased uptake of GPP is beneficial for society, as it leads to environmental benefits such as less emissions and reduction of waste.

The take home message of this research is as follows: contracting authorities can use standardization strategies, which address barriers to standardization, to support the broader uptake of future standards, leading to the improvement of public procurement of sustainability that is necessary to reach organizational sustainability goals.

## 7. References.

- Ahsan, K., & Rahman, S. (2017). Green public procurement implementation challenges in Australian public healthcare sector. *Journal of Cleaner Production*, 152, 181-197.
- Alford, J., & Greve, C. (2017). Strategy in the public and private sectors: Similarities, differences and changes. *Administrative Sciences*, 7(4), 35.
- Alvarez, S., & Rubio, A. (2015). Carbon footprint in Green Public Procurement: a case study in the services sector. *Journal of Cleaner Production*, 93, 159-166.
- Anderson, L. M., & Bateman, T. S. (2000). Individual environmental initiative: Championing natural environmental issues in US business organizations. *Academy of Management journal*, 43(4), 548-570.
- Barbour, R. S. (2001). Checklists for improving rigour in qualitative research: a case of the tail wagging the dog?. *Bmj*, 322(7294), 1115-1117.
- Bloch, C., & Bugge, M. M. (2013). Public sector innovation—From theory to measurement. *Structural change and economic dynamics*, 27, 133-145.
- Bouwer, M., Jonk, M., Berman, T., Bersani, R., Lusser, H., Nappa, V. & Viganò, C. (2006). Green Public Procurement in Europe 2006—Conclusions and recommendations. Virage Milieu & Management bv, Korte Spaarne 31, 2011 AJ Haarlem, the Netherlands.
- Brammer, S., & Walker, H. (2011). Sustainable procurement in the public sector: an international comparative study. *International Journal of Operations & Production Management*.
- Bratt, C., Hallstedt, S., Robèrt, K. H., Broman, G., & Oldmark, J. (2013). Assessment of criteria development for public procurement from a strategic sustainability perspective. *Journal of Cleaner Production*, 52, 309-316.
- Breyer, S. G. (1982). Regulation and its Reform. *Harvard University Press*.
- Carter, N., Bryant-Lukosius, D., DiCenso, A., Blythe, J. & Neville, AJ. (2014). The use of triangulation in qualitative research. *Oncol Nurs Forum*.
- Cerutti, A. K., Contu, S., Ardente, F., Donno, D., & Beccaro, G. L. (2016). Carbon footprint in green public procurement: Policy evaluation from a case study in the food sector. *Food Policy*, 58, 82-93.
- Chari, F., & Chiriseri, L. (2014). Barriers to sustainable procurement in Zimbabwe.
- Cheng, W., Appolloni, A., D'Amato, A., & Zhu, Q. (2018). Green Public Procurement, missing concepts and future trends—A critical review. *Journal of Cleaner Production*, 176, 770-784.
- Chersan, I. C., Dumitru, V. F., Gorgan, C., & Gorgan, V. (2020). Green public procurement in the academic literature. *Amfiteatru Economic*, 22(53), 82-101.
- Chesbrough, H. (2004). Managing open innovation. *Research-technology management*, 47(1), 23-26.
- Chesbrough, H., & Bogers, M. (2014). Explicating open innovation: Clarifying an emerging paradigm for understanding innovation. *New Frontiers in Open Innovation*. Oxford: Oxford University Press, Forthcoming, 3-28.
- Cinar, E., Trott, P., & Simms, C. (2019). A systematic review of barriers to the public sector innovation process. *Public Management Review*, 21(2), 264-290.
- Cotton, D., Grissom, M., Spalding, D., & Want, R. (2012). Standardization barriers in the petroleum industry. *University of Colorado*, 4.

- Daugaard, N. (2016). Overcoming the barriers of green public procurement. *Primes*. Accessed on 18th of July 2021, from: <http://primes-eu.net/news-events/news/overcoming-the-barriers-of-green-public-procurement/>
- Dorée, A., van der Wal, G., & Boes, H. (2011). Client leadership in sustainability: how the Dutch railway agency created CO2 awareness in the industry. In *Proceedings 27th Annual ARCOM Conference* (pp. 5-7).
- EC. (2008a). Public procurement for a better environment. *Brussels: European Commission*. Brussels, 16.7.2008 COM(2008) 400 final
- EC. (2008b). Towards an increased contribution from standardisation to innovation in Europe: Commission of the European Communities. *Brussels: European Commission*.
- EC. (2014). Directive 2014/25/EU of the European Parliament and of the Council of 26 February 2014 on procurement by entities operating in the water, energy, transport and postal services sectors and repealing Directive 2004/17/EC Text with EEA relevance. Brussels: European Commission.
- EC. (2020a). Public Procurement. *Internal Market, Industry, Entrepreneurship and SMEs*. Accessed on 30th of December 2020, from: [https://ec.europa.eu/growth/single-market/public-procurement\\_en](https://ec.europa.eu/growth/single-market/public-procurement_en)
- EC. (2020b). What is GPP. *Environment*. Accessed on 30th of December 2020, from: [https://ec.europa.eu/environment/gpp/what\\_en.htm](https://ec.europa.eu/environment/gpp/what_en.htm)
- EC. (2021). Barriers to the take-up of GPP. Accessed on 17th of July 2021, from: [https://ec.europa.eu/environment/gpp/barriers\\_en.htm](https://ec.europa.eu/environment/gpp/barriers_en.htm)
- Edwards, R., & Holland, J. (2013). What is qualitative interviewing?. *A&C Black*.
- Ernst, D. (2011) 'Indigenous Innovation and Globalization: the Challenge for China's Standardization Strategy', (June), pp. 1–126.
- Foray, D., Goddard, J., Beldarrain, X.G., Landabaso, M., McCann, P., Morgan, K., Nauwelaers, C., Ortega-Argilès, R., Mulatero, F. (2011). RIS (Regional Innovation Strategies) 3 Guide. European Union - Regional Policy. Draft
- Freedman, H. (2015). *Strategy: A History*. Oxford University Press.
- Gelderman, C. J., Semeijn, J., & Vluggen, R. (2017). Development of sustainability in public sector procurement. *Public Money & Management*, 37(6), 435-442.
- Giunipero, L. C., Hooker, R. E., & Denslow, D. (2012). Purchasing and supply management sustainability: Drivers and barriers. *Journal of Purchasing and Supply Management*, 18(4), 258-269.
- Glas, A. H., Schaupp, M., & Essig, M. (2017). An organizational perspective on the implementation of strategic goals in public procurement. *Journal of public procurement*.
- Glaser, B. G. (1965). The constant comparative method of qualitative analysis. *Social problems*, 12(4), 436-445.
- Gold, R., & Schneider-Gold, C. (2008). Current and future standards in treatment of myasthenia gravis. *Neurotherapeutics*, 5(4), 535-541.
- Günther, E., & Scheibe, L. (2006). The hurdle analysis. A self-evaluation tool for municipalities to identify, analyse and overcome hurdles to green procurement. *Corporate Social Responsibility and Environmental Management*, 13(2), 61-77.
- Hennink, M. M., Kaiser, B. N., & Weber, M. B. (2019). What influences saturation? Estimating sample sizes in focus group research. *Qualitative health research*, 29(10), 1483-1496.

- Hesping, F. H., & Schiele, H. (2015). Purchasing strategy development: A multi-level review. *Journal of purchasing and supply management*, 21(2), 138-150.
- Hilal, A. H., & Alabri, S. S. (2013). Using NVivo for data analysis in qualitative research. *International interdisciplinary journal of education*, 2(2), 181-186.
- Holland, B. A. (2005). Scholarship and mission in the 21st century university: The role of engagement. In *Proceedings of the Australian Universities Quality Forum* (Vol. 5, pp. 11-17).
- Karapetrovic, S. (2002). Strategies for the integration of management systems and standards. *The TQM Magazine*.
- Keaveney, M., & Butler, P. (2014). An Analysis of the Barriers to and Drivers of Green Public Procurement in Achieving a More Sustainable Construction Industry.
- Klimaatakkoord. (2019). Klimaatakkoord. Accessed on 29th of July 2021, from: <https://www.klimaatakkoord.nl/documenten/publicaties/2019/06/28/klimaatakkoord>
- Koch, P., Cunningham, P., Schwabsky, N., & Hauknes, J. (2006). Innovation in the public sector: Summary and Policy Recommendations.
- Kruidhof, C. (2018). ProRail gebruikt voortaan MKI bij aanbestedingen. *Spoorpro: vakblad voor de spoorsector*. Accessed on 27th of July 2021, from: <https://www.spoorpro.nl/spoorbouw/2018/05/03/prorail-gebruikt-voortaan-mki-bij-aanbestedingen/>
- Leal Filho, W., Skouloudis, A., Brandli, L. L., Salvia, A. L., Avila, L. V., & Rayman-Bacchus, L. (2019). Sustainability and procurement practices in higher education institutions: Barriers and drivers. *Journal of cleaner production*, 231, 1267-1280.
- Leung, L. (2015). Validity, reliability, and generalizability in qualitative research. *Journal of family medicine and primary care*, 4(3), 324.
- Lloyd, R. E., & McCue, C. P. (2004). What is public procurement? Definitional problems and implications. In *International Public Procurement Conference Proceedings* (Vol. 3, pp. 2-18).
- Lysons, K., & Farrington, B. (2006). Purchasing and supply management. *Research Education*.
- McKelvey, B. (2006). Van De Ven and Johnson's "engaged scholarship": Nice try, but.... *Academy of Management Review*, 31(4), 822-829.
- McMurray, A. J., Islam, M. M., Siwar, C., & Fien, J. (2014). Sustainable procurement in Malaysian organizations: Practices, barriers and opportunities. *Journal of Purchasing and Supply Management*, 20(3), 195-207.
- Ministerie Van Infrastructuur en Waterstaat. (2019). Uitvoeringsprogramma Circulaire Economie 2019-2023.
- Mintzberg, H. (1987). The strategy concept I: Five Ps for strategy. *California management review*, 30(1), 11-24.
- Mitchell, L. (2005). The definition of standards and their assessment. In *Competency based education and training* (pp. 56-64). Routledge.
- 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. *Ecological Economics*, 68(6), 1838-1849.
- Nollet, J., Ponce, S., & Campbell, M. (2005). About "strategy" and "strategies" in supply management. *Journal of Purchasing and Supply Management*, 11(2-3), 129-140.

OECD. (2020). Public Procurement. Accessed on 30th of December 2020, from: <http://www.oecd.org/gov/public-procurement/>

Palmujoki, A., Parikka-Alhola, K., & Ekroos, A. (2010). Green public procurement: analysis on the use of environmental criteria in contracts. *Review of European Community & International Environmental Law*, 19(2), 250-262.

Patrucco, A. S., Luzzini, D., Ronchi, S., Essig, M., Amann, M., & Glas, A. H. (2017). Designing a public procurement strategy: lessons from local governments. *Public Money & Management*, 37(4), 269-276.

Patton, M. Q. (1999). Enhancing the quality and credibility of qualitative analysis. *Health services research*, 34(5 Pt 2), 1189.

Plantinga, H. E. C. (2020). The good, the bad, and the tacit: Explicating implicit procurement knowledge to achieve purposeful management of procurement instruments. *University of Twente*.

Pouikli, K. (2021). Towards mandatory Green Public Procurement (GPP) requirements under the EU Green Deal: reconsidering the role of public procurement as an environmental policy tool. *ERA Forum* (Vol. 21, No. 4, pp. 699-721).

ProRail. (2020a). Over ProRail. Accessed on 30th of December 2020, from: <https://www.prorail.nl/omwonenden/over-prorail>

ProRail. (2020b). ProRail Kader Maatschappelijk Verantwoord Inkopen.

ProRail. (2021). ERTMS: het digitale spoorplatform. Accessed on 13th of February 2021, from: <https://www.prorail.nl/programmas/ertms>

Rainville, A. (2017). Standards in green public procurement—A framework to enhance innovation. *Journal of Cleaner Production*, 167, 1029-1037.

Rietbergen, M. G., & Blok, K. (2013). Assessing the potential impact of the CO2 Performance Ladder on the reduction of carbon dioxide emissions in the Netherlands. *Journal of Cleaner Production*, 52, 33-45.

Rietbergen, M. G., Opstelten, I. J., & Blok, K. (2017). Improving energy and carbon management in construction and civil engineering companies—evaluating the impacts of the CO 2 Performance Ladder. *Energy Efficiency*, 10(1), 55-79.

Roman, A. V. (2017). Institutionalizing sustainability: A structural equation model of sustainable procurement in US public agencies. *Journal of cleaner production*, 143, 1048-1059.

Shawcross, J. K., & Ridgman, T. W. (2019). Linking practice and theory using Engaged Scholarship. *European Journal of Engineering Education*, 44(1-2), 35-48.

Silverman, D. (2013). *Doing qualitative research: A practical handbook*. Sage.

Simeone, L. (2020). Characterizing strategic design processes in relation to definitions of strategy from military, business and management studies. *The Design Journal*, 23(4), 515-534.

Small, S. A., & Uttal, L. (2005). Action-oriented research: Strategies for engaged scholarship. *Journal of Marriage and Family*, 67(4), 936-948.

Swann, P., (2000). The Economics of Standardization - Final Report for Standards and Technical Regulations Directorate. *Department of Trade and Industry*.

- Swanson, M., Weissman, A., Davis, G., Socolof, M. L., & Davis, K. (2005). Developing priorities for greener state government purchasing: a California case study. *Journal of Cleaner Production*, 13(7), 669-677.
- Taylor, S. J., & Bogdan, R. (1984). Introduction to qualitative research methods: The search for meanings. *Wiley-Interscience*.
- Taylor, S. P. (2018). Innovation in the public sector: dimensions, processes, barriers and developing a fostering framework. *International Journal of Research Science & Management*, 5(1), 28-37.
- Testa, F., Annunziata, E., Iraldo, F., & Frey, M. (2016). Drawbacks and opportunities of green public procurement: an effective tool for sustainable production. *Journal of Cleaner Production*, 112, 1893-1900.
- Testa, F., Iraldo, F., Frey, M., & Daddi, T. (2012). What factors influence the uptake of GPP (green public procurement) practices? New evidence from an Italian survey. *Ecological Economics*, 82, 88-96.
- Thomson, J., & Jackson, T. (2007). Sustainable procurement in practice: lessons from local government. *Journal of Environmental Planning and Management*, 50(3), 421-444.
- United Nations Framework Convention on Climate Change. (2015). Paris Agreement. Accessed on 21th of July 2021, from: [https://unfccc.int/documentation/documents/advanced\\_search/items/6911.php?preref%4600008831](https://unfccc.int/documentation/documents/advanced_search/items/6911.php?preref%4600008831)
- Uttam, K., & Roos, C. L. L. (2015). Competitive dialogue procedure for sustainable public procurement. *Journal of Cleaner Production*, 86, 403-416.
- Vaismoradi, M., Jones, J., Turunen, H., & Snelgrove, S. (2016). Theme development in qualitative content analysis and thematic analysis.
- Van de Ven, A. H. (2007). *Engaged scholarship: A guide for organizational and social research*. Oxford University Press on Demand.
- Vluggen, R., Gelderman, C. J., Semeijn, J., & Van Pelt, M. (2019). Sustainable public procurement—External forces and accountability. *Sustainability*, 11(20), 5696.
- Voordijk, H., & Adriaanse, A. (2016). Engaged scholarship in construction management research: the adoption of information and communications technology in construction projects. *Construction management and economics*, 34(7-8), 536-551.
- Walker, H., & Brammer, S. (2009). Sustainable procurement in the United Kingdom public sector. *Supply Chain Management: An International Journal*.
- Wesseling, J. H., & Edquist, C. (2018). Public procurement for innovation to help meet societal challenges: a review and case study. *Science and Public Policy*, 45(4), 493-502.
- Yin, R. K. (2011). Applications of case study research. *SAGE*.
- Yin, R. K. (2013). Validity and generalization in future case study evaluations. *Evaluation*, 19(3), 321-332.

## 8. Appendix

### *Appendix A: Interview guide*

#### **Interview template**

Welcome and thank you for participating in this research, which focuses on improving procurements of sustainability and innovation through standardization strategies. I am examining different tenders within ProRail and interviewing the people involved about the procedures and standards involved in the procurement process, to delineate a strategy for moving from singular successful sustainability and innovation procurements to a more organized and standardized way, eventually increasing the amount of sustainability and innovation procurements. The questionnaire will be conducted verbally and the questions will only be presented to the participants at the time of the interview, to solicit the most meaningful responses. This interview will be recorded and will last about an hour. The gathered data and the participant's privacy will be protected according to the informed consent form, which is already signed before the interview in a separate document. Do you have any questions before we start?

Name:

Date:

Position:

How long in:

Procurement project:

1. What is your role in the organization?
  - With respect to planning or conducting sustainability and innovation procurement?
2. In light of the climate neutral and circular infrastructure strategy goals recently set by the Ministry of Infrastructure and Water Management together with ProRail and Rijkswaterstaat, Kader Maatschappelijk Verantwoord Inkopen (ProRail, 2020) forms the operationalisation of these goals, for example reducing CO2 emissions, waste and toxicity through some leading principles in procurement practices. Could you tell me what your interpretation is of this vision on innovation and sustainability?
  - How well are you underway in accomplishing that vision in your opinion?
  - Is there anything specific to these goals you hope to achieve through public procurement?

3. Which procurement projects have you been involved in that relate to that vision, and how did they relate to it?
  - At what stage is this project? (concept, planning, tender writing, execution – procurement process/tendering – supplier selection, contracting, implementation)
  - Could you elaborate on some details of this procurement? (what was procured, costs, how many tenders, which supplier, contract length)
  - How were you involved and with whom did you work?
  - Who were the most important stakeholders and why?
4. In the procurement planning process, what approach did you take to incorporate sustainability and innovativeness?
  - What are the routines or best-practices you encountered in this procurement process? (in particular for this project – we will discuss procedures for conducting procurements in general in a later question)
  - How did you engage with other stakeholders (internal and external) in this process?
  - Was standardization specifically involved in any way?
5. Let's move on to discussing the tenders themselves. Voluntary standards often help in decision making. A standard is a repeatable, harmonised, agreed and (often) documented way of doing something. It sets specifications above what is required by regulation. Very common standards include ISO standards on for example quality management like the ISO 9000-family or environmental standards you often see on supermarket products such as fairtrade. But they can also be as broad as certain methods of procurement instruments such as CO2-prestatieladder. Are you aware of any standards used in this specific project?
  - How did you determine technical specifications?
  - How did you account for interoperability?
  - In the award criteria?
  - For technical specifications?
  - How do they relate to functional requirements listed?
  - Did the contract clauses drafted for the winning party contain reference to any standards?

**Note: for each question; what led up to the decision to include them; did it vary from the past, and if so, how? What was the intended effect? If multiple standards were used, how were they considered together?**

6. What about standardized procedures? These could be working agreements or routines for example.
  - In management of the procurement project?
  - In the different processes of procurement?
  
7. Are there any barriers you encountered in the procurement process, especially with respect to the use of standards? If so, what are they?
  - What needs to be changed in your opinion to overcome these barriers?
  - Are there any tools you are aware of that could help?
  
8. With standardization, we mean both 1) the creation of standards documents that could be used in the tenders, to for example shorten tenders or assure environmental benefits and 2) the more managerial view of creating routines/best practices for conducting procurement projects such as knowing how to work with standards and the ability to identify the need for new ones, aka process standardization, which often leads to better efficiency, guarantee of quality and increased productivity in organizations.
  - For each type of standardization, you see any way such standardizations could help in overcoming the barriers encountered in the procurement process and why?
  - What stakeholders would you need? What venue would be appropriate to conduct the standardization? Do you perceive any barriers to doing so?
  
9. If you could start over the procurement process for each of the projects you mentioned, what would you do differently?
  - What are the main learnings you received from conducting each project, in terms of the availability and application of any relevant standards?
  - Do you have any insights regarding how to further best practices across these projects, such as through process standardization?

10. Could you recommend anyone else involved in this procurement project (or other relevant individual) for an interview?

*Appendix B: Informed consent form used for interviews*

 Utrecht University **INFORMED CONSENT FORM** for participation in:

**<Please enter title of your thesis>**

**To be completed by the participant:**

I confirm that:

- I am satisfied with the received information about the research;
- I have been given opportunity to ask questions about the research and that any questions that have been risen have been answered satisfactorily;
- I had the opportunity to think carefully about participating in the study;
- I will give an honest answer to the questions asked.

I agree that:

- the data to be collected will be obtained and stored for scientific purposes;
- the collected, completely anonymous, research data can be shared and re-used by scientists to answer other research questions;
- video and/or audio recordings may also be used for scientific purposes.

I understand that:

- I have the right to withdraw my consent to use the data;
- I have the right to see the research report afterwards.

Name of participant: \_\_\_\_\_

Signature: \_\_\_\_\_ Date, place: \_\_\_/\_\_\_/\_\_\_, \_\_\_\_\_

**To be completed by the investigator:**

I declare that I have explained the above mentioned participant what participation means and the reasons for data collection. I guarantee the privacy of the data.

Name: \_\_\_\_\_

Date: \_\_\_/\_\_\_/\_\_\_(dd/mm/yyyy)

Signature: \_\_\_\_\_