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Innovative public procurement (IPP) – Implications and potential for zero-emission neighborhood (ZEN) projects?

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Innovative public procurement (IPP) – Implications and potential for zero-emission neighborhood (ZEN) projects?

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Abstract. As a component of the urban fabric system, zero-emission neighborhood (ZEN) projects represent an opportunity to boost the sustainable performance of cities. However, overlooking the potential of different actors or underestimating the complexity of interactions among them may threaten the projects themselves. Public procurement is a powerful tool that potentially enables national and local authorities to achieve sustainable development goals while procuring necessary products and services. This paper aims to understand the potential of innovative public procurement (IPP) to reduce some of the project complexity in ZEN. Besides literature on sustainable neighborhoods (SN), empirical insights are drawn from an ongoing ZEN project to map the primary sources of complexity in such projects. Afterward, the potential for dialogue with suppliers is mainly discussed in light of these sources. Our findings suggest that using IPP may assist in reducing the complexity imposed on ZEN projects.

1. Introduction

Cities and urban areas occupy just 3% of the planet's surface, but consume 60 to 80 % of the world's energy and produce around 75% of carbon emissions [1]. Although the integrated nature of neighborhood-scale projects entails an opportunity to achieve sustainable development, see, i.e. [2, 3], by nature such projects comprise a diverse group of actors. This imposes high complexity and uncertainty on the projects. Many studies have addressed the positive influence of end-user engagement (or citizen participation) in sustainable neighborhood (SN) projects [4-7], concerning both new developments and retrofitting. However, to the authors' knowledge existing literature largely ignores dialogue with suppliers in SN projects. Public procurement offers various interaction opportunities with suppliers before, during and after the formal tender stage. In this paper, we will focus on interaction during the pre-tender stage (market dialogue). The increasing trend towards using dialogue with suppliers in the public procurement process [8-12] deserves attention in regards to the impact on SN projects and comparison to end-user engagement activities.

The potential of dialogue with suppliers in the context of SN projects is addressed primarily due to two reasons. First, previous work has called for research aimed at reducing the influence of market forces in neighborhood development, since they contributed to the limited success of planning movements [13]. However, under the right circumstances, market forces could be seen as an asset rather than a liability. For example, extensive research shows that interaction with suppliers can improve efficiency, learning, and innovation [14-16]. Second, SN projects constitute a large and diverse group of stakeholders. This brings the idea of complexity into the picture. Therefore, dialogue at the outset of the project and public procurement could be harnessed to reduce, or at least understand, the increased



complexity in such projects. The purpose of this paper is to study the potential of dialogue with suppliers before the formal tender stage in the public procurement process, and its potential for complexity mitigation. Thus, this article intends to fill the void in the literature on SN through dealing with the following central question: “How can we conceptualize the potential of innovative public procurement (IPP) and in particular pre-tender market dialogue, for mitigating the added project complexity in SN (and ZEN) projects?”

This study treats ZEN as a specific type of SN (or SN 2.0) due to (1) its inherent complexity from SN; where both contain a broad group of actors, and (2) its quest to advance the sustainable performance of cities through more ambitious goals. Our contribution is twofold. First, we aim to describe the sources of complexity in SN and ZEN projects. Second, we assess the potential of (IPP) to reduce this complexity. In the following section selected theories and concepts are reviewed for this study. Section 3 describes the methodology and empirical material. In section 4, we discuss the impact of pre-tender market dialogue on the complexity and attempt to answer the research question. Section 5 concludes the study and provides suggestions for further research.

2. Relevant literature

2.1. SN projects and complexity

To be considered sustainable, cities need to meet “the needs of the present without compromising the ability of future generations to meet their own needs” [17]. However, no city can become sustainable without the contributions of its smaller urban parts, such as neighborhoods. Due to the social and environmental risks associated with cities and urban areas, SN development is receiving more attention from both governments and industry [18]. Several studies, see for example [13, 19, 20], describe the key points that planners and local authorities should take into consideration when planning and developing SN projects. In those studies, the environmental, social and economic aspects are prevalent. Those aspects have direct benefits on citizens, i.e., public health, clean air, inclusive community, self-sufficiency, and social relationships. It is natural to see that SN criteria are centered on citizen needs as they represent the ultimate end-users who will live, work and enjoy those neighborhoods. Some authors treat stakeholder engagement as part of the institutional aspect in SN projects [13]. Besides governments and citizens, the private sector, represented by contractors, developers, R&D firms, utility and service providers and material suppliers, could participate in developing new standards on SN inspired by their expertise [18]. For simplicity, we use the word supplier(s) in this study to refer to all private sector’s actors.

Although there is no single, generally accepted definition of project complexity, it has received attention due to its influence on projects; it can manipulate objectives, organizing forms, management processes, and procurement arrangements [21-24]. A complex system can be defined as “a large number of parts that interact in a nonsimple way” [25]. Project complexity can be characterized by the number of different parts and the degree of interrelatedness among those parts [21-23]. Williams [23] named this type of complexity as structural complexity, where it applies to any project dimension, such as physical and organizational dimensions of projects. In project management studies, concepts of complexity and uncertainty are found connected [23, 26]. We will follow Williams [23] who included uncertainty as a further element to project complexity.

Concerning complexity, project management scholars distinguish between two types of uncertainties; uncertainty in 1) goals and 2) methods [22, 23]. The first concerns how well-defined the project’s outcome up front against an extensive collection of requirements and needs (i.e., user requirements and customer needs). The second deals with new methods and technology to achieve those goals. In the context of SN projects, barriers such as unsustainable planning, poor project management capabilities, difficulties in applying sustainable technologies, and difficulties in coordination among stakeholders and their interests [18], are all examples of how ill-defined methods can impede the development of SN. In line with Davies and Mackenzie [26], we acknowledge the previously described uncertainty as internal sources of uncertainty, while external sources originate from the environment

surrounding and affecting the project. SN projects intend to improve the social, environmental and economic characteristics of the urban system. Therefore, such projects are expected to be impacted by the external forces located in the surrounding environment, such as political and business players. For example, lack of supporting policies and national standards as barriers to SN development [18], can increase the uncertainty in SN projects.

In this paper, we conceptualize complexity in SN projects in terms of 1) structural complexity and 2) uncertainty, see figure 1. First, we operationalize structural complexity in SN projects from physical and organizational standpoints. Physical complexity is the number of neighborhood physical parts (sub-projects) and the interdependencies between them, while organizational complexity represents the number and diversity of project actors and the interactions between them. Second, as described above, we also distinguish between internal and external sources of uncertainty in SN projects.

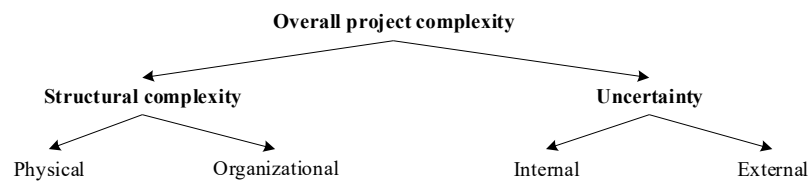


Figure 1. Complexity in SN projects.

2.2. Innovative public procurement (IPP)

Public procurement is a tool available at the disposal of public institutions (i.e., governments and state-owned enterprises) to procure goods, services, and works. As a demand-side innovation policy instrument, public procurement for innovation (PPI) can contribute to “satisfying unsatisfied human needs and solving societal problems” [10]. IPP, on the other hand, happens when public institutions conduct procurement activities in an unconventional way [27]. This includes changes to traditional strategies, guidelines, processes, legal frameworks, and practices. For example, a partnership approach is an example of an untraditional public procurement [28].

We increasingly witness more dialogue-based procurement activities [8, 10, 12], in which dialogue happens before a formal contract exists between the public buyer and supplier(s); either before (i.e., market dialogue) or during the formal tender stage (i.e., competitive dialogue, innovative partnership). This paper regards dialogue-based procurement as a branch of the IPP process since it empowers public institutions to procure unconventionally in order to meet unmet needs [10, 27]. The pre-tender stage in the public procurement process is the least regulated stage compared to the remaining formal tender and post-tender stages. In the EU, directives on public procurement allow public institutions to interact with the market during the pre-tender stage for purposes such as preparation of specifications, sharing of plans and visions, and seeking advice from the market. Hence, the pre-tender stage can be exploited to overcome some aspects of the agency problem, such as information asymmetry or ‘market failure’ described by Edler and Georghiou [29]. Moreover, as a part of an IPP process, dialogue with suppliers during this stage may facilitate the public institutions’ mission to procure innovatively. For this paper, we summarize the rationales to conduct a dialogue with suppliers during the pre-tender stage in public procurement as the following:

- *Needs mapping.* Public institutions do not always have precise, well-defined needs. Current or potential stakeholders can validate already, identified needs or identify new ones [8].
- *Improving requirements and specs.* Poorly-formed specs can undermine procurement outcomes. Consulting the market helps buyers to formulate more functional and innovation-driven (yet achievable) specs in the call for tender [8, 10, 30].
- *Supply market access.* Interaction allows purchasers to get information about potential suppliers and available solutions [8, 10, 11, 29], including capacities and capabilities. In the case of new solutions, a market dialogue may be utilized as a means to plan and coordinate the path forward.
- *Market visibility.* Early signals regarding particular public demands enable suppliers to prioritize which technology (or markets) they should tackle first [29]. For example, market dialogue may

reduce some of the market risk perceived by suppliers once they become aware of the buyers' needs and willingness to buy [11].

- *Market link creation.* Due to the diverse group of actors, market dialogues may trigger different levels of interaction through exchanging knowledge (not necessarily relevant to the procurement in hand), or even new, spin-off collaborations. For example, third actors can provide buyers with the support [31] necessary to link with the market and conduct the dialogue (see, i.e. www.innovativeanskaffelser.no). Furthermore, such dialogues may provide better conditions (i.e., trust) for future collaboration.

3. Methodology

In the theory section, we investigated several studies regarding SN, where two of which are reviews, to understand its characteristics and barriers. Next, we looked at the complexity, particularly project complexity, to define the primary sources of complexity in SN projects. Afterward, we outlined the potential value of dialogue with suppliers in the pre-tender stage from IPP literature. While in the discussion, we follow the framework illustrated in figure 2. This approach allows us to elaborate on the sources that make ZEN projects such complex endeavors, based on theoretical insights from literature on SN projects and empirical insights from the Research Centre on Zero Emission Neighborhoods in Smart Cities (ZEN Centre). In which we studied an ongoing ZEN project in Norway, Ydalir project. The ZEN center was established in collaboration with the Research Council of Norway in 2017 to accelerate the transition to a low carbon society by developing sustainable neighborhoods with zero greenhouse gas emissions, see (<https://fimezen.no/>). Lastly, we discussed how pre-tender market dialogue (as part of the IPP process) can potentially contribute to reducing the project complexity.

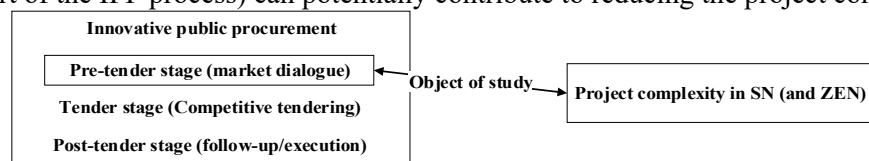


Figure 2. Analytical framework.

Following Dubois and Gadde [32] recommendation, looking into real world observation was necessary to understand how IPP's potential can be conceptualized to mitigate project complexity and develop better theoretical perspective. For example, the continuous interplay between complexity theory and project data helped us to define the sources of complexity in SN and ZEN projects. Data concerning Ydalir project was collected from project documents and a group interview conducted with two project managers. Moreover, both authors are part of the research team in the ZEN center.

3.1. Illustrative case study - Ydalir project

The project aims to develop a new neighborhood with high ambitions regarding energy and emission. The estimated timeframe for project completion is 2030, in which around 1,000 residential units (a combination of detached houses and apartment) are planned to be built around a school and kindergarten. Currently, the project is in the design and construction phases; the building of the first residential unit is planned to start within the end of 2019. The project owner (hereafter ETS) is a local development agency that aims to enable population growth by developing lands for housing and businesses at a reasonable price. The local municipality owns this agency; however, ETS operates as a private entity.

ETS owns 80% of the project land, where it sells land plots for private developers who wish to invest in building residential units. The remaining 20% belong to two private landowners, who also have plans to develop residential units. Only one of those landowners agreed to follow ZEN ambition plans. The school and kindergarten are being built by the municipality and planned to open autumn 2019. Among the stakeholders, several public players represented by the local municipality, energy utility company, waste management company, and transportation agency. Private actors include housing developers, consultancies and engineering firms, law firm, and contractors. Also, the project receives research support from the ZEN center.

During the strategic planning phase between autumn 2016 and spring 2017, ETS held five dialogue rounds that took place in the form of workshops between interested stakeholders, in order to frame and formulate project goals. The output of these workshops put into a master plan that functions now as a roadmap to realize the ZEN ambitions of the project. It translates the project's vision into functional requirements addressing issues related to material selection, design, energy, and mobility. The masterplan's requirements are anchored in the purchase contracts among ETS and developers. Citizens were not involved during the workshops, primarily because the project is a new development and takes place on a non-populated area; however, it intends to run participation rounds with future citizens.

4. Discussion

In section 2, we conceptualized two primary sources of complexity in SN projects and described five rationales to conduct pre-tender market dialogues. In what follows, we discuss the potential of market dialogues in regards to project complexity in ZEN projects, as illustrated in figure 3.

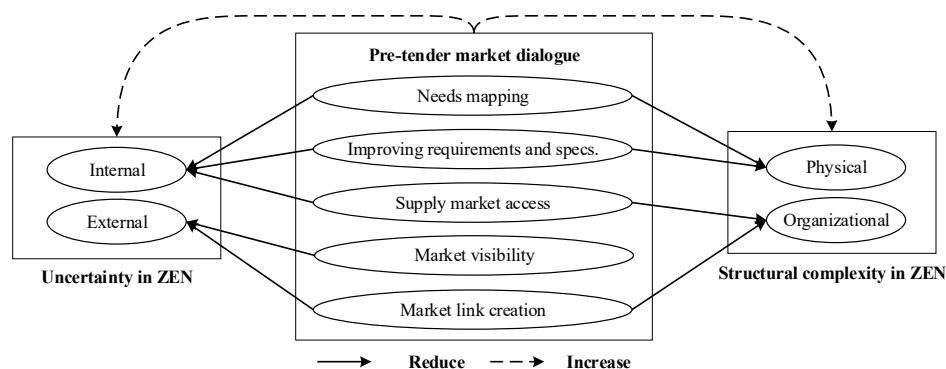


Figure 3. The impact of pre-tender market dialogue on ZEN project complexity

4.1. Physical complexity

Neighborhood-scale projects consist of many interrelated buildings with associated infrastructure, located within a confined geographical area. Traditionally, changes in the design of one component may release sequential impacts to other components, and affect the design (or construction) of the whole neighborhood [23]. Nevertheless, in the wake of SN projects, like ZEN, the interrelatedness of parts exceeds the traditional engineering view to include smart grids, shared renewables and batteries, shared transport and shared utilities. Those shared parts contribute in reducing the carbon footprint of the neighborhood as a whole, but they add more complexity to the project. Thus, in a complex project like ZEN, the project itself functions as a system of systems (or array) [22], where the ZEN's smaller parts function as standalone (sub-projects), yet interdependent.

Early market dialogue with suppliers may provide insights on what is sufficient to build an integrated and sustainable neighborhood. This may result in reducing the number of variant parts and suggest more collective-based solutions, including, for example, mobility and parking solutions. Using their market expertise, suppliers can also inspire public actors to formulate more standardized specifications, i.e., energy and emission targets, which contributes in reducing the number of variant parts or subparts.

4.2. Organizational complexity

Different actors are expected to exist in a neighborhood project since it contains several different parts (or sub-projects) that require varying degrees of specialization (i.e., resource, knowledge, and so on.). Some actors may even hold more than one role. For instance, the local municipality in Ydalir project is responsible for (1) developing of the school and kindergarten and (2) supporting private developers in their zoning plans. In order to understand the level of interactions in a complex system like ZEN, we use the notion of near decomposability by Simon [25], where intense interaction exists between actors operating in the same subproject (i.e., one building) and less interaction between actors operating in different subprojects. Weak interaction between the actors responsible for different parts or belongs to

different subprojects may have adverse effects as joint planning and coordination are required to realize the neighborhood's vision (and shared solutions). In Ydalir case, for instance, the competitive nature of private developers is seen as a challenge that can affect coordination and knowledge exchange practices.

Market dialogues give public actors – who lead or have an influential role in neighborhood projects – access to the supply market. They learn not only about which solutions the market can deliver today but also the organizational capacities of suppliers. This empowers public actors to choose their partners based on relevant capabilities (e.g., communication), which may serve the interactive and exploratory nature of ZEN projects. Furthermore, market links are essential, especially when multiple tiers of suppliers are expected to exist. Companies that participate in market dialogues get the chance to meet their peers who have a similar interest in ZEN projects. It also may encourage some players to discuss potential collaboration plans (i.e., co-operative procurement) or even formalize their collaboration into an alliance or joint-venture. So consequently, market dialogue can contribute to building better conditions for collaboration, such as mutual trust and knowledge sharing.

4.3. *Internal uncertainty*

ZEN projects have a variety of goals and require a variety of methods to meet the emission targets related to material, energy, and mobility. Uncertainty in project goals results in ambiguous needs and specs, while uncertainty in methods (and technologies) may result in changes to project deliverables and challenges to project actors. Ydalir tried to mitigate this issue through conducting a series of dialogue workshops early in the planning stage, where interested parties participated in formulating a high-level master plan describing the project's long-term (zero-emission) vision. The master plan provides guidelines, boundaries, and a set of functional requirements targeting, i.e., mobility and energy, which leaves some room for developers to decide how to proceed based on their expertise.

Although IPP was not followed formally in Ydalir project; since ETS uses private purchasing contracts and the local municipality uses traditional public procurement process, we see that some elements of IPP were present in the strategic planning phase, such as market dialogues. The master plan translated the project's goals into functional requirements addressing issues related to material selection, design, energy, and mobility. Functional specs allow developers to apply their expertise and propose new solutions and technologies that buyers might be unaware of [33]. Thus, dialogue with the market, including developers and engineering companies in Ydalir project provided better specs and requirements to cope with the uncertainty in the project goals. Another benefit of the master plan is creating one standard for all interested private actors who wish to work in the project. This may help in reducing the complexity of project specs. Consulting the supply market seems rational because it also allows buyers to learn what the market has to offer in terms of new methods and latest technologies. Moreover, if a specific solution is not available in the market, a market dialogue may be utilized as a means to plan a future R&D with specialized suppliers.

4.4. *External uncertainty*

Some contextual factors are found to be related to project complexity, such as policies and regulations, and perceived risk from the market. They are crucial to maintaining internal project stability and continuity. Policies, for instance, facilitate sustainable development [18]. In the case, ETS planned to include ZEN requirement (master plan) in the purchase contracts between itself and developers, and in the zoning plans between the municipality and developers. However, while the purchase contracts covered all requirements, the municipality could not include all of them (i.e., passive house standards) in the zoning plans since the national building laws do not cover them. This political factor impacted the project and created several challenges, such as less control over the stakeholders who are reluctant to follow high environmental standards.

Linking with multiple actors from different public institutions can help address such issues up front, and hence avoiding being trapped in current regulations or leading to develop supporting policies. Moreover, market dialogues give suppliers visibility over the market and allow them to rethink their business strategies and consider new opportunities – based on which market or technology is emerging.

This may attract new, experienced suppliers and encourage less experienced suppliers to catch up. For example, companies lacking knowledge about neighborhood sustainability assessment tools (i.e., BREEAM Communities) may want to follow their peers to avoid losing a potential seat in ZEN markets.

4.5. Upfront increase for overall decrease?

Project complexity might spike at the outset of the project due to the pre-tender market dialogues (by inviting the market players). However, this temporary increase can be tolerated if it led to a reduction in overall project complexity and improved project outcomes. Furthermore, unlike the first three rationales, *market visibility* and *market links creation* serve buyers and suppliers to prepare for the procurement of future projects. This implicates that a ZEN project can use market dialogues as a means to diffuse ZEN-based knowledge and develop its ecosystem of actors.

5. Conclusions

We began our paper with the observation that SN literature has focused on end-user engagement more than market engagement activities, and stressed the need to explore in greater depth IPP to understand its potential in reducing complexity in ZEN projects. Our findings are twofold. First, we described four different sources of project complexity in ZEN. Second, IPP is shown to be an attractive governance tool that could potentially manage some of the project complexity in ZEN. Future research should explore in-depth case studies of IPP with dialogue practices, in order to measure the impact on complexity. Furthermore, we encourage practitioners and scholars to address the issue of complexity in the context of SN as it may assist in uncovering new challenges.

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