# STRENGTHENING REQUIREMENT SPECIFICATION IN SUSTAINABLE PROCUREMENT – AN INVESTIGATION OF CHALLENGES

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## ABSTRACT

To reap the benefits of sustainability in the construction sector, it is crucial that the stakeholders involved can implement it in practice. Investigations have shown that choices made in the early phases of the building process are of very great importance for the outcome and the initiatives and decisions taken by the building owner are crucial.

This paper presents research on Danish building practitioners' ability to make requirements for sustainability in procurement. On the basis of an action research strategy, we asked practitioners to help identify the challenges involved in requiring sustainable solutions through procurement. These included among others a lack of knowledge or experience in sustainable procurement and interdisciplinary challenges. The research showed that practitioners are able to formulate specific requirements for sustainability in procurement. However the challenges found imply that a sustainable approach in procurement is not fully implemented in a Danish context. This suggests that there is a need for guidance in the area, if the practitioners are to move from good intentions to making more specific requirements for sustainability in procurement.

## KEYWORDS:

sustainable procurement, requirement specification, procurement challenges, Danish construction industry, building life cycle



## 1. INTRODUCTION

A vital element in the execution of visions, ideas or strategies for sustainability is to call for it in a clear and unambiguous way, in both construction and in building renovation. The considerable pressure to embed sustainability in construction and building renovation, however, has not translated into any widespread establishment of sustainable procurement (Meehan and Bryde 2011).

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The academic literature on sustainable procurement in general is not extensive (Sourani and Sohail 2013) and a review on the subject (Walker and Brammer 2012) shows that research on sustainable procurement in construction in the public sector is similarly limited.

Sustainable procurement is generally defined as *'a process whereby organisations meet their needs for goods, services, works and utilities in a way that achieves value for money on a whole life basis in terms of generating benefits not only to the organisation, but also to society and the economy, whilst minimising damage to the environment'* (UK Sustainable Procurement Task Force 2006). The literature shows that the various aspects of sustainability in procurement are investigated both in combination and as separate themes. Environmental aspects are typically related to energy use and waste management, social aspects are often related to health issues or supply chain management, and economic aspects are typically related to returns on investment in sustainable procurement (Oruezabala and Rico 2012). The dominant focus in the literature has been on the environmental aspects (Walker and Brammer 2012) and on the economic aspects of sustainable procurement (Ruparathna and Hewage 2015), whereas the social aspects of sustainable procurement are under-researched (Walker and Brammer 2009). Recent studies on sustainable procurement in the public sector, however, have moved towards including all three aspects of sustainability (Walker and Brammer 2012).

For a long time, the focus has been on the client as the agent of change with regard to innovation in construction (Brown et al. 2006; Edler and Georghiou 2007), but others argue that little is known about how clients can make a difference in practice as agents of change (Haugbølle et al. 2011). The latter do, however, suggest that the sustainable renovation of the existing building stock requires new procurement strategies and methods if it is to succeed. They also argue that a strong strategic orientation or a strategy can form the basis of requests for environmental elements in relation to procurement and help consolidate the requirements in request for proposals (Haugbølle et al. 2011). According to Naoum (2015), the whole building process needs changes in organisation, structure, and communication channels if sustainable construction is to be achieved. Sterner argues that a client's ability to formulate, evaluate and verify the relevant (environmental) requirements and to include these aspects is crucial to the development of an (environmentally) conscious process (Sterner 2002). Berry and McCarthy (2011) agree, emphasising that a procurement strategy is an important underlying element for sustainable procurement actions. Ruparathna and Hewage (2015) maintain that the owner's leadership and commitment is vital for the establishment of sustainable procurement.

The literature suggests methods to identify and implement the building owner's needs in the procurement of sustainable construction and building renovation, but the focus is too narrow according to Alshubbak et al. (2015). They propose a model that identifies, captures and categorises the building owner's needs in all phases of a building's life cycle, since this will give all phases equal relevance (Alshubbak et al. 2015), though it might collect an amount of data on the building owner's needs that is simply too massive to process. Other researchers have investigated what factors are important when addressing sustainability in procurement. Central to these are the requirements set by the building owners, which can be defined as the objectives, needs, wishes and expectations of the building owner (Kamara et al. 2000). Kamara et al. (2000) also argue that the requirements are a primary source of information for a building project and that it is essential that they are fully understood by all project participants if the project is to be successful and the client satisfied. To achieve such understanding, the requirements set by the building owner in non-design terms need translating into design

terms that can be understood by the project team. In recent research Xia et al. (2013) have examined 49 design/build requests for proposals within the public sectors of the US to investigate state-of-the-art practice for definition of sustainability requirements. The research showed that sustainability was required in more than half of the requests. These requests are most often by use of the Leadership of Energy and Environmental Design (LEED) certification system, and have according to the writers become an important part in best-value evaluation.

A survey among Swedish building clients on how they include environmental aspects in procurement showed that the requirements could be divided into six categories: waste, materials, contractor's environmental work, construction, ecological aspects, and other matters. The survey showed a preponderance of requirements in the first two categories at the time of the survey (Sterner 2002). The same survey warned that requirements in one category, which are intended to reduce environmental impact in one area, can affect the outcome in other areas. Sourani and Sohail (2013) carried out a similar, yet more comprehensive, investigation of significant factors for sustainable procurement, which was based on a Delphi investigation and described 41 factors they considered would help public building owners better address sustainability in their procurements. The factors are divided into eight overall groups, including knowledge and perception factors, organisational and management factors, logistical factors, contractual factors, instrumental factors, strategic factors and financial factors. The literature, however, also shows that although corporations consider sustainability important, it is not necessarily taken into account in their procurement practice (Meehan and Bryde 2011), and even where some do include sustainability aspects in the procurement process, no effect has been seen (Varnas et al. 2009).

There are a few examples in the literature supporting implementation of sustainability aspects in procurement; these are development of decision models and a framework for evaluation of contractors (Chen et al. 2008; Sarkis et al. 2012). Berry and McCarthy (2011) also proposed a guide to sustainable procurement in construction, aiming at providing knowledge to industry professionals. Yet, the research by Sourani and Sohail (2013) shows there is a lack of tools that support addressing sustainability in procurement decision-making.

The challenges and benefits of sustainable procurement have also been investigated in the Canadian construction sector. According to Ruparathna and Hewage (2015), the challenges include costs, insufficient regulation, the lack of a method for evaluating bids, and a lack of knowledge. The largest benefits were found to be reduction of harmful emissions and waste generation, and long-term cost savings. The authors emphasise that sustainable procurement policies are influenced by local dynamics, but the challenges are likely to occur in other places.

According to Meehan and Bryde (2011), the complexity and wide range of sustainable development lead to confusion and anxiety about sustainable procurement at an operational level, causing inactivity among those responsible for procurement decision-making. This underlines the argument by Sterner (2002) that there is a danger that requirements set in one area with good intentions could adversely affect another area. Several places in the literature also stress that action towards sustainability in the early phases of a building or building renovation process is important for the amount of sustainability obtained in a project, e.g. (Berry and McCarthy 2011; Sarkis et al. 2012).

This article presents research on the Danish building practitioners' ability to make requirements for sustainability in the procurement of new construction and building renovation. We identify challenges met when setting requirements and present eight typical types of challenges, including technical challenges, interdisciplinary challenges and challenges due

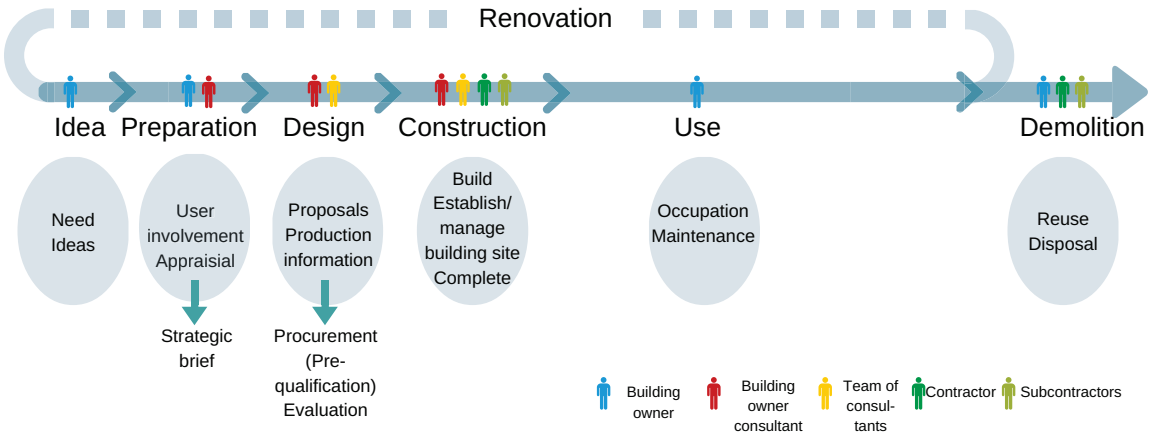
to a lack of knowledge and experience. We determine that it is possible for building owners to set specific requirements for sustainability in procurement and that the stakeholders are aware that making requirements for sustainability is necessary if we are to incorporate sustainability in construction and building renovation. Our findings are based on an action research strategy, gathering practitioners in the Danish construction industry at both workshops and in group sessions to collect information about the challenges they face and their ability to set specific requirements for sustainability.

This research considered procurement of new construction and building renovation projects. The practitioners who participated were both private and public, and no building type or use was specified prior to the investigations performed. Further, the paper investigated sustainability in broad terms, with no special focus on the environment.

## 2. THE BUILDING LIFE CYCLE

Figure 1 shows the building life cycle of new construction and large building renovation projects. The figure is an elaboration on the project process as described by Berry and McCarthy (2011). It illustrates the main phases and events of a building or building renovation project from the Idea phase through to *Demolition or Renovation*. It shows the various project phases and how they vary in duration, with the *Use* phase in most cases being by far the longest. This article considers the first part of the process, from the *Idea* phase to the end of the *Construction* phase. We do not consider the subsequent procurement of services during use and at the end of life. In larger building renovation projects, the phases are the same as mentioned here, but some elements are different. In the case of building renovation, the basis for the building site is three-dimensional, because parts of the original building will remain. This might lead to restraints that cannot be changed or moved towards sustainable solutions. User involvement will become even more important in building renovation and will occur in several phases, and the user might well be present during work on site.

**FIGURE 1.** A building life cycle, describing phases and processes for new construction and larger building renovation.




The figure also shows the main stakeholders traditionally involved during a project: the building owner, the building owner's consultant, other consultants, the contractor and subcontractors. The large circles in the figure summarise the main events in each phase and

the elements of procurement that are mandatory for public building and social housing and subject to the public procurement directive of the European Commission (European Commission 2016). The strategic brief is important for the building owner, because this is the building owner's opportunity to set requirements before the *design* phase, after which the building owner is most often represented by a building owner consultant. The importance of this element in making requirements for sustainable buildings is also emphasized by (Sodagar and Fieloson 2008). It argues that sustainable building can be hindered if there is not enough knowledge to develop a project brief with clear targets and strategies for sustainability impacts. Furthermore, these targets and strategies should remain as a guide for facility management, refurbishment and the end-of-life phase. The building owner will still be decisive, but usually he will not participate actively in the *design* and *construction* phase. Figure 1 simplifies the process. For example, the element called 'proposals' in the design phase covers all the proposal elements, such as the outline proposal, the detailed proposal and the final proposal.

It is possible to make requirements for sustainability throughout the process. But introducing these requirements late in the process is often more costly than introducing them early in the process. Introducing requirements for sustainable solutions after a tender has been accepted leaves the contractor free to set the price without competition. It is therefore important for the building owner to use the opportunities to include requirements for sustainability early in the process. These opportunities include, but are not limited to, the strategic brief, the construction procurement, and the procurement of the building site, as well as the design of the procurement evaluation. In these stages of the process, there are concrete opportunities to translate the building owner's strategy for sustainability into requirements for sustainability in construction or building renovation.

## 3. RESEARCH METHODOLOGY

A qualitative approach was adopted in this research to investigate how to make requirements for sustainability in the procurement of construction or building renovation. An explorative action-based research strategy was used because it involves practitioners and researchers in a collaborative partnership and can have implications beyond the specific project by transferring knowledge gained on to others. It is crucial for the strategy that the participants work on questions that are of genuine interest to them (Saunders et al. 2016). A similar exploratory research strategy using focus groups has been used elsewhere in this field of research (Walker and Phillips 2009).

This research was conducted as part of two *Innobyg* development projects. Innobyg is an innovation network for sustainable construction in the Danish construction industry, which is co-financed by the Danish Agency for Science, Technology and Innovation. The development projects that hosted this research were entitled 'The Building Owner's Values in Relation to Energy-Efficient and Sustainable Building' (Innobyg 2014a) and 'Sustainability at the Building Site' (Innobyg 2014b). Both projects ran from December 2010 to July 2014. Data for the research presented in this article was collected in 2013 and 2014.

Across the development projects, an investigation was conducted on how to make requirements for sustainability in procurement of construction or building renovation. The project 'The Building Owner's Values in Relation to Energy-Efficient and Sustainable Building' hosted workshops conducted with a wide variety of stakeholders in construction. The project 'Sustainability at the Building Site', hosted group sessions with stakeholders represented at a

building site. In this paper, the practitioners and researchers who attended these workshops and group sessions are referred to as the "participants".

### *3.1 Workshops*

Three workshops were conducted with the overall aim of discussing how to set requirements in procurement with regard to sustainability. The workshop method was selected as a good way to gather practitioners and create an active interaction that can increase existing knowledge. The workshops addressed three specific elements in sustainability, chosen by the project group. The elements covered were: Indoor climate, Materials, and Architecture and Process. The workshops were publicly announced and open to all stakeholders in the Danish construction industry.

The structure of the workshops was always the same, and they lasted three to four hours. All workshops were initiated with a short welcome and presentation of the theme of the day. This was followed by presentations by stakeholders experienced in the theme of the day arranged by the project group. These stakeholders included private and public housing building owners, architect companies, and a non-profit private foundation. The presentations were to inspire participants and place focus on the theme of the workshop. Subsequent plenum discussions and work in smaller groups with around 5-7 participants were presented and facilitated around the questions listed in Table 1. A central part of the workshop, these smaller groups made it possible for the participants to share their knowledge and individual skills in comfortable surroundings. At the end of each workshop, data was collected in a common list, highlighting the key points of knowledge shared during the workshop. All notes made by the participants were collected afterwards, and the statements were gathered and analysed.

Table 1 presents participants and the questions used for the group work during the workshops.

**TABLE 1.** Participants in and questions asked at the workshops on how to require sustainability in procurement.

| Workshop subject | | Indoor climate | Materials | Architecture and Process |
|---|---|---|---|---|
| Number of participants | | 31 | 13 | 17 |
| Stakeholders represented | Building owners | 7 | 4 | 4 |
| | Consultants | 7 | 4 | 3 |
| | Contractors | 3 | - | - |
| | Manufactures | 3 | - | - |
| | Knowledge institutions | 7 | 3 | 7 |
| | Others | 4 | 2 | 3 |
| Questions asked | | • Challenges – specific areas of interest<br>• Good examples – cases or buildings<br>• Specific phrases and requirements for use in procurement | | |

### *3.2 Group Sessions*

Five group sessions were conducted in the Innobyg development project 'Sustainability at the Building Site'. The aim of the group sessions was also to discuss how to set requirements for sustainability in procurement with specific focus on the building site. Like the workshops, group sessions were chosen as a way of gathering the practitioners and encouraging them to be confident and informative. As a prelude for the group sessions, a meeting was arranged to present the challenges and relevance of sustainability at the building site. The meeting was attended by a large and diverse group of stakeholders in the Danish construction industry,

and the themes for discussion at the subsequent group sessions were proposed by the project group. At the meeting, these themes were adopted and further developed by the participants. This meeting, and thereby the opportunity of attending the group sessions, was publicly announced to stakeholders in the Danish construction industry.

The elements considered at the group sessions included: Transport, Logistics and Material Management, Waste and Consumption (energy and water), Materials, Social Sustainability, and Life Cycle Costs.

The structure of the group sessions was always the same, all lasting approximately two hours based on a short non-standardised interview guide. Not all elements were necessarily taken up in the specific form at all group sessions. The guide was used as a framework for the discussions and as a tool to keep the focus on the theme of the day. The group session form was chosen to make sure that the participants would find the setting fit for exchanging knowledge, without feeling exposed. We thought it was important for the contractors and subcontractors to be represented and feel comfortable enough to share their experiences. The group sessions were typically held in a neutral place for the participants.

Table 2 shows the type and number of participants of the group sessions. Most participants in the sessions had a lot of experience in the field of construction. Questions from the interview guide are also shown.

**TABLE 2.** Participants in and questions asked at the workshops on how to require sustainability in procurement.

| Group session subjects | | Transport, logistics and material management | Waste and consumption (energy and water) | Materials | Social sustainability | Life cycle costs |
|---|---|---|---|---|---|---|
| Number of participants | | 6 | 9 | 9 | 9 | 6 |
| Stakeholders represented | Building owners | X | X | X | X | X |
| | Consultants | X | X | X | | X |
| | Contractors | X | X | | X | X |
| | Manufacturers | | | X | X | X |
| | Knowledge institutions | X | X | X | X | X |
| | Others | | X | X | | |
| Interview guide questions | | • What problems have you had in defining sustainability at a building site?<br>• Give specific experiences of describing sustainability at a building site.<br>• Suggestions for concrete input or phrasing in procurement documents.<br>• What is the correlation between the proposed phrasing of requirements and the design of the procurement evaluation? | | | | |

## 4. FINDINGS

This section gives the findings of the investigation on how to make requirements for sustainability in the procurement of new construction and building renovation. There were three research objectives: to identify challenges faced when setting requirements; to determine whether it is possible to set specific requirements for sustainability in procurement; and to estimate to what extent specific requirements determine the amount of sustainability implemented. The research also resulted in a large number of recommendations from the practitioners.

It is known from the literature and underpinned by the workshops with practitioners in this research that, even though building owners have an interest in implementing sustainability in a construction or building renovation project, it can be difficult to specify requirements

for sustainable solutions in procurement and in procurement evaluation. One major challenge discussed is both setting specific requirements and at the same time maintaining a holistic perspective on sustainability.

### *4.1 Types of challenges identified*

The participants in the workshops and group sessions were asked to specify challenges they faced in making sustainability requirements in procurement. The resulting statements were subsequently grouped independently from the individual workshop and group session themes. The types of challenges were derived and categorised by the author based partly on the existing literature and partly on in vivo coding.

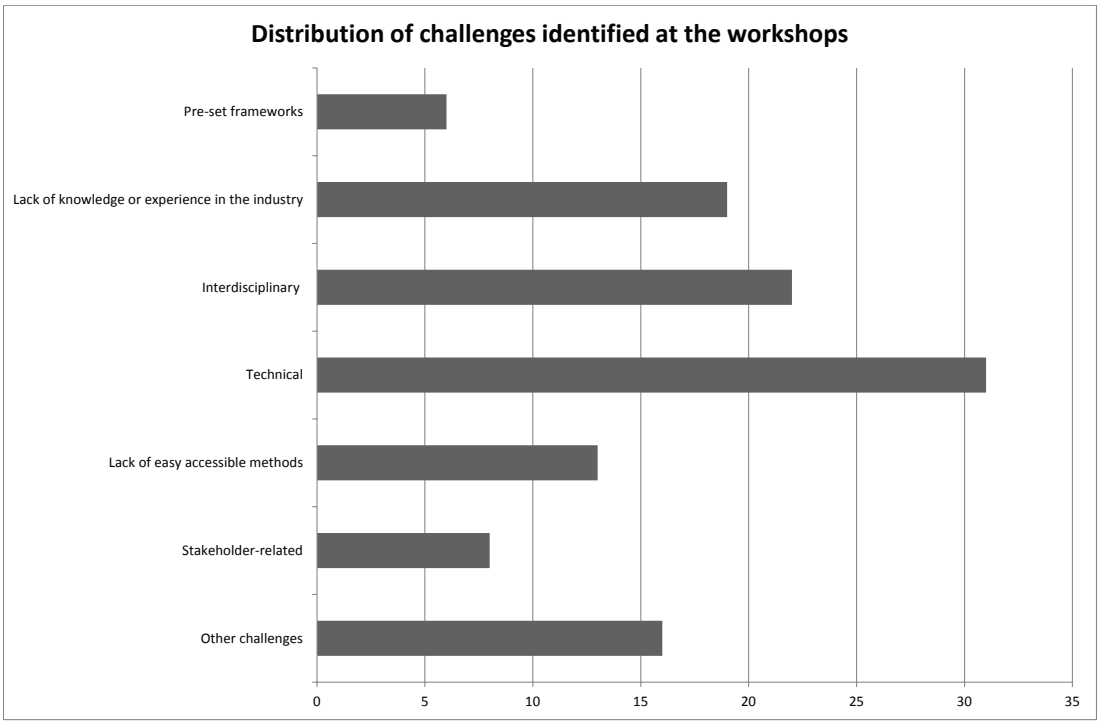
Table 3 illustrates the processing of data from the workshops. It includes the types of challenge established, a grouping of the statements, and specific examples (translated by the author). Further characteristics of the types of challenge are given. The categories of statements contain at least six statements, and statements were put in only one category, although some might relate to several categories.

**TABLE 3.** Challenges related to sustainability requirements in the procurement of new construction or building renovation, identified at the workshops.

| Type of challenges: | Statement types: | Examples: |
|---|---|---|
| ***Pre-set frameworks***<br>Unchangeable restraints such as legislation or the physical framework of the building site. | - Rules of procurement<br>- Existing building | - Rules of procurement hinder the development of new products/initiatives<br>- Condition of existing building |
| ***Lack of knowledge or experience in the industry***<br>Challenges thought to result from a lack of knowledge or experience in the field of sustainability and sustainable procurement. | - Confusion on how to evaluate elements<br>- Lack of a sense of what is the right solution with regard to sustainability<br>- Economic aspects | - User behaviour (an unknown factor in relation to technical solutions and increasing demands)<br>- How do we put a value on what is a good indoor climate?<br>- For whom is it worthwhile? |
| ***Interdisciplinary***<br>Challenges that are related to two or more elements in sustainability, e.g. both materials and indoor climate. | - Cooperation across phase change.<br>- Early involvement of stakeholders and a new form of cooperation | - Loss of ambition and information during phase change<br>- Prioritising elements of interest with regard to a specific project and sustainability<br>- A common perception of the term would make it easier to set goals |
| ***Technical***<br>Challenges that are of a technical or technological nature | - Combining existing technical solutions<br>- Emittance from materials<br>- Process steering | - Not forcing the construction period<br>- LCA for materials<br>- Sustainability is often introduced (too) late in a project |
| ***Lack of easy accessible methods***<br>Challenges related to the need or request for easy hands-on methods or simplification | - Uniformity on requirements for materials<br>- Common perception of sustainability<br>- Systematic instructions for sustainability in procurement | - Lack of any systematic guidelines for sustainable procurement<br>- Specific consultancy about choice of materials in (sustainable construction)<br>- DGNB is commercial and too expensive |
| ***Stakeholder-related***<br>Challenges related to the stakeholders' competence such as skills, willingness or knowledge. Not related to a specific stakeholder group | - Risk-taking<br>- Credibility<br>- The ability to deliver sustainability | - Credibility<br>- Even though the building owner asks for LCC calculations, they are seldom used<br>- Lack of willingness to actively ask for sustainability in construction |
| ***Other challenges***<br>Challenges related to all other aspects mentioned | - Extensive focus on energy<br>- The wheel is reinvented in every project | - Emphasise and communicate the gains of sustainability<br>- Social clauses<br>- Forms of procurement<br>- A broader spectrum of energy renovation solutions |

The workshops lead to 115 statements on challenges faced in making sustainability requirements in procurement. The distribution of the statements is seen in Figure 2.

**FIGURE 2.** Distribution of challenges identified at the workshops.




Grouping the challenges showed that the most common challenges are technical, followed by interdisciplinary challenges and a lack of knowledge and experience. Together, these represent more than half of all the statements given during the workshops. In contrast, the pre-set frameworks are mentioned the least.

We expected that the interdisciplinary challenges would be the most common, as they are in the literature. However, it was the technical challenges that were most frequently mentioned. The technical challenges were mentioned in all the workshops, and they have a design-related character as can be seen in Table 3. One reason for the large number of technical challenges mentioned might be the participants' concern with weighing the technical solutions against each other, as they aim at a sustainable solution in a holistic perspective.

The individual workshop themes are all close to equally represented in the different types of challenge, except that statements from the workshop on Materials are underrepresented in the group *'Lack of knowledge or experience in the industry'*. In contrast, statements from that workshop are clearly overrepresented in the group *'Lack of easy accessible methods'*. This could indicate that the stakeholders have not yet adopted the methods available (such as LCA) for materials, or that they need more easily accessible methods to get to grips with the topic.

The category *'Other challenges'* included several challenges related to energy in buildings, which was a bit surprising. The project group had decided to leave out energy as a theme at the workshops, because it was considered to be already well investigated and highly prioritised in a Danish context. Despite this, it still had a prominent position in the awareness of the participants.

At the group sessions, the data on challenges are of a more specific nature than those at the workshops. Initially, we attempted to group the statements about challenges at the group sessions in the same way as the challenges from the workshops, but an additional type of challenge was found relevant for the group sessions: challenges related to the *'use of incentives, restrictions and control'*. This category was necessary because the participants needed ways of enforcing their requirements.

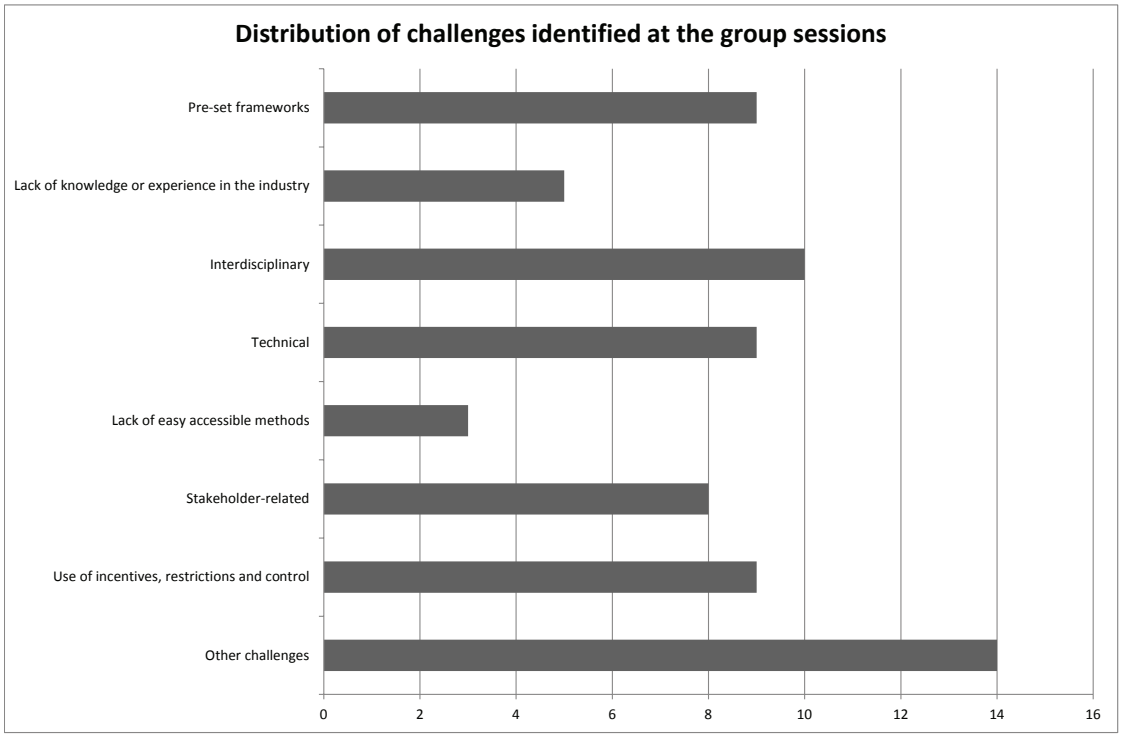
Examples of challenges related to making requirements for sustainability at the building site are shown in Table 4.

**TABLE 4.** Challenges related to requiring sustainability at the building site identified at the group sessions.

| Type of challenges | Grouping statements: | Examples of statements: |
|---|---|---|
| ***Pre-set frameworks***<br>Unchangeable restraints such as legislation or the physical framework of the building site. | - Rules of procurement<br>- The economic framework | - The building owner has a set price within which he can specify (or require) anything, but everything comes with a price<br>- Silo-thinking and separate funding is a challenge for the (public) building owner |
| ***Lack of knowledge or experience in the industry***<br>Challenges thought to result from a lack of knowledge or experience in the field of sustainability. | - The building site as an independent contract | - No one can tell what it costs to operate a building site<br>- It is a general challenge to compile knowledge (in the field) |
| ***Interdisciplinary***<br>Challenges that are related to two or more elements in sustainability, e.g. both materials and indoor climate. | - The (traditional) conflict between theory and practice (between consultants and contractors)<br>- Weighing the indicators in sustainability. | - Sometimes the economic aspects of sustainability are prioritised, leaving other aspects as unsustainable<br>- The discussion on supply chain responsibility is between materials and social responsibility |
| ***Technical***<br>Challenges that are of a technical or technological nature | - Choosing the right technical solution | - Which group of materials should be focused on (with regard to requirements)<br>- The building owners should take the trouble to estimate the consequences of the requirements that are set |
| ***Lack of easy accessible methods***<br>Challenges related to the need or request for easy hands-on methods or simplification | - Lack of usable standard texts for sustainable procurement | - There are too many errors in procurement. There is too much copy-pasting, and there is a need for more quality control<br>- There is no default text (for procurement), so the building owners need to step up and take responsibility. |
| ***Stakeholder-related***<br>Challenges related to the stakeholders' competence such as skills, willingness or knowledge. Not related to a specific stakeholder group | - Risk allocation<br>- Taking on responsibility<br>- Clear communication | - It is a challenge that consultants do not risk much – in the form of either reward or punishment – when they do not take on responsibility<br>- The mentality at the building site, all the way to project manager level |
| ***Use of incentives, restrictions and control***<br>Challenges in how to enforce the requirements that are set | - To many declarations of intent<br>- Economic aspects overrule good intent | - It is a challenge to set up the best incentives at the right time<br>- It is important to include restrictions, but the biggest challenge is to enforce them. |
| ***Other challenges***<br>Challenges related to all other aspects mentioned | - Extensive focus on CSR | - The number of apprentices or trainees might be a parameter of negotiation<br>- Everyone agrees that social clauses should be complied with |

Figure 3 illustrates the distribution of the 67 statements of challenges the practitioners at the group sessions face in making sustainability requirements in procurement.

**FIGURE 3.** Distribution of challenges identified at the group sessions.




Statements from the different group sessions are generally evenly distributed between the different types of challenge, but two types of challenge stand out. The challenge types *'lack of knowledge and experience'* and *'lack of easy accessible methods'* were not very frequent and included less than the six statements which was initially set as the smallest number of statements accepted for a category. The two type categories were however maintained. The distribution and types of challenges identified at the group sessions show a considerable variety, with an emphasis on *'interdisciplinary'* challenges, *'use of incentives, restrictions and control'*, *'pre-set framework'*, and *'stakeholder related'* challenges. No correlation was found between the distributions of the group session themes and of the different types of challenge identified.

The group sessions had a narrower perspective, covering just the building site, than the workshops. This led to other types of challenge being mentioned by the participants and they were able to be more specific in the description of challenges. We also interpreted the need for an additional type of challenge as a result of the narrower perspective in the group sessions, which led to discussion on how to set restrictions for and control the requirements that are set.

### *4.2 Ability to make requirements for sustainability in procurement*

The workshop participants were invited to give examples of specific phrases and requirements for procurement. This proved to be more difficult for the participants than we had expected. Out of 79 attempts, only 9 specific phrases or requirements for procurement were found. One third of the phrases given by the practitioners could be categorised as attempts at making

requirements for sustainability in procurement, but none of them had a specific phrase or requirement. The majority of the suggestions for specific phrases given by the practitioners could not be defined as either being specific phrases or attempts to make requirements for sustainability. Instead, they might best be classified as recommendations or good advice mainly related to the building process.

**TABLE 5.** Examples of specific phrases and requirements for sustainability in procurement.

| | |
|---|---|
| **Workshops** | - The list of materials should be evaluated according to the DGNB assessment scheme<br>- In principle, the design specification should be followed, but you are encouraged to present alternative solutions, if they are realisable within the framework of the project<br>- The promised goals are measured for (at least) the first year (followed by restrictions for the contractor if the goals are not achieved) |
| **Group sessions** | - District heating (if accessible) should be used for desiccation of the construction<br>- Materials used (at the building site) should be reusable<br>- ID cards for (access to) the building site (including information about employer, safety courses attended or similar)<br>- Describe how the building site should be run (give examples) |

Although not many specific phrases were generated at the workshops, they did show that the stakeholders are indeed able to set specific requirements for sustainability in the procurement of construction and building renovation. This was further confirmed by the outcome of the group sessions that led to a larger number of specific phrases.

We think that the form of the smaller group sessions encouraged more specific requirements, due to the smaller number of participants and the narrower focus on a specific part of the building process. The participants in both workshops and group sessions represent the same type of stakeholders, and we believe therefore that an equal number of competences were present.

Many of the requirements that were set refer to existing legislation, recommendations, or voluntary assessment systems, all aimed at setting up measurability in some form. Examples include asking for evaluation in accordance with the certification system DGNB, or requiring an estimate of the amount of waste, or demanding a certain number of apprentices or trainees.

Some of the requirements were more specific about equipment or the handling of situations. Examples include asking for a specific size of truck for delivery, or requiring that district heating is used for drying out concrete constructions.

### *4.3 Recommendations*

At the group sessions, the participants were also asked to share their experience of describing sustainability at the building site when writing procurements. This resulted in not only statements about experiences, but also a lot of statements that can best be categorised as recommendations. But the same happened at the workshops, where the participants were not asked for examples of experience or recommendations. Table 6 gives some specific examples of recommendations along with the categories they represent.

Most of the recommendations at both workshops and group sessions were about the process. Many of the recommendations emphasize the need for the early involvement of stakeholders in construction or building renovation and a holistic approach to encouraging sustainability.

Procurement-related recommendations were also prominent at both workshops and group sessions. This was expected because the literature also suggested that existing

**TABLE 6.** Recommendations for sustainable procurement based on workshops (WS) and group sessions (GS.)

| Categories of recommendations: | Examples: |
|---|---|
| ***Related to building process*** | - Resources should be moved to the beginning of the building project process (WS)<br>- To achieve sustainable solutions, think of process and design (GS)<br>- Hire consultancy before consultancy (GS) |
| ***Procurement (techniques)*** | - The procurement writer should be a specialist in doing that (WS)<br>- The building owner should think of the procurement sequence (e.g. in choice of materials, leading to no extra materials needed to complete the building as fast as possible) (GS) |
| ***Topic specific*** | - Climate proofing (WS)<br>- Have a look/refer to the REACH candidate list of substances of very high concern for authorisation (for materials) (GS)<br>- It is a must that waste fractions are described (GS)<br>- The (appropriate) number of trainees/apprentices depends on the size of the building project (GS) |
| ***Cooperation*** | - The architects and engineers should cooperate in generating solutions that adapted to common overall goal (WS)<br>- Remember that specification of materials starts with the consultants (architects) (GS)<br>- It is important to realise that you cannot be an expert in all areas (GS) |

procurement strategies and methods need to be changed if sustainability is to be incorporated in construction or building renovation. Most of these recommendations were about procurement techniques, writing procurements correctly, choosing what to procure, and the sequence of procurements in a building project. There were also recommendations related to the form of the procurement, whether it should be specific in its requirements, like a shopping list, or whether it should just define overall goals, allowing the consultants freedom of method. The form of procurement preferred was correlated to stakeholder type.

Topic specific recommendations were overrepresented at the group sessions compared to the workshops. We think this was caused by the narrow field of interest at the group sessions. Due to their topic-specific nature, no common description of them can be given.

Cooperation-related recommendations came out of both the workshops and the group sessions. Most were related to communication between the stakeholders and understanding of each other's situation, in the attempt to achieve sustainable buildings.

Other types of recommendations were also mentioned, including economics, guidance, or evaluation. One category, however, stands out: *'measurability'*, which was mentioned a couple of times at the workshops, but not at all at the group sessions.

### *4.4 Do specific requirements determine the amount of sustainability?*

The transdisciplinary challenges are well represented in this research and can be said to be the key to sustainability. The statements addressing transdisciplinary aspects included the challenge of the lack of common terms, the need for interdisciplinary cooperation, and that too many specific requirements would leave too little room for freedom of method. We expected this type of challenge to be important for the participants, and we believe handling this type of challenge is essential to the increase in sustainability. It is mainly the building owners that ask for specific requirements so they can follow up on these in a delivery, while the consultants typically want more freedom of method.

The technical challenge also stands out when comparing the challenges identified both at the workshops and at the group sessions. This challenge to some extent overlaps with the transdisciplinary challenges, as it relates to choosing the right technical solutions, and at the

same time remaining a holistic perspective. This challenge is met by the use of requirements that refer to e.g. existing legislation or voluntary assessment systems.

A research goal was to determine to what extent specific requirements determine the amount of sustainability that will be implemented in a building project. According to the participants in this research, both specific requirements and overall goals can result in a sustainable building. Yet many participants have argued that the building owner has to initiate sustainability and that requirements are the building owners only tool to do so. So whether the form of the requirements is a determinant for the amount of sustainability achieved might be debatable, but the amount of sustainability definitely does depend on requirements being clearly set, no matter in what detail they are expressed.

## 5. DISCUSSION AND CONCLUSION

This research aimed to investigate Danish building practitioner's ability to make requirements for sustainability in the procurement of new construction and building renovation. Based on an action research strategy, we identified eight typical types of challenges when sustainability is required for in procurement and showed that practitioners were indeed able to specify requirements for sustainability, although these could be further strengthened.

The present investigation contributes to the incipient research on how sustainability is implemented in procurement in the Danish construction industry. This research is distinguished from the majority of the existing literature on sustainable procurement by introducing a broad sustainability perspective, and we found that the practitioners are interested in and to some extent able to specify requirements in the social aspects of sustainability in particular. However, the results still imply that the non-existent measurability of the social aspects is challenging for the practitioners. This part of the research contributes to body of research within the social aspects of sustainable procurement that according to Walker and Bremer (2009) are under-researched.

The identification of eight typical challenges in making requirements for sustainability implies that a sustainable approach in procurement has still not been fully implemented in the Danish context. The challenges identified are to some extent confirmed by other research in the area, e.g. by Ruparathna and Hewage (2015). Two types of challenge overlap: the lack of knowledge and the lack of methods for the evaluation of sustainability in tenders. We recommend that the areas identified are further investigated, so as to supply the practitioners with knowledge that can strengthen the requirements. One finding stands out though, which is that the technical aspects of sustainability were identified in the workshops as the biggest challenge. This finding shows that an area we expected to be well-developed and of minor concern in relation to implementing sustainability in procurement is still of great importance to the practitioners. It also indicates the need for research on methods that can help the practitioners in weighting these technical elements to find the most sustainable solution to make requirements for. We believe this to be very important for progress in the area of sustainable procurement.

The ratio of recommendations to specific requirements identified in this research again implies that sustainable procurement is still in its infancy; but it also suggests that there is considerable interest in implementing sustainability among the practitioners, despite the restrictions imposed by the strict regulation in the area of procurement. This finding also implies that there is a need for guidance in the area, if the practitioners are to move from

good intentions to actually making more specific requirements for sustainability in procurement. Such guidelines could come from the government or the relevant industry organisations. Good guidelines might also minimise the risk of misunderstandings from the current lack of a common definitions of sustainability.

This research had a number of limitations. Only volunteers participated in the research, so they might have had more awareness of, or dedication to, the sustainability agenda. The slight difference in approach between the workshops and group sessions might have made a difference in focus and how confident the participants were in sharing their knowledge. The smaller number of participants in the group sessions with their more specific focus seems to have resulted in a larger number of specific statements.

This research was not limited to investigating either new construction or building renovation, but looked for knowledge and experience in both areas. This was clear to the participants in the workshops and group sessions. However, it might have given more specific knowledge if we had chosen only to discuss for instance building renovation. We think that the knowledge generated is equally applicable to new constructions and large building renovations, but that most existing knowledge relates to new buildings.

Our intention in the research was to examine sustainability in a broad perspective, but this goal was not fully achieved in the workshops. There was a distinct focus on the environmental aspects of sustainability, and two out of three workshops were on this topic. The group sessions, however, did maintain a broader perspective of sustainability, including both life cycle costs and the social aspects of sustainability. The development of guidelines or something similar should also address the need for this broad perspective if we are to achieve more sustainability.

Bringing the practitioners together showed that there is a need for strengthening the requirements made in procurement and that this could form the basis for increasing the amount of sustainability achieved in practice.

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