

LEAVING NO ONE BEHIND: A GLIMPSE INTO THE STATE OF ADOPTION OF THE SUSTAINABLE DEVELOPMENT GOALS IN THE DANISH CONSTRUCTION INDUSTRY

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The 17 Sustainable Development Goals (SDGs) presented in the 2030 Agenda by the United Nations in 2015 provide an ambitious, global framework for sustainable development. The construction industry holds great potential for contributing to achieving the goals towards 2030. This study investigates the current state of implementation of the SDGs within the Danish construction industry, both on a strategic and project specific level. It provides insights into the barriers for implementation. A survey was distributed to actors within the construction industry and responded by 54 people, involving architects, engineers, building owners, contractors, suppliers and manufacturers, along with academic experts. The results indicate that 90% agree that the SDGs can add value to construction project, and 79% had implemented the SDGs on a strategic level. 45% had worked with the SDGs on a project level, where the goals 7 (clean and affordable energy), 12 (responsible consumption) and 13 (climate action) were most often applied. The main barriers to implementing the SDGs were a lack of measurability, time, and resources. The prioritization of goals was discussed in the light of previous research. This study provides valuable insights into the current state of implementation of the SDGs in the Danish construction industry and points towards the following directions for future research: 1) further development of tools and methods to support the actors within the construction industry, especially focusing on measurability and prioritization, 2) in-depth investigation of the state of implementation of the SDGs for the different actors within the construction industry, and, lastly, 3) further studies on the challenges and barriers for implementing the goals within the construction industry.

Keywords: green buildings, SDGs, sustainability, building design, 2030 Agenda

INTRODUCTION

Sustainable development has gained increasing focus within the construction industry in recent years. In 2015, the 17 Sustainable Development Goals (SDGs) were presented in the 2030 Agenda. They were agreed upon among the 193 member states of the United Nations, marking a global milestone for sustainable development (United Nations 2015). The SDGs dedicate equal attention to the social,

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environmental and economic dimensions of sustainability and are supported by 169 targets and 231 global indicators (United Nations 2015; Diaz-Sarachaga, Jato-Espino, and Castro-Fresno 2018). According to the 2030 Agenda, the SDGs should be translated to the local and project-specific levels to become operational (Caiado *et al.*, 2018; United Nations 2015; Ike *et al.*, 2019). In Denmark, local supplementary indicators have recently been introduced, taking a step towards improved operationalizability for the goals in a Danish context (2030-panelet 2020), along with the Danish action plan towards 2030 (The Danish Government 2017). A united approach from all levels of society is needed to mobilize the transformation required to achieve the SDGs. Therefore, a great responsibility for achieving the 2030 Agenda lies within the construction sector, where the SDGs can provide a common and stable definition for sustainability (Goubran and Cucuzzella 2019). However, practitioners within the construction industry experienced multiple barriers to adopting and implementing the goals both strategically and on an operational level (Gade and Opoku 2020; Deloitte 2020). This study investigates the state of implementation and adoption of the SDGs within the Danish construction industry and how the SDGs are prioritized in individual construction projects. This was done exploratively using a survey method, targeting professionals within the construction industry, such as architects, professional building owners, engineers, contractors, and suppliers. The results provide preliminary insights into the practical state of implementing the SDGs in the Danish construction sector both on a strategic and project specific level and serves as a foundation for further investigation of the topic.

LITERATURE REVIEW

Due to the recency of the SDGs, the academic literature investigating the link between the SDGs and the built environment is still limited. However, multiple studies exploring the topic exist. Goubran and Cucuzzella (2019) provided a state-of-the-art overview of how the SDGs have been utilized in building design and proposed two mapping tools that can be applied to track the integration of SDGs in construction projects (Goubran and Cucuzzella 2019). The first mapping tool supports the analysis of sustainable design visions around the SDG topics in building projects. The second tool supports evaluating the SDG integration in the projects. Furthermore, Goubran (2019) identified SDG targets that directly or indirectly depend on construction activities. The study concludes that 17% of the targets depend directly on the construction sector's activities, and 27% of the targets depend indirectly (Goubran 2019). A research agenda for the SDGs in construction was proposed by Thuesen and Opoku (2018), including research in the relationships between the goals, measures for evaluating progress, addressing the targets with specific projects, and facilitating knowledge transfer. Opoku (2016) highlighted that the role of the sustainable built environment, in particular, can contribute to the socio-economic development and well-being of society in relation to the SDGs. The link between existing frameworks for the sustainability assessment of buildings and the SDGs have been explored in several studies. Multiple frameworks supporting the achievement of the SDGs, which are applicable in a construction context, exist, such as the SDG Compass (GRI, UN Global Compact, and World Business Council for Sustainable Development 2016), which suggests a process for integrating the SDGs within a business on a strategic level, SDG Capture (Niras 2019), which supports an early dialogue and goal setting in relation for the SDGs in both projects and on a strategic level, and the SDG impact assessment tool (Chalmers University of Technology and University of Gotheborg 2020), which is a strategic decision support tool for self-assessment of how an

activity, organisation or innovation affects the SDGs. Grainger-Brown *et al.* (2019) reviewed existing tools and frameworks for strategic implementation of the SDGs in organisations. However, other studies have shown that the tools are often conceptual and not adapted to the specific needs of the actors within the construction industry (Caiado *et al.*, 2018; Goubran and Cucuzzella 2019). Allen *et al.* (2019) and GRI *et al.* (2016) proposed a framework supporting the strategic implementation of the goals, and Stafford-Smith *et al.* (2017) presented suggestions to how the SDGs can be implemented in an integrated way. The barriers of operationalising and monitoring the implementation of the SDGs have been explored, e.g., in a literature review by Caiado *et al.* (2018). Gade and Opoku (2020) investigated the barriers to implementing the SDGs among Danish building owners and pointed towards a broader investigation of applying the goals in practice. Jaiyesimi (2016) explored the challenges of implementing the SDGs in Africa. The barriers and challenges of sustainable building design have been investigated by, e.g., (Häkkinen and Belloni 2011), (D. J. Opoku, Ayarkwa, and Agyekum 2019), and (Tokbolat *et al.*, 2019). While these studies provide valuable insights into the barriers for designing sustainable buildings, there is a need for identifying and investigating the barriers of practical implementation of the SDGs among the different actors/professions within the construction industry, as well as practical examples to push the integration of the 2030 Agenda.

METHODS

This study aimed to investigate the current state of practical implementation of the SDGs within the Danish construction industry. An online survey/questionnaire was chosen as the method for data collection. The survey method was chosen as the purpose was to do an initial, broad, explorative investigation involving different actors from different professions within the construction industry. The target population for the study were actors within the construction industry, such as architects, engineers, professional building owners, and contractors with an interest and practical experience in sustainable construction. Furthermore, academics within the field were also targeted to achieve a theoretical perspective of the topic. The survey was in Danish and consisted of a mix between open-ended questions and closed questions with answering options and yes/no questions. The level of complexity of the questions was not high as the goal was to do a broad, explorative investigation of the topic.

The survey was distributed through the social media LinkedIn. In this way, the survey was initially shared within the researchers' network, targeting building professionals interested in sustainable building design and the SDGs. Snowball sampling was used, as respondents within the target population could share the survey with other subjects similar to them through a chain of referral (Goodman 1961). To ensure that the respondents were within the targeted population, the respondents first had to clarify their profession in a screening question, which had to be within the construction industry to qualify. The advantages of distributing the survey through LinkedIn was that it was time efficient. The respondents did not feel pressured to answer (in opposition to a mail survey), and only the actors interested in the SDGs application in construction responded. The limitations of this method are that the population might not be representative of the construction industry due to the number of respondents and are therefore not generalizable. However, the results can provide indications on the general state of implementation of the SDGs within the different professional groups and provide directions for further research.

Results

In the following, the results of the survey are presented. 54 respondents answered the survey, distributed between 14 architects, 11 engineers, 9 professional building owners, 7 contractors, 9 academics, and 8 “others”, including suppliers and manufacturers. The first step in this investigation was to explore whether the respondents knew the SDGs, as this is of course, a foundation for implementing them. 90% of the respondents answered they knew the SDGs, and 10% did not, divided almost equally among the professions surveyed, where only the architects and the academics all responded that they know the SDGs. This is above the general knowledge of the SDGs in Denmark, which was 74% in February 2020 (Verdensmaal.org 2020), but since the questionnaire was clearly marked with the SDG topic, there will also be a tendency to have respondents with high knowledge on the topic since their interest in the topic is a driver for answering the questionnaire. The 10% who did not know the SDGs were not able to answer the rest of the questions.

Can the SDGs add value to construction projects?

The respondents were asked what their overall impressions of the SDGs in relation to construction are and whether implementing the SDGs can add value to construction projects or not. 90% of the respondents think that the SDGs can add value to construction projects, 3% do not think they can, and 8% do not know. This might reflect that the 8% do not know the SDGs well enough to judge if they can potentially add value or are simply unsure. Divided into professions, 92% of architects expressed that the SDGs could add value in construction projects, while 100% of engineers and building owners agree on the potential value. Only 50% of contractors believe in potential added value. Also, 100% of the academics think that value can be added. This group especially focused on the process and issues regarding measurability. The respondents were also able to elaborate their responses by providing further comments on how the SDGs can add value to construction projects. One respondent argued that, on the one hand, the SDGs could be used to strengthen the arguments of architectural decisions, and on the other hand, it is not measurable. The respondent said that the goals require interpretation to provide practical value. Furthermore, it was expressed that the SDGs can provide a common language for sustainability, which can benefit both the communication among involved actors and with the client. Goal 8 (decent work and economic growth) and 12 (responsible consumption) were highlighted as goals where the construction can significantly contribute. The construction industry’s contribution to the goals will be further elaborated in the discussion section. Several respondents answered the SDGs could support pushing the industry towards better and more sustainable buildings, and specific examples were given, especially focusing on environmental dimensions of sustainability. Some examples are elaborated in the section “Examples of implementation”.

Experienced barriers

The respondents overall agree that there is a great potential in implementing the SDGs in construction projects. However, several barriers were highlighted. Of the respondents, 61% had experienced barriers in implementing the SDGs, and 39% had not. Mainly, the issue of the SDGs being difficult to adapt to specific, measurable activities was raised. It was expressed that the SDGs are perceived as a strategic framework rather than operationalised goals, that can be applied in individual construction projects. One respondent answered that it could be challenging to see the relevance of the goals, and that there was a risk that it was perceived as “just another

concept of sustainability”, among the other concepts for sustainability assessment such as DGNB. It was expressed that the SDGs serve well for sustainability awareness and branding purposes but that they are not sector specific and therefore difficult to apply. The positive side of this is possible increased awareness of the goals, but with this follows a pitfall of greenwashing if the goals are not actually implemented. Along these lines, it was expressed that without actual documentation for how a project support the SDGs, it is obviously challenging to measure whether the project contributes to the SDGs or not. The culture within the construction industry was highlighted by several of the respondents as being conservative and too economy-driven, which was seen as a barrier to sustainable development. Also, it was highlighted that all actors need to understand the SDGs and are engaged in achieving the goals to ensure successful implementation and that it is crucial that the building owners set goals for sustainability and include these in the building brief and contracts. The question of whether building sustainably is rentable was raised among the respondents. Lastly, it was expressed that it takes time and resources to understand and apply the goals. Regarding the process of implementing the SDGs, different approaches were elaborated by the respondents. One respondent argued that it is important to consider all 17 goals as a whole in order to achieve a balanced approach to sustainability. In opposition, another respondent replied that a good starting point is to choose a few of the SDGs and do them well. These approaches will be further explored in the discussion section.

The current state of implementation of the SDGs

In this section, the strategic implementation of the SDGs within the respondents’ companies/organisations are explored, followed by specific examples and prioritization of the SDGs in individual construction projects. The SDGs are future-facing, and therefore any organizational action towards the SDGs requires some level of strategizing and planning, encompassing the development of key decisions and actions in organisations and their execution (Rasche 2007). It can therefore be argued that strategic action is required to ensure consistent and ongoing SDG impact within organisations (Grainger-Brown and Malekpour 2019). The respondents were asked if their company/organisation works strategically with the SDGs to get an overview of the state of strategic implementation of the SDGs. In total, 79% answered that they do, 17% do not, and 4% don’t know. A majority of architects (85%) and engineers (89%) stated that the SDGs are strategically implemented in their company/organisation, with only 78% of clients and 40% contractors.

All academics responded that their organisations work strategically with the SDGs. However, this result does not provide insights into the current state of the construction industry but indicates that the SDGs are well integrated into the educational system and thereby future workforce. 75% of the suppliers answered “yes,” and the rest were not sure. Respondents were then asked whether the SDGs have been implemented in a specific construction project that the respondent was involved in to investigate the SDG integration on a project level. A majority of respondents (45%) had not worked with the SDGs on a project level, 38% had worked with the SDGs, and 17% were unsure of whether they had or not. The large group of unsure respondents might reflect that they have worked with several aspects that could relate to the SDGs but were uncertain if the link was explicit. A majority of engineers (56%) and contractors (60%) had worked with one or more SDGs in a project, but only 31% of architects, 44% of building owners, 38% of academics and 25% of “others”. The respondents who worked with SDGs in construction projects were asked which specific SDGs and

targets had been integrated into the projects. The responses differed slightly within the different professions. However, goals 7, 12 and 13 (climate action) were the ones most often applied. Among the professions, the priorities of the architects differed and highlighted goal 3 (health and well-being) as often applied in their projects. Only 29% of the respondents had implemented the SDGs in practice. Therefore, the prioritisations only reflect this small group of 16 persons but can still be used as an indicator for focus areas despite the statistical insecurities.

The priorities might reflect where in the design process the actors are involved, e.g., the contractors are often not a part of a project until the detailed design phase and are therefore not as concerned with the indoor environment and climate action as, e.g., the architects.

Examples of implementation

The respondents provided specific examples of how they had implemented the goals in practice. This seemed like a challenging task, as only a few provided specific examples. One responded that it was hard to provide an example as many aspects could be related to the SDGs in some way. Along these lines, it was expressed by one respondent that many sustainable initiatives had been applied without linking these to the SDGs. Others were very specific with answers like “flexible installations”, “limited use of resources”, “energy”, “indoor climate”, and several answered that they apply the sustainability assessment method DGNB and thereby contribute to achieving multiple goals. Others responded that they apply multiple SDGs and use them actively in branding the projects, emphasising that they only highlight the goals they actively contribute to.

Also, one architect responded that the SDGs were applied during the early design phase as a checklist. Several tools supporting the SDG implementation were highlighted, such as Frame (Frame ApS 2020) and the Danish SDG barometer (Bygherreforeningen and Arkitektforeningen 2020). Sustainable construction sites were also highlighted as a practical example, emphasising social responsibility, better waste management and partnerships across the supply chain. Also, it was expressed by one respondent that it is a priority for advisors to estimate how a project will contribute to the SDGs, including a plan for how it can be approached throughout the design process. Several respondents expressed that early dialogue among the involved actors, such as building owner and advisors, was crucial for successfully implementing the goals. Along the lines of goal 12, it was expressed that the reuse of construction materials and a circular mindset was a priority among several respondents, including increasing requirements for LCA documentation of materials.

DISCUSSION

In this section, the results will be discussed in relation to previous studies to reflect on how the construction industry can contribute to the SDGs and whether the SDGs should be approached as a whole or only focus on the SDGs that are found relevant - both approaches were taken by respondents in this study. Though progress has been made in recent years, little has been written on how organizations manage the challenge of interpreting and prioritising sustainability goals (Ranängen, Cöster, and Isaksson 2018; Gade and Opoku 2020). The goals are interconnected, interlinked, and designed to encompass a balance between the social, environmental, and economic dimensions and should therefore be viewed as a whole (United Nations 2015). However, approaching the goals individually and focusing the effort can be a good start and a practical point of departure for broader implementation of the goals, but

this approach might compromise the holistic approach to sustainable development. Also, it is a danger that the understanding of the potential positive interactions between goals is missed (Morton, Pencheon, and Squires 2017). Several tools can support organisations, within the construction industry and beyond, in implementing the SDGs on a strategic level, such as the SDG compass (GRI, UN Global Compact, and World Business Council for Sustainable Development 2016) and the SDG impact assessment tool (Chalmers University of Technology and University of Gotheborg 2020). Following the process suggested in the SDG Compass, a starting point for implementing the SDGs on a strategic level is first to understand the goals and create a baseline for how the business currently performs in relation to the goals, followed by prioritizing goals and selecting relevant indicators (at this stage the SDG impact assessment tool and SDG Capture (Niras 2019) can support the process).

Then, the goals should be anchored within the business (GRI, UN Global Compact, and World Business Council for Sustainable Development 2016), and in relation to construction it should be considered how the goals can be operationalized on a project level, and how the impact/effect should be measured. This process can be similar for the different actors within the construction industry, however, the prioritization of the goals will differ depending on where in the building design process the companies are involved, as seen in the results. The Danish supplementing SDG indicators (2030-panelet 2020) are a step in the direction of making the goals more relevant and measurable in a Danish context. Along these lines, the construction companies need to consider how they can measure their contribution to the SDGs. The authors argue that the professional building owners and their advisors play an important role in integrating this in building briefs, tenders, and contracts.

However, the Danish indicators need to be interpreted from a construction perspective to sufficiently support the actors within the construction industry. In this study, the respondents highlighted goals 7 (affordable and clean energy), 12 and 13, as the ones most often contributed to construction projects. The results align with Goubran *et al.* (2019), who also highlighted goals 7, 12 and 13, where the construction industry can primarily contribute. In another study, Goubran (2019) analysed the level of dependence of the construction industry on the SDGs and concluded that goal 11 (sustainable cities and communities), goal 6 (clean water and sanitation), goal 7, and goal 15 (life on land) are directly dependent on construction activities. Opoku (2016) investigated the impact of the sustainable built environment on the SDGs. Opoku (2016) emphasized goal 3, goal 6, goal 7, goal 9 (innovation and infrastructure), and goal 11 as goals where construction activities have the highest impact and highlighted the interlinked and intertwined nature of the SDGs. Gade and Opoku (2020) investigated the challenges and barriers experienced by Danish professional building owners and their prioritization of SDGs in construction projects. Gade and Opoku (2020) highlighted goal 7, goal 11 and goal 13 with the highest priority, followed by goal 12, goal 8 and goal 17 (partnerships for the goals).

The World Green Building Council (2017) emphasises goal 12, 11 (sustainable cities and communities) and 13 as goals, which green buildings can mainly contribute to. These are followed by goal 15, goal 17, goal 9, and lastly, goal 3, 7 and 8. The general consensus of these studies is that the construction sector can particularly contribute to goal 7, 11, 12 and 13. However, the SDGs should be approached as a whole to ensure a balanced approach to sustainability. Also, it should be emphasised that the construction industry involves multiple actors who can contribute to the SDGs in different ways and at various stages of the building design process and throughout a

building's life span. The authors argue that the SDGs should be implemented both on a strategic level within the companies, but also as a design tool and for early goal setting and prioritization within construction projects to spark transformative change.

CONCLUSIONS

This study investigated the current state of the SDGs in practice within the Danish construction industry and provided indications on the state of implementation on both a strategic and operational level among different actors within the construction industry, counting architects, engineers, building owners, contractors, suppliers and manufacturers, and academics. The results indicate that most of the companies surveyed (79%) had implemented the goals on a strategic level, while only 29% had implemented the goals on a project level. Goals 7, 12 and 13 were the ones most contributed to construction projects by the respondents. The main barriers to implementation were lack of measurability and limited time and resources. Additionally, the paper findings contribute to international research and building projects when implementing the SDGs in construction by gathering some experiences and identifying the perceived barriers. It also contributes to construction management on how organizations must change their strategies to enhance the SDGs in construction. Based on the results, the authors suggest the following directions for future research: 1) further development of tools and methods to support the actors within the construction industry, mainly focusing on measurability, operability and prioritization, 2) in-depth investigation of the state of implementation of the SDGs for the different actors within the construction industry, and, lastly, 3) further studies on the challenges and barriers for implementing the goals in the construction industry.

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