

Conference paper

Housing Architecture and the Future: Competition Responding to Climate Challenges

Magnus Rönn,

University of Gothenburg and Kulturlandskapet, magnus.ronn.arch@gmail.com

Anna Braide,

Chalmers University of Technology, anna.braide@chalmers.se

Christian Koch,

Halmstad University and University of Southern Denmark, christian.koch@hh.se

Abstract

This paper presents a design-developer competition. The case may be seen as an example of early steering, i.e., of a model that has been developed for public governing of competitions based on fundamental principles. Firstly, steering through competition programs. Secondly, steering by design and competence. Thirdly, steering by jury and design review. Fourthly, steering by contract. After checking the companies behind the overall best contribution, the site was transferred to the developer for implementing the winning design. The competition program, design proposal, and jury report are part of the contract as appendices.

The aim is to describe, understand, and critically examine the design-developer competition and its steering principles: (a) the competition program and its ability to support design solutions; (b) the demand for multidisciplinary design teams to face complex challenges; (c) the search for a winner through evaluating proposals; and (d) the safeguarding of a winning design and the transformation and qualities into a land allocation agreement. The lessons to be learned in this case are presented in ten findings, starting with programming the task. Regarding climate footprint, energy, circularity, and design for flexible housing, the competition can be seen as successful and points out crucial issues for developing climate-smart architecture.

Keywords

Competition, sustainable design, climate declaration, energy solutions, recycling, innovation, flexibility

INTRODUCTION

Background

In this paper, we present findings and discuss experiences from an open design-developer competition in Sweden executed in 2022 by the Norrköping municipality, where our focus is on the winning submission. The competition format is part of a liberal policy in which companies voluntarily compete, according to publicly presented competition programs; jurors award proposals after ranking them as winners and losers. Two design-developer competitions have been conducted as part of an R&D project. The first was organised as an invited competition. The second was an open competition. The global objective in both competitions is to promote the design of flexible apartments and affordable housing, plus-energy solutions, reduction of carbon emissions, circularity, and innovation.

The competition in Norrköping is a joint venture between a *public authority* (Norrköping municipality as organiser), *academia* (research support by Chalmers University of Technology and the University of Halmstad), and the *private sector* (design teams made up of architects, engineers, contractors, and developers producing proposals). The competition has been executed in collaboration with Chalmers University of Technology, Halmstad University, and Swedish Architects (an association for architects and urban designers). The competition program was approved by Swedish Architects. The involved researchers (Braide, Koch, & Rönn) have taken an active part in developing the competition.

The competition addresses the need for innovative, climate-smart architecture with plus-energy solutions and adaptable apartments. The objectives include early steering of CO₂ emissions in design and construction. The average level of carbon emissions for residential buildings in Sweden has been found to be at 318 kg CO₂e/sqm GFA (gross floor area) for multifamily residential buildings in Sweden (Malmqvist et al., 2021). The aim in the competition is a 40% reduction in Modules A1–A5, translating to a maximum emission of 191 kg CO₂e/sqm GFA. Socially sustainable housing in the competition was intended to be supported by flexibility operating as a design strategy, responding to needs for households that grow and shrink over time (Schneider and Till, 2006; Braide 2019).

Objectives and questions

This paper has an explorative approach. Learning from a single competition is an overall objective and approach for knowledge development. The specific purpose is to test, understand, and critically reflect on the winning design in Norrköping. The open competition allows the municipality to govern the outcome through four means: (a) programming the task and conditions; (b) inviting multidisciplinary design teams to produce solutions; (c) appointing professional jurors to judge submissions; and (d) transforming winning designs into a built environment by land allocation agreements which steer its implementation. Based on this starting point, the following research questions are to be investigated:

- How has the steering by objectives, demands, and conditions in the competition influenced the winning design team?
- How has the winning design team responded to the complex and ecological challenges in the competition program and attached appendices?
- How have qualities been developed and made visible in the winning proposal?
- How have the highlighted qualities been implemented in the land allocation agreement between the developer and the municipality?

Case Study and Action Research

The open competition is a case study that must be understood both in its local context (Groat & Wang, 2002; Johansson, 2000) and in a wider tradition of competitions in architecture and urban planning. The competition is presented in a *thick description* to maximise the learning from a single case (Stake, 2000; Geertz, 2008). Case-study research may be used for producing knowledge of general importance (Flyvberg, 2006). The research group (Braide, Koch & Rönn) has participated in the preparation and played an active role in designing the competition program. The active involvement in planning and designing the competition is supported by engaged scholarship (Van de Ven, 2007) and action research approaches (Carlsson & Koch, 2014).

The primary sources are documents from the Norrköping municipality, interviews with professionals on the winning team, and field notes from the jury meetings. The data have been collected and analysed in five steps: Step one contains documents produced in the competition, such as the competition program, design proposals, jury report, and land allocation agreement. Documents in step two are steering the conditions on the competition site: *Detailed development plan* (Detaljplan), *Aesthetic program* (Gestaltningssprogram), *Quality program* (Kvalitetsprogram), *Guidelines for and Allocation in Norrköping Municipality* (Riktlinjer för kommunala markanvisningar), *Action Plan for Land Allocation for Housing Construction* (Handlingsplan för marktilldelning vid bostadsbyggande), and *Architecture City Norrköping* (Arkitekturstaden Norrköping). Documents have been examined by content analysis (Krippendorff, 2004), close reading (Brummet, 2019), and architectural critique (Attoe, 1978). Meaningful words in documents have been coded and combined into patterns that give meaning and convey messages. Step three is field notes and observations inside the jury room. Step four is seven in-depth reviews with members of the winning design team. Two supplementary interviews have been conducted regarding the municipality's review of the companies behind the winning design, and the negotiations ending in a contract for implementing the winning design. As a basis for interviews, a questionnaire with open questions within eight themes was developed. Professionals in the winning team have been interviewed regarding: 1) the competition formats in general; 2) the specific design-developer competition in Norrköping; 3) composition of the design team (qualifications, professions, and companies); 4) design processes; 5) competition program (mission, goals, and requirements); 6) development of the design proposal; 7) compensation for work efforts; and 8) success factors. By applying a format with open questions, it has been possible to ask supplementary field questions and obtain precise answers. This is especially important in studies that have an exploratory starting point and a limited number of informants. This is also the main reason for the use of the in-depth interview method. Each of the seven interviews lasted about one hour. The received oral information has been transformed into text, coded, and then subjected to analysis. A selection of highlighted points is reported in the paper. Step five includes the methods to safeguard the research results. The involvement in this case, i.e., the research group (Rönn, Braide, Koch), in the programming of the competition requires a distance from the competition, critical reflection on the findings, and awareness of the researcher's role.

Framework for understanding the competition

The design-developer competition can be described as being in between the classical architectural competition and the design-and-build contest. There are no competition rules approved by professional associations for consultants, building contractors, and developers. The competitions are run locally, and the municipality has a decisive influence as: (a) organiser; (b) landowner; (c) planning authority; and (d) decision-maker in building permits. In this competition format, the site is a fundamental asset controlled by the municipality. The law regulating transforming public-owned land to developers is very simple in Sweden. According to the law (SFS 2014:899), the municipality only needs to report its objectives and general conditions for the allocation of land, processing routines, and principles for pricing land. In Sweden, municipalities have a strong position as planning authorities and landowners compared to an Anglo-

American context. In land allocation policies adopted by municipalities, public properties are typically distributed to the developer through competition or direct allocation, depending on location, attractiveness, local interests, and need for design. Companies normally compete at their own expense. The winner will have access to ready-to-build plots. How the teams of architects and developers regulate their internal costs in the competition format is seen by the public organiser as a private matter for the involved companies. The competitions in Norrköping deviate from this practice by offering financial compensation for approved proposals for the five best contributions. This is an exception. The compensation (170,000 SEK) may cover half the cost for a fully paid team to produce a submission capable of becoming a winning design. Thus, the companies taking part in the open competition in Norrköping have invested time and knowledge in an uncertain outcome by producing submissions.

The design-developer competition is a market-oriented format in Sweden, Finland, and Austria (Östman, 2014; Liskee, 2008; Kazepov & Verwiebe, 2022). The few international studies on the competition format stand out compared to the studies of the classical architectural competition and its long tradition presented in books, scientific conferences, anthologies, doctoral theses, and journals as thematic issues (Andersson, Bloxham, Zettersten & Rönn, 2016). The research on competitions in architecture and urban design has focused on the classic architectural competition that developed during the 19th century in England, France, Germany, Austria, and America (Tostrup, 1999). Approved architectural competitions are governed by international, European, and national rules. This standardisation of the competition conditions—based on practice and professional experience and guarded by associations and institutions—is a significant difference between the design-developer competition and the classic architectural competitions.

The design-developer competition is a market-oriented competition that is locally governed outside the control of the Swedish Architects association. The format is in between the architectural competition and the design build contest. Even if there are several similarities to the classical architectural competition, such as a competition program describing the task, judging criteria, delivery demands, and jury picking winners, the competition format has a background reminiscent of design-build contests (Lahdenperä, 2021, Quatman & Dhar). The competition format started in Sweden during the 1960s and 1970s by municipalities for making residential areas for single houses and multifamily housing (Sandblad, 1984; Sköld Partner, 1990). The competition then increased during the 1980s' deregulation of the building sector (Bodström, 1994). Despite the deregulation and trust in the market forces, the municipalities still have a strong toolbox as organisers, landowners, planning authorities, and decision-makers for building permits. Surprisingly, the design-developer competition is not a part of the Public Procurement Act (2016:1145), even though there is a public organiser. Since there is no national standard, the rules of the game vary a lot. From this point of view, the examination of the open design-developer competition in Norrköping and the winning contribution adds new knowledge to the research area.

Theorising the competition format

Design proposals are compared and ranked in competitions. *Compare* is originally from Latin and has two meanings: "com" stands for "bring together", and "par" is translated to "equal".¹ Competition is understood as an act of putting things together and judging them by the same standard, following a specific regime. The regimen in design-developer competitions involves three fundamental logical approaches. Georg Henrik von Wright (1967) describes them as *prescriptive*, *proactive*, and *permissive*.

¹ See <https://www.merriam-webster.com/dictionary/compare>

They create a conceptual pattern. *Prescriptive norms* inform what should be done by the key actors in the competition. *Proactive norms* are about prohibitions and actions that are not allowed. Submissions from competitors that violate the rules should be excluded by the organiser when checking the proposals. However, minor errors can normally be corrected. *Permissive norms* define what is allowed and lack limitations. Both the space for freedom and the requirements often need to be clarified at the beginning of the competition by a special administrator to preserve anonymity. There is mutual interest among the organiser, competitors, and jurors in avoiding misunderstandings. In short, the logic of the competition is about “should,” “should not,” and “permissions.”

The design-developer competition follows the general theoretical analysis of Georg Henrik von Wright. von Wright’s theories also need to be combined with a specific model for the competition formats and its crucial phases, starting with the invitation to design teams and ending in the implementation of the winning design (See figure 1). The presented model is intended to show fundamental logics for governing the design outcomes. In this case, steering is done by (1) programming the task and conditions; (2) design; (3) ranking proposals; and (4) awarding a contract to the winner. The model below visualises how this governing operated in the investigated competition.

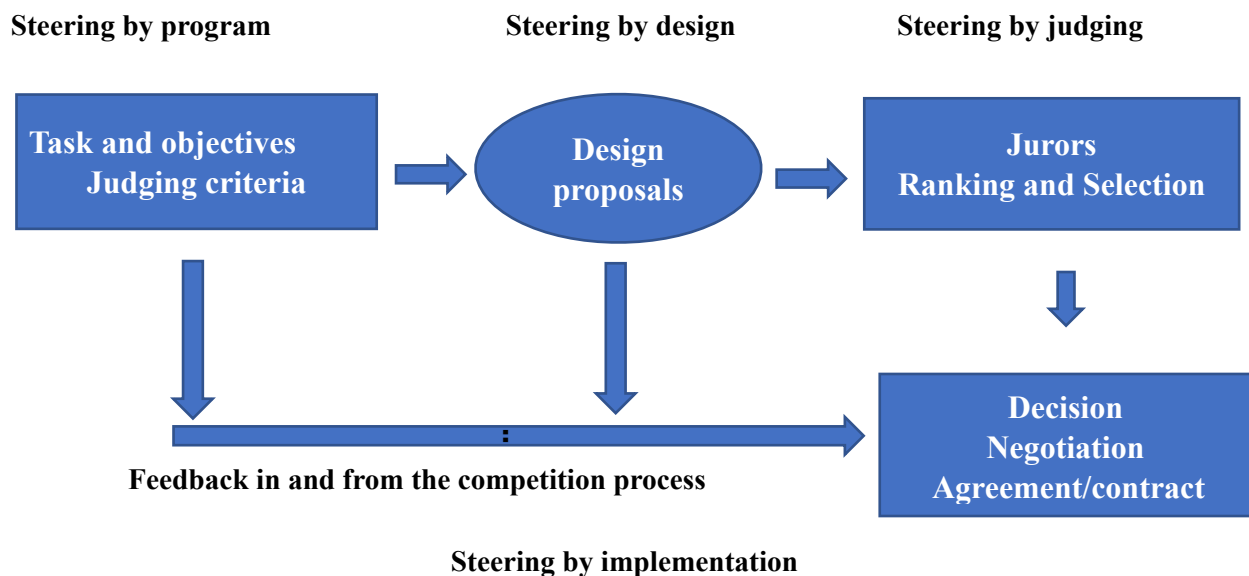


Figure 1: The model steering principles in the open design-developer competitions in Norrköping. The program, winning design, and jury report are appendices in the land allocation agreement.

The model can be further described in detailed as follows:

Steering by program: This governance begins with the programming of the mission, prerequisites, and conditions presented in a brief. At the heart of the competition program are descriptions of: (a) the task, site, and context; (b) the goal and intentions; (c) the assessment criteria and jurors; (d) the submission requirements; and (e) the conditions the developer must fulfil for getting access to the land. In this competition, design teams submit their proposals anonymously to guarantee fair play (justice and equal conditions). The competition site in Norrköping had already been regulated in a detailed development plan, and the price of the land was set at 4,800 SEK per m² of RFA (residential floor area). The detailed development plan stipulates that the site is to be used for housing and business on the ground floor. Dwellings may be built of four to seven floors. The building permit must be developed in consultation with the city

architect. The developer cannot change architects or make major alterations to the winning design without acceptance by the municipality. The competition program asks for submissions with high quality in terms of housing that fits the surroundings, reduction of CO₂ emissions by 40%, circular processes in design and construction, contributing to social sustainability through flexible apartments that allow households to grow and contract over time, affordable housing with energy-smart ecological solutions, and innovation in the design, construction, and management of housing.

Steering by Design: The organiser wants to attract multidisciplinary design teams to the complex task, producing excellent design. Central to this principle in Norrköping has been to prioritise a mission that is both challenging and inspiring. The intention is to invite companies with the required expertise; to get good submissions, the conditions must meet market expectations and reach out to competitors. The competition has been marketed by Swedish Architects on their website. The municipality posted information about the competition on their website for land allocation. They also sent emails to developers who have expressed interest in executing building projects in the city. The organiser states in the competition program that competitors had to involve developers, architects, and landscape architects, as well as experts in energy, climate declaration, sustainability, and circularity. The aim was to create space for knowledge exchange in designing proposals.

Steering by judging: The design proposals must be presented anonymously in competitions. In this competition, the jurors didn't know the names of the competitors responsible for the submissions. The anonymous presentation of submissions is intended to safeguard equal terms in design reviews. The ethical considerations behind this demand are fair play. The idea of fairness is a fundamental principle in competitions. In picking the winning design, the individual jury member has a moral responsibility to: (a) carefully examine each proposal; (b) compare the solutions; (c) rank the contributions according to the assessment criteria; and (d) finally single out the overall best solution as the winner. The comparison seldom shows that one design proposal has a superior solution to all criteria. For this reason, the jurors have to make an overall assessment of the proposals. The final judgment becomes a summary of parts into a whole. The jurors in the Norrköping competition were selected with respect to their professional ability to distinguish between pros and cons in the submissions. In this case, the jury needed five meetings to find a winning design proposal among the six contributions.

Steering by implementation: Typical for design-developer competitions in Sweden is that the competition site is publicly owned. Transferring municipal land to companies is a decision made by politicians. The administration provides supporting documents. The land allocation agreement is typically handled by civil servants; the contract is signed after negotiation with the winning developer and regulates the conditions for the implementation. The municipality have templates for this kind of contract, which are then adjusted to the specific terms at hand. A common and simple way of taking care of design qualities in land allocation agreements is to include the (a) competition program; (b) winning design proposals; and (c) jury report in the contract as appendices. This is also the case with the agreement in the Norrköping competition. Steering the implementation includes checking the developer's financial capacity and proof of paid taxes. As stated in the local policy, the municipality's own land must be transformed based on its market value. This value was fixed at 4,800 SEK per m² of RFA (residential floor area). The idea behind fixed prices in the program is to promote design teams to compete on design qualities—not by bidding on the land. The financial conditions are thus clarified in advance. This can be assumed to improve quality if there are developers looking for buildable land.

THE CASE DESCRIPTION

The land allocation policy

The Norrköping municipality has a guideline, renewed in 2018, regulating land allocation. The elected officials have placed the responsibility for the transfer of municipally owned land with the Urban Planning Office. In doing so, the municipality is supposed to promote competition. When allocating ready-to-build land to companies at market value, new developers should be offered the same access to land as well-established companies, while assessing their capacity, financial resources, and long-term interests. However, it is costly to produce a winning design proposal. There is no regulation in the guidelines concerning financial compensation to competitors for their development of approved submissions.

In Norrköping, competitions are organised by the Urban Planning Office. The officials have to present proposals to the elected members of the Urban Planning Committee for approval. The competition program must be advertised on the city's website and sent to companies. The jury should identify the best solution, and the Urban Planning Committee will make an agreement with the winning company. The municipality may provide a special aesthetic program as a foundation for design and construction in areas where architecture is seen as important. The site in the competition at hand has this kind of location. It is situated in a new inner-city district, which should be experienced as pioneering (Competition program, p. 6). The municipality's architectural policy is also supposed to be used in the detailed development plans, in competitions, and in the following assessment of applications for building permits.

The competition is a part of a large architecture and planning project transforming the harbour area into a new inner-city district. The detailed development plan stipulated that the competition site should be used for housing, with commercial space on the ground floor. The organiser wanted to create housing at the site that: (a) has high architectural standards and fits into the new context; (b) produces more renewable energy than is used during the year; (c) reduces CO₂ emissions; (d) promotes circularity in architecture and construction; (e) contributes to social sustainability through flexible apartments that meet a diversity of needs, allowing households to grow and shrink over time, and provide space for communal activities; (f) has affordable rent/costs and fulfilled demands for climate-smart architecture; (g) supports good housing, functions, and experiences of beauty; and (h) addresses challenges in the local community with creativity and innovation in design, construction, and management (Competition Program, 2022).

The competition program has appendices focusing on: (a) design strategy for flexibility in housing; (b) template for energy describing how energy should be reported; (c) template for climate declaration describing how CO₂ emissions should be calculated and presented; (d) template describing circularity in architecture and construction; and (e) template describing how innovation can be understood in architecture and construction.

The Jury Report and Winning Design

The competition generated six proposals. More proposals were expected, but an unforeseen downturn in the construction sector affected the competitive spirit. Since the site had such a visible location in the city, the jury found the relationship to its surroundings to be an important part of judging the proposals. The decision to select a winning design with a lot of small apartments in combination with collective space for social activities was motivated as follows:

After completing the assessment, the jury has concluded that Ramverket is the proposal that most convincingly combines architectural quality and the high goals set in competitions and recommends the proposal for further processing and implementation. The proposed framework is an exciting concept with an important point of departure in recycling, and a strong character of its own. In order to get the climate impact to be as low as calculated, it is necessary that climate-smart solutions be implemented in the coming stages of the project. Great humility is required around recycling. The industry is facing a huge journey in this area, which places high demands on the continued process, but it is nevertheless important that recycling can become a key point of departure in the development of innovative climate-smart homes (Jury report, 2023, p. 4).



Figure 2. *Façade facing the public space. Design by Kaminsky, Mareld, Preservia, Kian Properties, and Moelven.*

The submission was produced by a multidisciplinary design team made up of professionals in architecture, landscape architecture, project management, and construction. The team consisted of five companies. The residential block has 178 dwellings (see Appendix, Figure 6). The design shows a framework of industrially produced modules. There are a high number of small apartments combined with collective space for social activities (see Figure 3). The housing is designed for single households and young citizens.

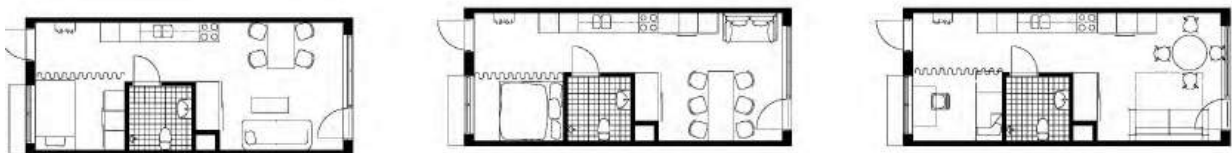


Figure 3. *Demonstration of flexibility by different furnishing and use of space in a small apartment. Design by Kaminsky, Mareld, Preservia, Kian Properties, and Moelven*

The residential block consists of four to seven floors (See Figure 4). The courtyard is divided into private and public spaces. The ground floor has space for business and mixed-space for apartments and businesses. The facade facing the park is designed with recycled sheet metal, reflecting the past industrial heritage of the site (See Figure 2). The colour scheme of the proposal follows recommendations in the

Quality program and the *Aesthetic program* developed by the city for the coordination of the exterior architecture in the new district. Parking takes place in a garage under the courtyard.



Figure 4 and 5. *The residential block showing the outdoor design, facades, and variation of floor plans. Design by Kaminsky, Mareld, Preservia, Kian Properties, and Moelven.*

LEARNING FROM A SINGLE COMPETITION

An experimental tradition

The open competition in Norrköping was planned as a tool for early steering of the project. For competitors, the invitation was intended to operate as a professional laboratory and an experimental arena, promoting new thinking in architecture and construction according to the presented model (Figure 1). Healey (2015) provides an overview of competitions as laboratories within an experimental tradition in architecture. Lipstadt (2010) suggests that the space for opportunities and experimentation in architectural competitions is a tradition that may explain cases of both breakthrough design and failures. According to Theodorou and Katasakou (2018, p. 3), well-executed competitions can secure “*a laboratory-like setting in which architects can experiment*”. Guilherme and Rocha (2013) describe the competition as a professional laboratory from the individual architect’s point of view. They use the famous Portuguese architect Souto de Maure as an example. He has taken part in several competitions and turned them into a personal laboratory. In contrast to this individual approach, the competition in Norrköping is founded in a collective understanding of being both a professional laboratory for competitors and a tool for the organiser to support new thinking. Based only on a competition program, multidisciplinary design teams should produce innovative solutions. There was no supervision from a demanding organiser to manage the design process since the proposals had to be anonymously presented. Nor can jurors intervene for this reason. The lack of external control was supposed to encourage professionals to test fresh design ideas and visualise new concepts. In this perspective, the competition may serve as a professional laboratory and experimental arena for finding innovative design solutions responding to challenges in a competition program. However, the freedom for designers is limited in the competition format by the fact that the developer is part of the team, steering housing needs, and proposals.

To have the company, who is signing the land lease agreement with the municipality and thereby becomes responsible for the implementation, within the design team and instead of outside as a client, differentiates the design-developer competition format from the architectural competition. In this competition format, designing is no shadow dance with an absent partner as in architectural competitions (Kreiner, 2013). Instead, the developer is a key partner in the team, must ensure that the submission is buildable, and provides financial resources for implementation. The design team is driven by their mutual willingness to produce a winning proposal that will give the developer access to land and the designers' future assignments. The learning outcome from the Norrköping competition will be presented and discussed in five points:

1. Internal conditions

The project manager in the winning design team acted as the developer and made two strong preconditions steering the design: the size of apartments, and the need for adjusting design and construction to a specific system for industrial production of modules by the building company in the team. The ability to operate as a professional laboratory and an experiment arena depends on the companies in the team and how they want to tackle the task. The requested design team had to involve a developer responsible for implementation. Creativity and new thinking in this competition format may prevail by providing good conditions for knowledge production and exchanging professional experience in the competition. The following quotes show tensions between developer and architects in the team:

At first, we had an internal meeting with us, and then we presented our ideas to the companies in the team. After we identified the objectives, it was important to analyse the detailed development plan, understand the challenge, and investigate the space, including how many apartments would fit on the plot. Our client had requests for what kind of apartments we should have in the proposal. Then we did volume studies and apartment plans. We continued by trying to get a handle on the task in a feedback loop with the client (in the team).

The many small apartments meant that we needed to be able to show that residents can use their homes in several different ways. The solutions were limited by the fact that the depth of the building bodies varied. It would have been possible to create greater flexibility in the homes if all building bodies had the same depth.

The client carried out a market survey showing a lack of small apartments in the new area. Therefore, the client wanted us to design smaller homes. Then we asked—what is flexibility in a small apartment? The follow-up question we tested was: What do we want to have space for in dwellings? That's how the proposal for rearranging the furniture came about, showing flexibility in a small apartment without transforming walls.

We wanted to keep a high room height in the garage after discussions with the client. The height was a quality for the future, if the need for parking is reduced in the basement, a surface can be cut out of the wooden joists and create an atrium for businesses. We saw a new flexibility in the parking space, which was not visible before...

Space combining residences and business is part of the flexibility. The buildings are in a new district, and it is difficult to know how business operations will develop. Some premises may initially be open for both residences and businesses. Space allows both uses to solve this dilemma...

The lack of a clear target group pointed out by the municipality in the competition program and the assumed demands for compact living made it possible to suggest a high number of small-size apartments in the new inner-city district. This was risky. In the winning design, four types of alteration and adaptability are used to minimise the anticipated critique of micro housing. In this scheme, flexibility operates as a design concept to bridge shortcomings in the submission compared to the housing intentions by combining small housing with (a) collective space for social activities; (b) illustrations showing varied types of furnishing and use of living space; (c) designing apartments on the ground floor that integrate space for living space with commercial space; and (d) preparing the garage in the basement for other uses and making the space accessible from the courtyard.

A study on small-size apartments in Finland summarised the critique as lack of spatial qualities, low usability, and absence of social sustainability (Pelsmakers, Saarimaa, and Vaattovaara, 2021). However, the developers' demand for small apartments has support in a doctoral dissertation in Denmark on compact living in Copenhagen and Aarhus (Hedegaard Winter, 2021). Inside the jury room, the design for compact living in the new inner-city district in Norrköping was discussed as a drawback. However, the small dwellings may attract single-person households and young people looking for a central location in the city (See Figure 3 and Appendix, Figure 6). The other housing in the new inner-city district is made up of larger apartments for an established middle class. The proposal will, therefore, most likely contribute to social diversity. Competing solutions also have this ability. The proposals in second place follow the required housing flexibility in a better way, showing three very different types of apartments. The outcome of the competition clearly demonstrates that the winning design doesn't need to be superior in every key aspect, which seldom is the case. In the Norrköping competition, the jurors had to weigh eight criteria of equal importance—architecture, energy use, climate footprint, circular process, affordable rent/cost, innovation, and developability. The task for the jury was to find the overall best solution: they needed five meetings to finalise the evaluation with a statement.

2. Experiment and innovation

Competitions in architecture have a long experimental tradition supporting new thinking: *“The expectations sanctioned by history are occasions when youthful talents triumph not only over their seniors but also over conventional ideas and traditional solutions ...”* (Lipstadt, 2010, p. 49). In a study of competitions in Finland, Sari, Person, and Varianien (2022) note that awarded design proposals ranged from students and independent practitioners to internationally recognised architects. Innovation was not seen as something exclusive, but rather a theme of experimental tradition that could be found in all kinds of open architectural competitions in Finland. Organisers looking for innovative solutions to design problems may also be found in design-developer competitions conducted in Sweden. Historically, creativity and innovation have been used interchangeably in design, with an understanding that creativity concerns experimenting and generating new thinking and original design ideas, while innovation also involves implementing new ideas and innovative solutions to something novel (Hill, 2013; Nilsson, 2013).

Innovation is a key concept in *The Oslo Manual*, integrating both a horizontal and a vertical dimension in the competition practice (OECD/Eurostat, 2018). In design-developer competitions, planning, producing, identifying, and implementing innovations oscillate between the key actors (organiser, competitors, ju-

rors) in a typical pattern. The organiser is initially responsible by asking for innovation in the competition, which then becomes a shared mission. This idea of a common responsibility for innovation in design-developer competitions, following a specific pattern, is expressed in two dimensions. Firstly, the competition is a process that has a series of activities that follow each other in time. This is the horizontal dimension beginning with an invitation as a competition program, continuing with designing solutions, evaluation of proposals, and ending with a built environment after implementation. Secondly, the competition in Norrköping also compasses a number of interwoven activities follow another logic. This is a vertical dimension that has been operated in four levels in the Norrköping-competition according to the interviews: (a) The companies in the winning team have established internal sub-projects to support new thinking and creativity in design; (b) there has been a multidisciplinary agenda at a team level supporting professionals to exchange skills, knowledge, and experience in finding innovative solutions; (c) the competitors have tested new ways of in-house working with the submission, which suggests a company level inside the design team; (d) the competition also has a municipality level including politics and officials, providing new demands in the invitation, and supporting regulations in the land allocation agreement. Expressions of new thinking in design among the informants are:

There are several novelties in the proposal. By being involved in the design process and connecting the design with the climate calculations, a new construction emerged for the entrance floor... one new thing in the proposal that we want to test is cooperation with a sheet metal contractor for recycling sheet metal for the facade.

Combining glulam beams with long spans with modules, which we tested in the project, is new. We have not done that previously... This was a new feature from our side in the competition... The ideas regarding the parking garage are innovative. We wanted the space to be made attractive and transformed for other purposes in the future ... Besides this, the overall innovation can be found in the fact that we are building an entire block with a lot of recycling

I think the municipality was innovative in the program. They seemed ambitious... The competition spurred architects and builders to make housing as sustainable as possible... The competition program had a strong approach to sustainability. I see that as innovative.... We must work much more on reducing the carbon footprint. I found this innovative, although this is an expanding requirement in the design-developer competition.

3. Design ideas and Housing architecture

The advice from the architects' associations in Sweden, Norway, and Denmark to design teams and jurors is very clear: go for the fundamental design ideas. The jury has to see, understand, and value the driving design ideas in the submissions. Drake (1979) called these ideas primary generators because of their driving force in designing proposals. In competitions, ideas have to take form and be expressed as design. The architects in the winning design team had to respond to the two strong demands from the developer: the orientation towards small apartments in the block and the use of modules for the construction. A field of tension emerges between key ideas operating as primary generators, internal intentions, and demands for flexibility that the proposal must meet. This challenge is bridged by design. In this case, successful by becoming a winner. The exchange of design problems, limitations, and solutions is typical in architectural design (Cross, 1992; Lundequist, 1992). This may be seen in the following two quotations:

The challenge was to design a proposal that answered all the sustainability requirements in the competition. Without these, the project would certainly look completely different.

We wanted to show that even small apartments can be flexible. It is a much greater challenge compared to creating flexibility in larger apartments.

There is a policy adopted by the municipality, intended to support quality in architecture and urban design, entitled *Architecture City Norrköping*. The municipality also has specific policies for steering the transformation of the port area into a new city district by design, art, colour, and materials, and these goals are therefore a part of the condition. In these aesthetic guidelines, detail and wholeness communicate quality in architecture and urban design. The two most important policies are called *Aesthetic program* and *Quality Program*, which present overall design strategies for achieving objectives in the new inner-city district governing the colour and material of the facades in the winning proposal (Figure 2 and Figure 4). Architectural quality stands out as an umbrella concept in the competition typical in European guideline adopted by governmental authorities (Acampa, 2019). The design team behind the winning submission sees quality in the façade facing the park, in letting the sun into the courtyard, in zoning the outdoor environment, in providing views, and in compensating small apartments with common space. These are all qualities developed out of design ideas and the submission gets comments from informants according to this understanding of the concept:

The fundamental idea that emerged was the opening of the residential block in the southwest corner, which we thought was a good place to let the sun into the yard. At the same time, we get gables, giving a more intimate scale to the neighbouring property and surrounding housing buildings... After that, the idea of a common space for social activities and the future-oriented possibility of an orangery in the yard emerged. The two basic concepts—the opening of a residential block and common space—guided the sketches of the apartment plans in the proposal.

The basic quality in the architecture is the openness of the southwest corner of the proposal, which is a design quality for the entire residential block. Also, for the apartments. The other great quality is the north facade towards the diagonal/park, which has been given a representative expression... The third strong quality in the proposal is the eastern part, where we angle the modules out to create sight lines along the street. The balconies command a view towards the water. The angles also provide a variation in the volume treatment in the quarter. This is what the architectural qualities look like in the proposal.

The courtyard is also part of the quality of the proposal. There is an orangery adjacent to the common space. A large sun terrace has been created here for everyone. Residents reach the yard via a staircase from the entrances along the street. This was a quality that we wanted to maintain throughout the project. The courtyard is divided into zones with private, semi-private, and public characters. The design is a mix of ideas that emerged from the team.

4. Ecological dimensions: climate footprint, circularity, and energy

The two top-ranked submissions have a strong reduction, according to the evaluation by the hired climate expert. They present a credible climate declaration showing 144 kg CO₂e/m² GFA, which is a much lower CO₂-emission in Modules A1–A5 compared to standard apartment buildings. This test is an important lesson on early steering in architectural projects. A climate-smart architecture is emerging.

Contemporary technologies have significant potential since the CO₂-emissions are 318 kg CO₂e/m² GFA for standard dwelling buildings in Sweden (Malmqvist et al., 2023). The climate declarations in the competition follow a template adjusted to the new law in Sweden (2021:787) demanding developers to present climate impacts.

The expert report concludes that the design teams have been thinking in terms of climate-smart design and construction. From this point of view, the demand for including climate declarations in the competition has contributed to climate benefits. The climate expert also finds that the climate impact generally seems to be correctly calculated in all the proposals (Evaluation, WSP 2022-12-07). Since the climate declaration is a new requirement tested in an early phase, the design-developer competition stands out as a promising tool for reducing CO₂ emissions. Decisive in the next step is how the climate benefits are taken care of in the implementation. Reflections on the climate declaration in the winning design proposal are:

I think we have low emissions because we were able to work with the construction company's modular system.... Their lightweight construction of walls worked well in this competition and provided a low climate footprint... The low CO₂ emissions are also due to the dwellings having a compact form. The proposal is a cohesive residential block—not free-standing buildings. Although several corners in the design stand out, the solution is compact...

To fulfil the requirement for climate calculations, the proposal must be fully drawn up with materials. Otherwise, you cannot count on the climate footprint. You must insert windows, and internal walls and know about cold bridges, etc.

I believe the climate declaration to be credible since we use a ready-made modular system. We got access to data on the climate footprint of materials in walls from the construction company... This created credibility, and we have not counted on recycling in the climate declaration. After implementation, we will have even lower CO₂ emissions than in the proposal... In the beginning, the construction company was sceptical about the climate calculation, but when they saw that it was possible to get further than expected and have a winning proposal, they were very positive.

The winning design is supported by a business model applied in the submission. The organiser contributes by offering a site for the storage of recycled material near the competition plot. Circularity is supposed to increase through the industrialised production of modules in a factory. This is made possible by including the constructor in the design team. The plan is also to involve an entrepreneur specialising in recycling sheets in the construction. The reused sheets are visualised on the facade, expressing both a climate-smart architectural design and a salute to the heritage in the area. The solution caught the jurors' eye. Examples of quotes from interviews that highlight circularity are:

Since we work with recycling, we know what current practice is, what is reasonable to promise as recycling, and what promises we can keep... Simultaneously, it felt good that the municipality seemed to push for recycling and intends to monitor demolition permits that can be used as donor buildings.

The idea of working with frames emerged as a strategy to manage the reuse of materials in the modules. The intention is to fill the frames with recycled sheet metal and windows. This is the reason why

the design proposal is called a framework, intended to operate as a creative frame for reuse and sustainability.

In designing the facade, we have recycled sheet metal to show that it is a circular building, even if it is a minor part of the climate footprint... A bigger possibility is to reduce the climate impact by producing industrialised modules in a factory... Manufacturing in the factory provides full control over circularity.

I think it was nice that the municipality was so accommodating and actively informed us about buildings that were going to be demolished to get material for recycling. Also, the municipality provided land (for rent) with space for recycling materials. I have never experienced that before.

The competition demonstrates energy possibilities. The design teams have presented residential blocks that can produce more renewable energy than is used during the year. The winning design has a roof with solar installations for electricity production. Batteries and electric cars are to be used for storage. The solution is criticised for being presented in a simplified manner, although combined with a detailed energy calculation. The contribution has a plus-energy solution when household electricity is excluded. The informants make the following comments on designing the energy system:

We try to achieve a plus-energy solution through solar cells... The question was how the form factor affected the energy solution, which in turn guided the design. So, for example, we chose to hang on balconies outside the climate shell to avoid cold bridges. Energy was already part of the design from the beginning.

The energy system is presented as an overview in terms of the storage of solar energy. This is because we have not decided where the storage will take place... We have calculated areas for technology in various locations in the block. We must follow up on where the technology fits best and how much (battery) storage will be needed in the future.

It took a long time to calculate the energy use since the proposal is a large block with extensive areas. The work was done manually. There should be a simpler system for making energy calculations in earlier stages.

5. Novelty in the land allocation agreement

The municipality partly renewed the standard for land allocation agreements. The contract has a section that is expected to promote the implementation of circularity in the winning design proposal. The agreement has four appendices: (a) a map showing the competition site; (b) the winning design proposal; (c) the competition program; and (d) the jury report. These documents are part of the contract. The news in the agreement is to be found in a specific called “The company's tender”. In this section, the contract refers to climate objectives and circularity. Cooperation between the municipality and the developer regarding space for storage of recycling material and the importance of making cost-effective arrangements is seen as a common issue. The developer may temporarily store materials not far from the competition site under a separate contract to enable recycling (Land allocation agreement, 2023).

Three critical comments can be made. Firstly, according to the land allocation policy in Norrköping, the criteria must be as clear as possible in contracts with developers. However, there are no measurable crite-

ria in the agreement apart from the calculations in the proposal for CO₂ emissions, energy use, and the number of apartments. These measures are part of the winning design. Secondly, the agreement only safeguards some of the qualities in the submission. Architectural qualities are intended to be checked during the pre-examining of the application for a building permit. How the other qualities will be safeguarded cannot be seen in the contract. Thirdly, goals such as ecological sustainability (low climate footprint, circularity, and plus-energy solutions) in the competition “are moving targets”. Implementing the winning design takes time. The built environment will most likely have better performance compared to the proposal. But there are no financial benefits to the contract if the buildings produce more energy than calculated, have a higher degree of recycling, and have a lower CO₂ emission than in the winning design. This is a new territory for trial and error. The agreement may, from this perspective, be seen as a first step to safeguarding climate-smart housing architecture in Norrköping.

Conclusion

The overall goal of the paper has been to produce knowledge about the design-developer competition as a tool and its ability to produce innovative solutions. The competition demonstrate success, drawbacks, and critical conditions for early steering of housing design and construction. The objectives, demands, and conditions in the competition have influenced the winning design team with one important exception. The large number of small apartments challenges the goal of flexibility and adaptation to growing and shrinking households. The jury assumed that the small apartments could be expected to contribute to social mixing in the new inner-city district as other housing in the area was designed for a well-off middle class. To have young tenants and small households as a target group is largely the result of a strategic choice linked to the desire for affordable housing in the competition. For the developer, it seems to be a question of the demand for housing in the new inner-city block. It is an example of two conflicting wishes that have been difficult to satisfy in the competition.

In the winning submission, factory-made modules have been a precondition for designing apartments. The pros are that the building system contributes to credible climate declarations in the early stages. The disadvantage is found in the modules' ability to meet the demand for flexible housing and adaptable accommodation for households that grow and shrink over time. The jury found this disadvantage to be bridged since the proposals could reach a new target group and contribute to social diversity and variety in the new inner-city. This shows that the jury made an overall assessment of the proposals based on their merits and shortcomings. A winning proposal does not have to be the best on all criteria.

The winning design team responded successfully to the ecological challenges in the competition program and attached appendices. Their design proposal strongly supports a reduced climate footprint, provides a plus-energy solution, and development of circularity in architecture and construction. The competition format emerges as a productive and promising tool for making ecological design. Architectural qualities are expressed in the facades of the submission, in the colouring, and the choice of wall materials. The exterior follows the qualities specified in the municipality's guidelines, primarily the aesthetic program and the quality program for the new inner-city district. The jury was impressed by the elegant facade facing the park. The highlighted qualities have been implemented in the land allocation agreement between the developer and the municipality. The competition program, the winning design proposal, and the jury report are in appendices to the contract and thus part of the agreement that must be followed. These three appendices to the contract represent a type of assurance of design qualities.

The competition program has been perceived as both attractive and challenging by professionals. Consequently, the competition format seems to operate as a professional laboratory and experimental arena, supporting creativity, new thinking, and innovation. The conclusion in case study is that complex object-

ives, strong demands, and potential access to plots may operate as driving forces supporting sustainable design in competitions. However, the working conditions for design teams are critical in this competition format, even if the overall best submission show technological innovations. Nor can creativity and new thinking in vertical dimensions of the design-developer competition be predicted in the same way as planned activities in the horizontal the dimension, which follow a typical pattern.

The financial compensation for making design proposals is an unresolved issue in design-developer competitions. This is a third conclusion. The design of climate- and energy-smart adaptable housing architecture must be a broad responsibility in society. Producing a winning proposal in open competitions is too costly and risky for solely responsible competitors; future-oriented design requires payback, not just access to buildable land for further assignments. In this case, developing a submission responding to strong objectives regarding climate, circularity, and energy has been time-consuming. Design and technology cannot be separated. They depend on each other. Good solutions must be understood as a coherent whole according to the winning design team.

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Declaration of Interest statement

The authors have no conflicting interests to declare.

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Appendix

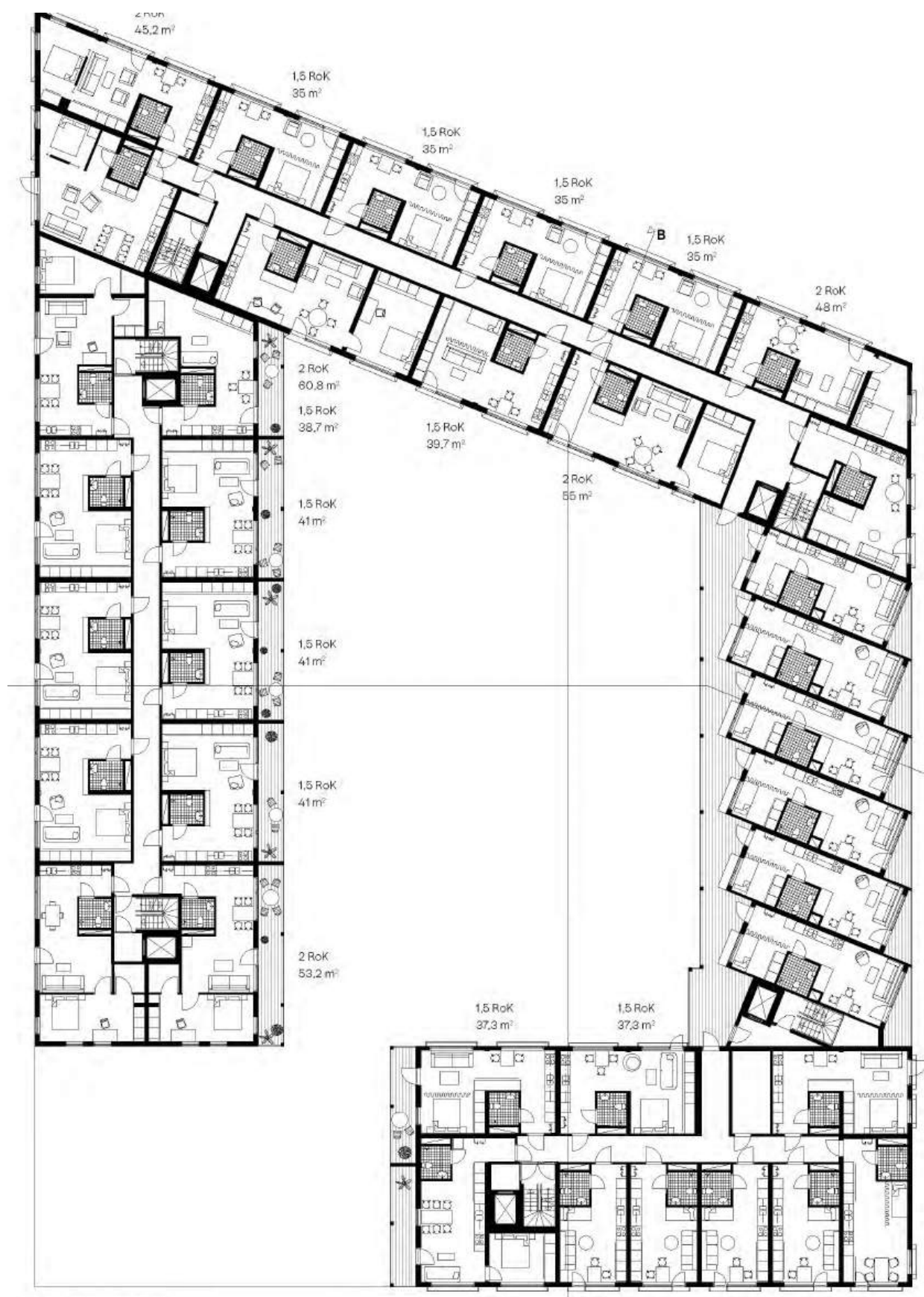


Figure 6. Floor plan in the residential block demonstrating the high number of small apartments. Design by Kaminsky, Mareld, Preservia, Kian Properties and Moelven.