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Research Article

Creating a Participatory Planning Approach Based on Swedish Visual Preferences for Building and Urban Design

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This research aims to foster social sustainability by allowing residents to participate in community decisions and creating a sense of belonging. Utilizing the photoelicitation technique, we conducted a visual preference survey with an average of 457 participants in Sweden to assess the physical and urban features of local development projects. The composite assessment of built environment quality was based on 11 qualities: urban planning, building mass configurations, building orientation, parking planning, roof articulation, building materials, color scheme, entrance articulation, fenestration, and balcony articulation and placement. We conducted a subjective qualitative analysis and quantitative evaluation of the photoelicitation data. The study identified the most preferable features leading to the highest rankings, presented a novel method to increase the participatory process's efficacy, and developed an assessment matrix based on the quality ranking of the 12 features. The primary outcome was the development of methods for knowledge transfer and quality assessment of built projects in Nordic cities, with a focus on putting residents' voices front and center in urban development.

Keywords: assessment matrix; photoelicitation; social sustainability; visual preference survey

1. Introduction

Research indicates that improving the built environment's quality encourages societal sustainability. According to McClure and Bartuska [1], poorly constructed environments are breeding grounds for high rates of sickness, crime, vandalism, and indifference, whereas high-quality environments can promote a stronger feeling of pride, engagement, and belonging. Ideal built environments are characterized by their richness, variety, and consensus meanings, tempered by a participatory underlying process. A consensus between the public and the design and planning community to foster the quality of the built environment is essential. Without public representation, Gjerde [2] asked, What are the chances of the built environment gaining the community's approval? Local built environments, such as neighborhoods or "places," are both physical and social entities [3]. An assemblage of built elements does not become a neighborhood (or an identifiable place) until people think of it as a neighborhood [4]. To enhance social sustainability, planners need to invest more in place attachment. Kooistra [5] articulated his definition of quality of place as the extent to which people find satisfaction in what they, individually and subjectively, deem significant in neighborhood design. Manzo and Perkins [6] asserted that place attachment concentrates on personal emotions and experiences, without contextualizing these ties within the broader sociopolitical framework in which planners function. A common question is why there is not more of what we like and less of what we do not like in our neighborhood, as almost everyone can name things they appreciate and things they wish to change [7]. This is true whether the person has a favorite house, street, or location. Only a small fraction of the public engages in urban planning decision-making, owing to obstacles associated with language, education, and socioeconomic position [8]. Treating all stakeholders impacted by new development fairly requires a predictable, inclusive process [8]. User participation in the design process and management of space is a highly effective means of supporting and encouraging a sense of ownership [9].

To better engage all citizens, local governments and the development community can use creative approaches to collect, organize, and distribute information [8]. By engaging and working together with residents in a meaningful and sustainable way, communities may realize their vision for where and how to grow next [8].

To examine all of that in a real-world setting, the authors chose Stockholm as a research context and Barkarby Staden in Järfälla municipality as the local built environments—neighborhoods or "place." The authors aimed first to investigate the framework and inclusiveness of the decision-making process in Swedish planning.

1.1. The Swedish Public's Participation in Urban Planning. Public participation has increased dramatically in Sweden since the democratization of the urban and regional planning processes [10]. However, the recent development of neighborhoods in Stockholm has not always garnered positive feedback. Carlson [11] stated that, although there are many different ways and incentives for public involvement in Sweden, but Tahvilzadeh [12] claimed that local implementation of these measures is lacking. Cars [13] shared Tahvilzadeh's concerns regarding the future of Sweden's current public participation model, specifically the appeal system's inability to handle emerging conflicts and the overpowering influence of active resistance groups. A single setting containing several significant architectural statements can create a visual cacophony [14], while the typically uninterested public has historically endured surroundings with poor visual characteristics [15]. Furthermore, according to Carlson [11], city architecture has changed throughout the past century. Most buildings and developments are now under the control of private firms, and they further outsource the planning process by hiring outside consultants and architects [11].

When the public is unsure of who to ask for information and who has the authority to change the course of events, it becomes challenging to understand the discussion and its true impact [16]. Because of this, not everyone may participate, which could lead to unbalanced public input [11]. According to Carlson [11], insufficient encouragement of public hearings has led to distorted perspectives and unbalanced arguments. Effective discussion must prioritize the public interest and promote communication between individuals and organizations. In these areas, we should specifically focus on streamlining and improving public communication and information. The concerned parties should undertake a public participation process. To achieve proper participation, both language and proper modeling are essential [11]. Further research is necessary to understand the relationship between neighborhood design and people's subjective evaluation of it [17, 18]. Sweden is making efforts to enhance public participation in the planning process. The authors shed light on two prominent cases, namely the "Urban Step" and the "Post Occupancy Evaluation," among others. Swedish architects and urban designers have presented the STEP approach for participatory planning based on neighborhood types, aiming to evaluate sustainable urban designs in the urban step. The method, which is a development of charrettes and workshops, emphasizes attraction planning over restriction planning [17]. The STEP method is hands-on, bottom-up, and based on local settlement types and cultural context. It has been used for designing villages, towns, and regional patterns. The method brings opposing parties closer in creative dialogue, making it an open arena for both laymen and professionals. The three essential tools are the round-table, the matrix of town and village types, and the value rose, which assesses sustainability in a broad sense, for choosing settlement types and comparing layouts from workshops. While the postoccupancy evaluation (POE) is a systematic and reliable process that aims to provide feedback on a building's performance in use after it has been built and occupied [18]. It collects information on building and energy use, as well as user satisfaction, which impacts our world and lives in various ways [19]. POE has evolved over the last 20 years, and its definition has evolved to include activities aimed at learning how a building performs based on the short results of design and construction decisions, such as cost, occupant satisfaction, and energy management, as well as improving the practices of building-related professionals and clients [20]. The knowledge of how buildings perform functionally and environmentally must inform future design and delivery to ensure spaces meet the needs of those using them. Governments, society, and users want the industry to deliver consistency, quality, and sustainability, as stated by RIBA President Professor Alan M. Jones [19].

This paper explores citizen involvement and voice, surpassing conventional methods, and engaging a diverse group of Swedish citizens via visual preference surveys on 12 featuers of the built environment: "urban planning, building mass configurations, building orientation, parking planning, roof articulation, building materials, color scheme, entrance articulation, fenestration, and balcony articulation and placement." These days, it can be challenging to engage citizens and give them a voice of importance. In other words, this article examines the creation of effective measures to ensure positive societal development and allow citizens to engage in dialogue when a city undergoes a change. Evidence shows that an area's social sustainability depends on its residents' influence. Involving communities and attending to individual needs can improve local social sustainability and aid in the fight against increasing anonymity in urban areas [11]. Urban development fosters greater democracy by prioritizing the voices of residents. Increased democracy is a prerequisite for increased social sustainability.

1.2. The Aim of the Study. The study aims to introduce a participatory planning approach that incorporates residents' visual preferences into urban design, promoting social sustainability, and community involvement.

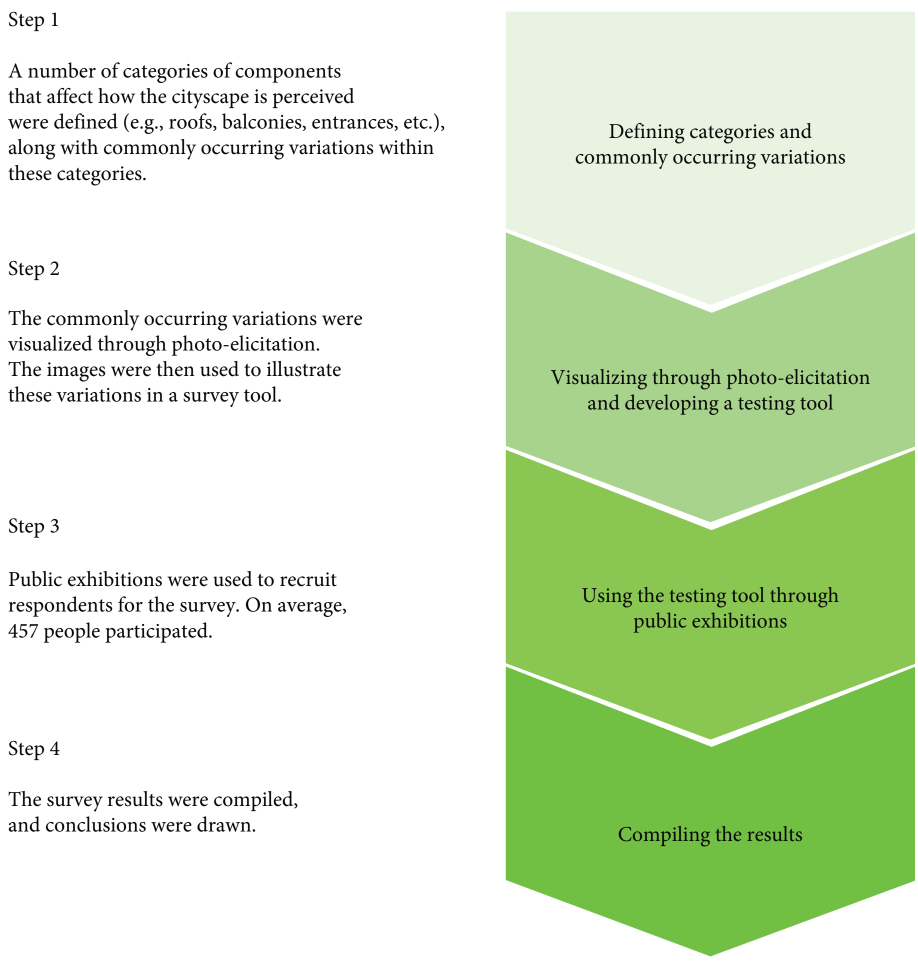


Figure 1: Simplified flowchart of the study.

1.3. The Objectives

1. To create an easy methodology to enhance the efficiency of the participatory process.
2. To illustrate the value of this method in assessing the quality of developed projects in Nordic cities and facilitating the transmission of knowledge.
3. To create an assessment method that is easy to use, urban planners, architects, and project developers may evaluate and modify the final outcomes of local development projects.

The study will be carried out in four steps, as shown in Figure 1. After that follows a more detailed explanation of what each part entails.

2. Methods and Materials

2.1. Step 1: Defining Categories and Commonly Occurring Variations. We first carried out the study by defining a number of categories of components that affect the cityscape through a literature review and observation. These categories are urban planning, building mass configurations, building orientation, parking planning, roof articulation, building materials, color scheme, entrance articulation, fenestration, and balcony articulation and placement. We then delved deeper into these categories and identified several commonly occurring types. These then formed the basis for the further investigation. We have examined the first four categories, which relate to the urban features of the built environment, separately, and discussed the next six categories, which reflect the physical features of the built environment, together. Please refer to Appendix C Table A1.

2.1.1. Urban Planning. We will develop a morphology and matrix for urban planning using approaches from the literature review to facilitate communication with nonspecialists. Urban morphology is an academic discipline that examines the intricate interconnections among various elements of human habitats, including monuments, gardens, streets, and buildings. Conversely, we regard these elements as entities that experience continuous transformation as a result of their utilization [21]. Geographic research [22] has primarily examined the interconnections among buildings, properties, and streets, in addition to the morphological composition of urban environments. According to Abarkan [23, 24], Swedish typomorphology possesses a substantial historical foundation, wherein numerous architects and geographers categorized neighborhoods, streets, and structures while constructing urban models of typical cities. In 1996, Rådberg and Friberg [25] introduced an all-encompassing classification of Swedish neighborhoods, which they categorized into 40 unique urban types. These types exhibit standard characteristics as well as minor variations with respect to building heights, floor space indices (FSIs), and open space indices (OSIs) [25]. This paper aims to create a morphology for common urban planning types in Stockholm, resembling the urban morphology in the Så byggdes staden [26], particularly the urban morphology of apartment buildings. The methodology will consist of six urban types: grid plan, huge courtyard district, functionalism (narrow house), huge scale district, postmodernism, and new modernism. This classification will enable laymen to better understand urban forms and contribute to easier dialogue between them and policymakers. The methodology identically resembles Så byggdes staden [26], which focuses on apartment buildings and villas. Please refer to Appendix A Figure A1.

2.1.2. Building Mass Configurations. Residential developments in central cities primarily consist of apartment buildings, which can be built together or laid out more freely. In the 1980s, researchers began to establish typologies [26, 27] and to categorize buildings based on their distinct architectural styles and historical eras. The book "Så Byggdes Staden" [26] showcases the dominant architectural styles used in apartment building. This paper aims to create a morphology for common building mass configuration types in Stockholm, resembling the building mass morphology in the Så byggdes trilogy [26]. A detailed classification of Swedish neighborhoods will consist of five building mass configurations: closed complex building (Sammanbyggda-flerbostadshus), slatted houses (Lamellhus), high-rise residential building (Punkthus), slab houses (from eight to nine floors) (Skivhus), and loft corridor building (loftgångshus). The methodology closely resembles the Så byggdes staden [26], which consists of apartment complexes and villas in particular. Please refer to Appendix A Figure A2.

2.1.2.1. A Closed Complex Building (Sammanbyggda-Flerbostadshus). A closed neighborhood development consists of multiapartment buildings facing the street on the plot boundary. The houses are three to five stories high. This is a typical stone townhouse. In larger cities, houses usually have plaster or brick facades, while some houses in smaller towns have wooden facades [26].

2.1.2.2. Slatted Houses, a Longitudinal Thin Building (Lamellhus). The free-standing rows of apartments often feature two to three stairwells, each containing two to four apartments. In the 1930s, slatted houses were usually narrow. It was common to build them in groups, either parallel to one another or at right angles. From the 1930s to the 1970s, slatted houses without elevators dominated residential construction [26].

2.1.2.3. High-Rise Residential Building (Punkthus). Point houses are detached apartment buildings with a stairwell. Each floor of the houses has four to six apartments. Corner apartments have views in two directions. In the 1930s, point houses with four to five floors became common on the outskirts of cities. Point houses are typically grouped together. In the 1950s, townhouses often had eight to 10 floors. In large cities' suburbs during the 1990s, it was a frequently used house type. In many cities, high point buildings became iconic landmarks [26].

2.1.2.4. Slab Houses, a Longitudinal Thin Building of Eight to Nine Floors (Skivhus). Parallel, eight- to nine-story-high slatted houses, also known as million-program houses, were a common house type during the 1960s and 1970s as a result of urbanization. These houses could make up an entire district. There were concrete frames and sometimes concrete elements on the houses facades. Due to the production method, we removed most of the existing vegetation and planted new plants after construction [26].

2.1.2.5. Loft Corridor Building, a Longitudinal Thin Building (Loftgångshus). Loft corridor houses are multiapartment buildings with a common staircase leading to long balconies from which each apartment has its own entrance. The 1970s and 1920s saw the rise in popularity of this type of house. The program aims to reduce elevator costs and improve community interaction. An entrance hall, a kitchen, and a bathroom usually face the loft corridor. The house type returns at the turn of the 21st century, with extended balconies along loft corridors [26].

2.1.3. Building Orientation and Solar Access. Balconies are a popular outdoor space for residents, providing fresh air and essential design elements in residential apartments [28, 29]. Urban balconies could serve as public spaces to restore physical and social health, particularly in the current social distancing experience [30]. Research shows that 25% of people who have worked more at home during the pandemic are planning to do so in the future, leading to an increasing need for adequate solar access into homes [31]. However, a little is known about the prioritization and assessment of solar access in Sweden's current urban planning process [32]. Research has emphasized the positive effects of daylighting on occupant health and well-being, including stress levels, mood, and photobiological effects [33]. Municipalities have different daylight routines, but there are no established ones for solar access to outdoor spaces or active solar energy production [32]. Urban planners often do not follow existing guidelines and recommendations for solar access, and outdoor solar access does not have the same priority as daylight indoors [32]. Urban planners' design decisions, such as form, density, roof type, and orientation, have a significant impact on building conditions, although planners may not always be aware of the effect of their design [34]. A detailed classification of building orientation and solar access in this methodology consists of four balcony orientations. Please refer to Appendix A Figure A3.

2.1.4. Parking Planning. Research on attitudes toward parking provision is rare, but a study by Noble and Jenks [35] found that the number of parking spaces provided in Lower

Earley, near reading, exceeded the number of cars owned by residents. However, high levels of dissatisfaction with parking provision were not due to low levels of provision but to poor layout and dwelling design, leading to high levels of on-street parking [36]. The researchers acknowledged the human dimension in this subject area and suggested that parking layouts should reflect the behavior and attitudes of the occupiers more than at Lower Earley. The House Builders Federation [37] conducted a survey of public opinion on private housing developments, including car parking [37]. Federation [37] stated that security was an important factor in parking location, with a strong resistance to parking any distance from the home. Community provision was mostly acceptable to younger households without children, whereas on-street parking raised concerns such as disputes with neighbors and problems finding a space [36]. Some people were willing to compromise over parking if it resulted in a desirable home, while most families with children saw a car as non-negotiable [37]. Future developments will likely still need to accommodate cars due to occupants' desire for convenience and unobtrusive parking [38]. The literature review indicates that we can apply parking standards more flexibly, yet there is currently no available literature on public perceptions of policy and design innovation. This research aims to fill this gap and help policymakers understand the attitudes and perceptions of existing occupiers and purchasers toward the many design solutions mentioned in national and international literature. We can classify parking planning into six distinct types: hidden parking, parking lots with a road between the house and the parking lot, parking along the street, private garages at street level, parking spaces outside the house, and collective parking spaces or garages for several buildings. Please refer to Appendix A Figure A4.

2.1.5. The Physical Features of the Built Environment. We have discussed the following six categories together, which reflect the physical features of the built environment: roof articulation, building materials, color scheme, entrance articulation, fenestration, and balcony articulation and placement.

Visual impact assessment is crucial for evaluating various elements of buildings in both built and natural environments [39]. The book "Så Byggdes Staden" [26] talks about the visual preference of traditional Swedish buildings from 1700s to 1800s. It does this by showing eight examples of private buildings from eight different landscapes: Dalsland, Gotland, Skåne, Blekinge, Ångermanland, Värmland, Östergötland, and Gästrikland. The finds show that the traditional building materials used were from the locale. Wood and stone were the main ones, and lime was sometimes used to cover the wood. Some building openings or tops had a secondary green or light green color scheme. Moreover the same researcher revealed the development of the color schemes for historical buildings from 1800 to 2000 was as following. The yellow, gray, rose, and red were the colors of building facades before 1800. They turned yellow, gray, and pink between the 1800s and 1880s. The colors changed from the 1800s to 2000s, going from yellow to gray to light yellow to brown.

Quantitative studies are essential for objectively assessing the visual environment [40]. Iverson introduced the concept of visual mass in 1985 to characterize an object's visual aspect from various angles. Other studies have focused on assessing visual impact, such as Torres-Sibille et al. [41], Ladenburg [42], and Bishop and Miller [43]. While Torres-Sibille et al. [41] developed an objective factor based on photographs and interviews, Torres-Sibille et al. [41] also developed an approach based on four criteria: view, color, fractal, and harmony between stable and moving panels for solar plants. Samavatekbatan, Gholami, and Karimimoshaver [39] further elaborated on the quantitative assessment of aesthetic factors, taking into account factors such as the observer's background, experience with advanced technology, and the general topography. The built environment, including buildings, streets, and neighborhoods, significantly impacts citizens' visual perceptions due to their unique appearance and configuration features. Swedish typomorphology has a long history [23, 24], with architects and geographers creating urban models and typologies of buildings, streets, and neighborhoods [27]. To highlight connections between elements, designers and geographers create types. Building typologies are typically focused on building elements and their configurations, such as windows, doors, façade design, room organization, and orientations [44].

Bishop and Miller [43] reported distance, contrast, and movement parameters in their visual evaluations of urban spaces. However, no systematic study has examined the impact of built environment elements on individuals in urban spaces [39]. Physical features of the built environment significantly impact neighborhood and environmental quality, particularly in metropolitan areas [45]. This study used photoelicitation at a local level to assess the visual impact of a built environment, including factors like facade material, balcony articulation, balcony balusters, facade color scheme, window articulation, roof articulation, entrance articulation, and balcony views. In other words, this article discusses how Swedes perceive their neighborhoods from both a visual and aesthetic perspective. Please refer to Appendix A Figures A5–A12.

2.2. Step 2: Visualizing Through Photoelicitation and Constructing a Testing Tool. We visualized the commonly occurring variations through photoelicitation. The testing tool then used pictures to explain the commonly occurring variations (survey). The authors photographed nearly all new projects in Stockholm to scan buildings built after 2000. We took four thousand photos in multiple municipalities throughout Stockholm to scan the 10 categories described in Step 1. A sentence from Collier's [46] study states that a picture is a restatement of reality; it depicts life in a clear, objective, and startling manner that makes the informant feel as if he is seeing it for the first time. The authors took the majority of the photos between 2016 and 2017. The authors of the article independently shot the majority of the photos. The websites of the building companies host the remaining images. Please refer to Figure 2 to see an example of three posters out of 19 posters, each containing approximately

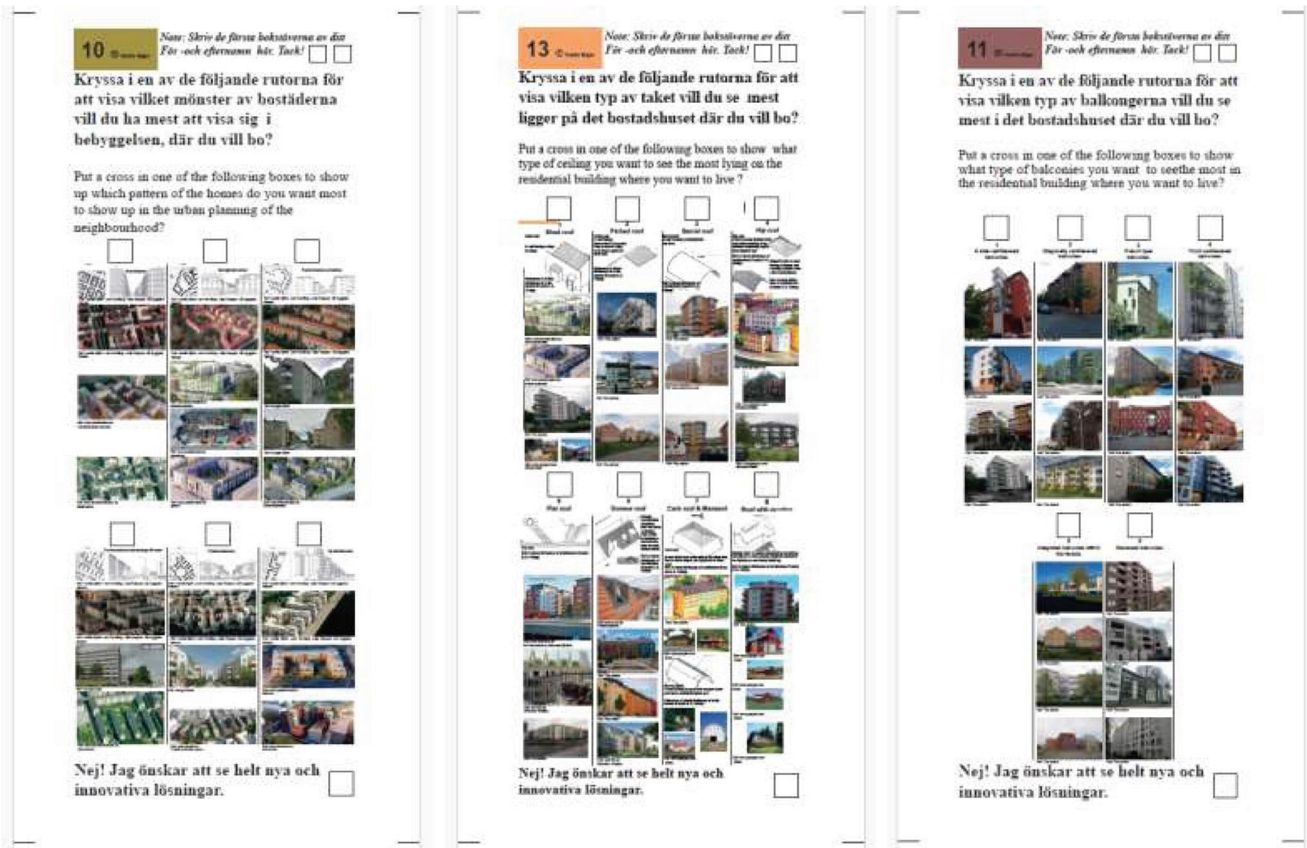


Figure 2: This figure presents three examples of the 13 testing tools utilized in the exhibitions. Refer to Appendix B. Reference: The authors.

16–20 images. In addition, there were seven folders in A3 format containing the same number of images. In contrast, for 30% of respondents, the folder made it easier to interact with all images without being in an exhibition. The author used only 12 of the 19 posters in the analysis, which were presented to each participant in five exhibitions and in different places (homes, offices, cafes, and unions). Please refer to Appendix B.

2.2.1. Photoelicitation. In the fields of architecture and engineering, photoelicitation is a qualitative research method in architecture and engineering that examines individuals' perceptions of the physical attributes of constructed environments and their daily interactions with them [46, 47]. The researcher may employ photographs during interviews as a means of stimulating participants to share their reflections, recollections, and personal encounters [48]. Scholars have the option to obtain their own photographs [49] or utilize those that already exist and are highly pertinent to their inquiries [50]. The utilization of visual aids, such as images, during interviews, can be a valuable tool in eliciting information from participants. This is particularly true when comprehending perspectives that differ from those of the researchers themselves [47]. When addressing transdisciplinary issues like human factors in design, sustainability, or climate change, visual methods are especially applicable [47]. Van Auken, Frisvoll, and Stewart [51] asserted that visual methods possess a unique capacity to enhance the involvement of participants in local planning projects that aim to promote sustainable community development and natural resource management. Photoelicitation prefers research participants' opinions by highlighting their perspectives [47]. The photoelicitation project, which generated images of locations pertinent to the significance of the built environment, struggles to depict the notion of ethnic integration [48]. This method should be considered for any subject matter in building studies that relates to constituents' experiences [47]. Researchers frequently use structured interviews to elicit responses from participants about photographs they have already produced [4]. We collected the survey results and used them as the foundation for developing an assessment matrix.

2.3. Step 3: Using the Testing Tool Through Public Exhibitions. We used public exhibitions to gather respondents for the survey. In total, an average of 457 people answered the survey. We conducted a survey primarily at Swedish universities to gather the opinions of Swedish citizens. The survey samples came from diverse categories of the Swedish community with different age ranges (18–90 years), genders (male and female), and ethnicities (Swedish and non-Swedish mother tongues). We used photoelicitation in the survey, asking participants to identify their preferred category type among 10 categories. With a rate of 68%, as

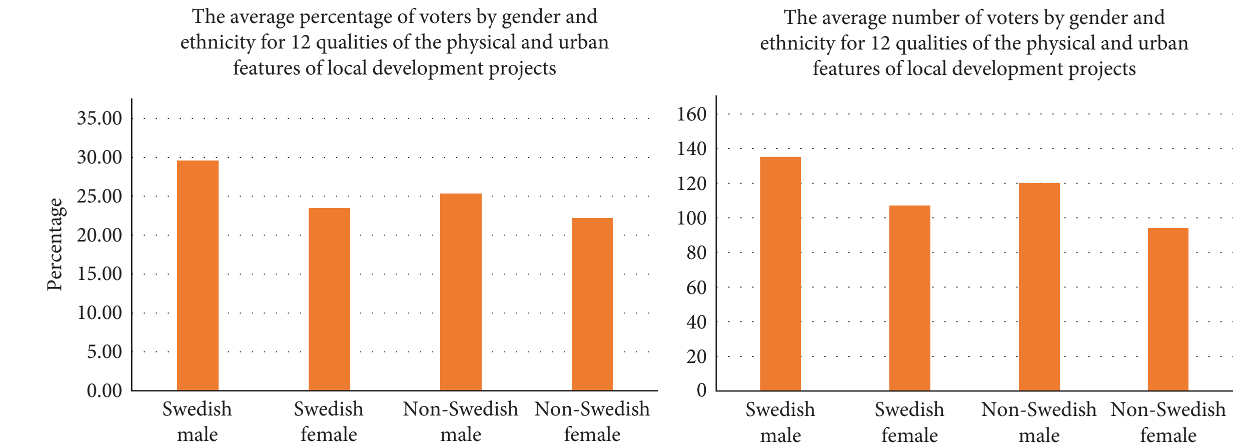


Figure 3: This figure shows the number and percentage of respondents by gender and ethnicity who voted for 12 visual sets.

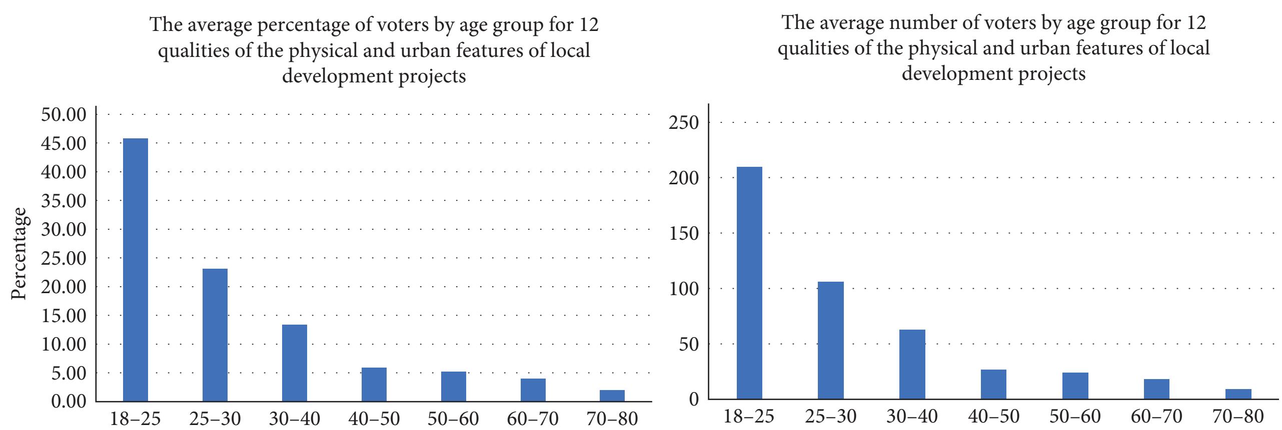


Figure 4: This figure shows the number and percentage of respondents by age who voted for 12 visual sets.

shown in Appendix D, students from various Swedish universities were included in the sample from KTH in Stockholm, Malardalen University, Jönköping University, Karlstad University, Linnaeus University, and the KTH School of Architecture. Participants received a small folder measuring 15 cm by 40 cm containing 12 posters, and they chose the image group representing their desired category in their neighborhood. The survey process was simple and suitable for even unskilled participants, who may not fully understand complex contexts like the built environment. The survey took about 20–30 min to complete. Please refer to Appendix B.

2.4. Step 4: Compiling Results. Prior to consolidating the survey results and drawing conclusions, we aim to showcase the results and the statistical profiles of the participants.

2.4.1. Results and Statistical Profiles of Respondents. Table A2 in Appendix D presents an extensive review of the survey results, illustrating the level of respondent participation based on age group, gender, and ethnicity for 12 physical and urban characteristics in Sweden's local development projects.

According to Figure 3, Swedish males had the highest respondent participation rate, accounting for 29.63% of the total. The female who is not of Swedish nationality achieved the lowest score, which was 22.18%. Figure 4 indicates that the age groups 18–25 and 25–30 have the largest percentage of respondents, accounting for 68.9% of the total. The age group 30–40 has a percentage of registered respondents of 13.4%, while the remaining age groups from 40 to 80 collectively have a respondents participation rate of 17%. The rates mentioned above indicate the average respondents rate for each age group, gender, and ethnicity across all 12 survey samples.

3. Results

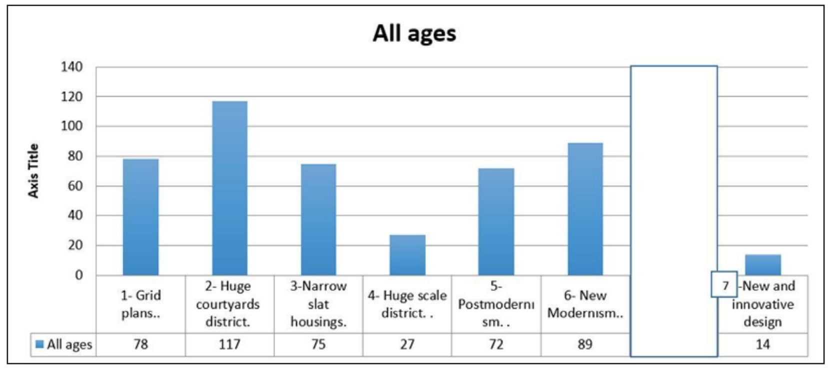
Following are samples of Swedish residents' preferences for the built environment and its urban and building design categories.

For picture references, all posters are available in Table 1.

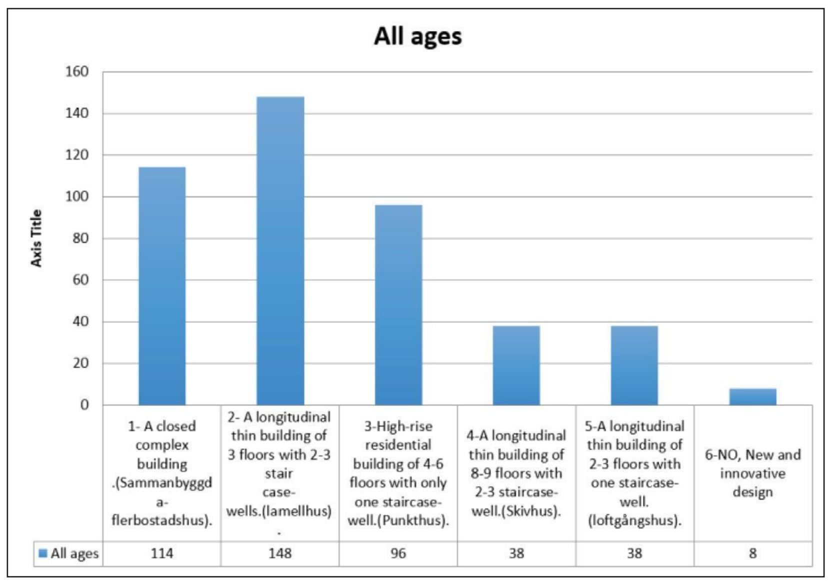
3.1. An Easy-to-Use Method for Assessing the Urban and Physical Features of Built Environments. This research resulted in the creation of a novel, easy-to-use assessment method. Please refer to Appendix E. By developing an easy-to-use method for assessment, urban planners, architects, and project developers can evaluate the finished projects. With this assessment method; in other words, they can see

Table 1: Displays Swedish residents' preferences for the built environment, including its urban and building design categories.

Urban planning
The results show that the preferred urban configuration among the interviewed citizens is huge courtyard districts. The least popular configuration (not including new and innovative) is huge scale districts



Building mass configuration
The most popular building type is the houses known in Sweden as lamellhus. The least popular type is what in Sweden is known as skivhus



Balcony Sun orientation
The most popular direction is south-oriented balconies and the least popular are north-oriented balconies

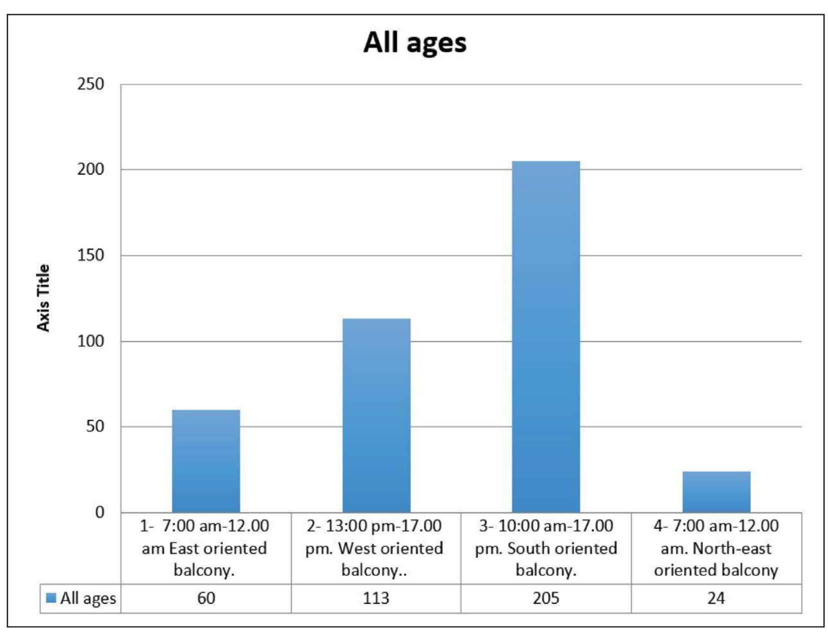
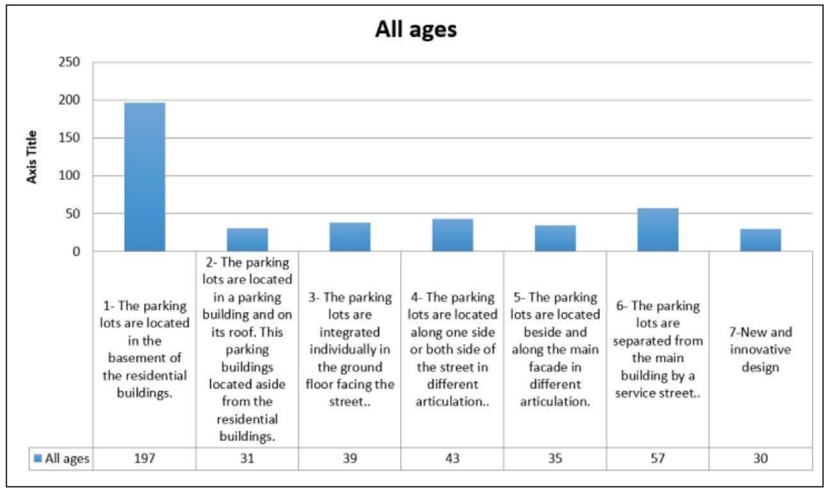
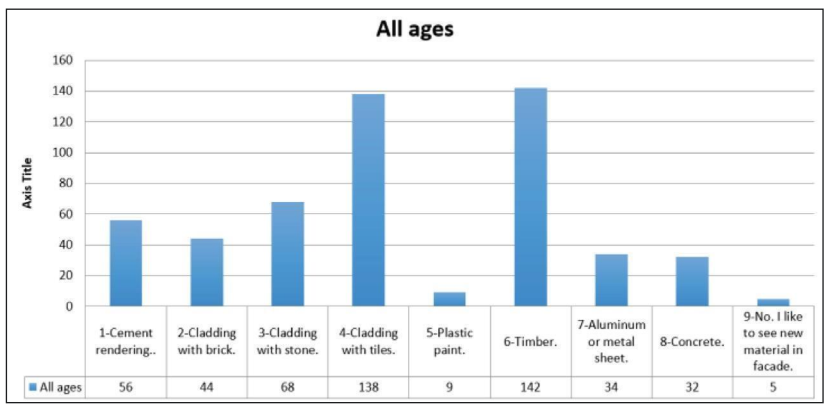


Table 1: Continued.

Parking planning
The most popular parking type is parking lots placed in the basement of residential buildings. The least popular parking types are parking in parking garages with roof parking



Façade material
The most popular façade material is timber (with cladding with tiles in a close second place). The overweening least popular material is plastic paint



Balcony types
The most popular balcony type is front cantilevered balconies. The least popular type is French balconies

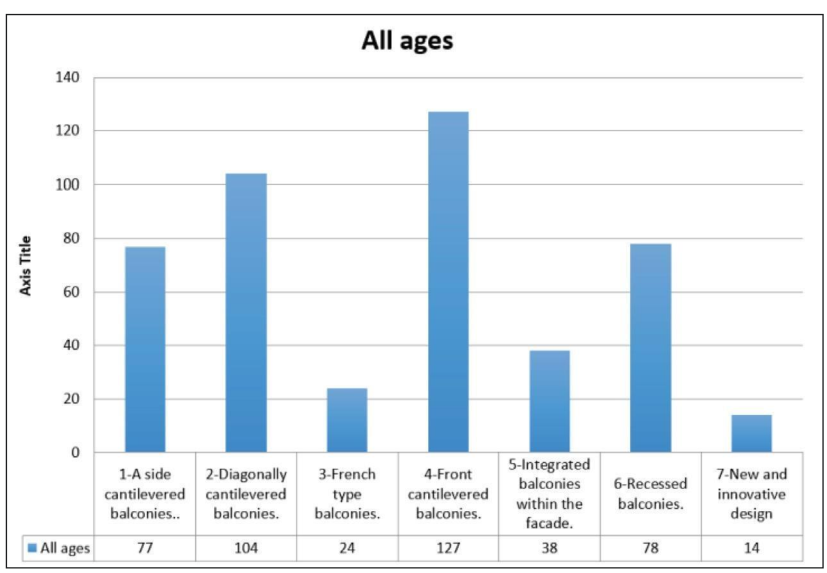


Table 1: Continued.

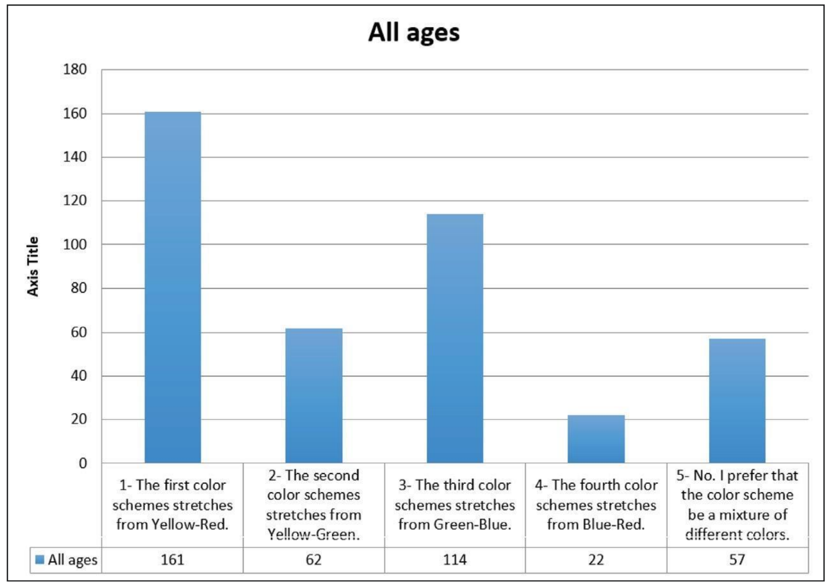
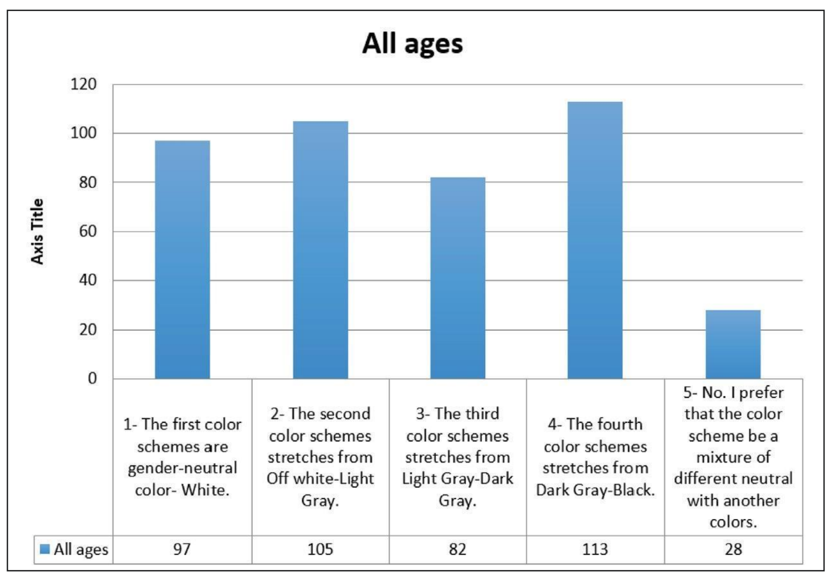
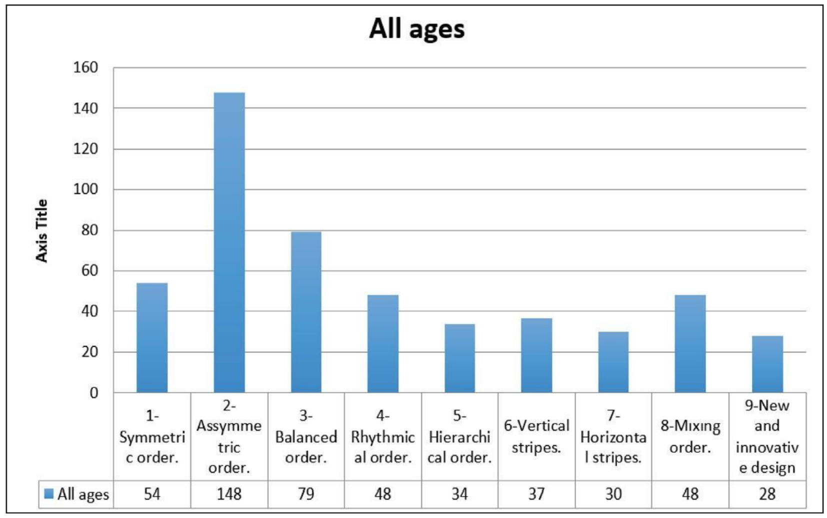
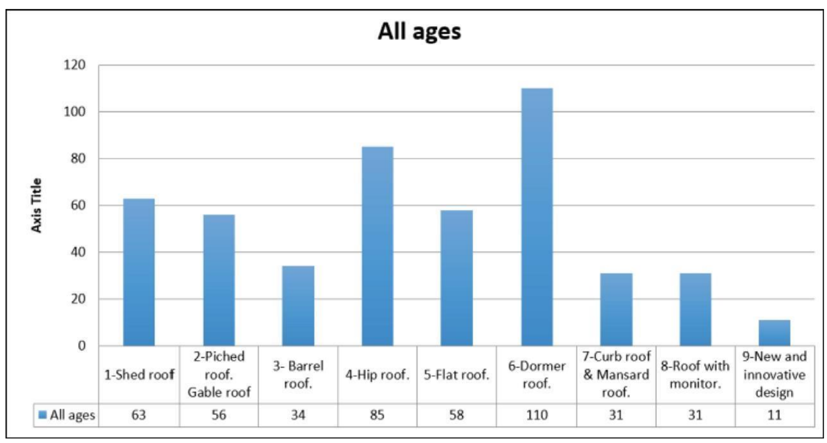
Façade color schemes The most preferred color schemes are yellow–red (among analogous colors) and dark gray–black (among grayscale colors). The least preferred color schemes are blue–red (among analogous colors) and light gray–dark gray (among grayscale colors)	 

Table 1: Continued.

Window articulation
The most popular window articulation is asymmetric order. The least popular is horizontal stripes



Roof type
The most popular roof type is dormer roofs. The least popular is curb roof and roof with monitor



Entrance articulation
The most popular entrance articulation is “As an aligned entrance with extra height on façade.” The least popular is “As an aligned entrance within the façade”

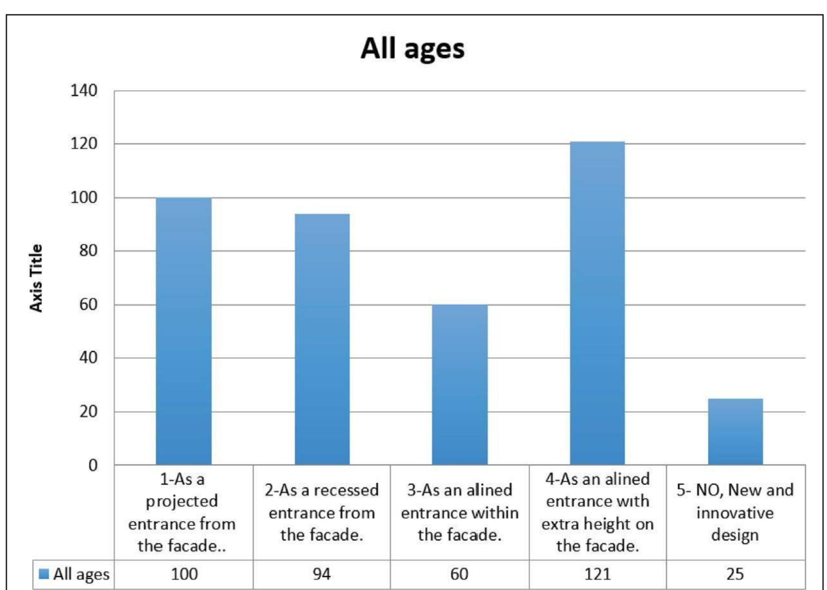
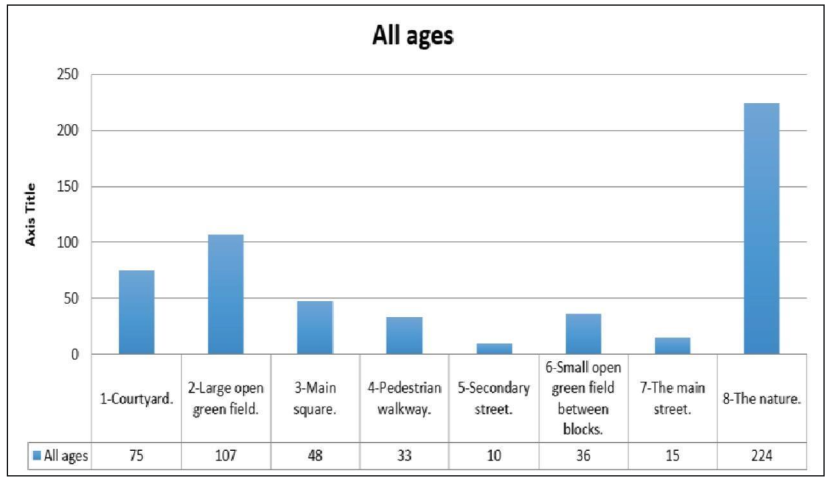
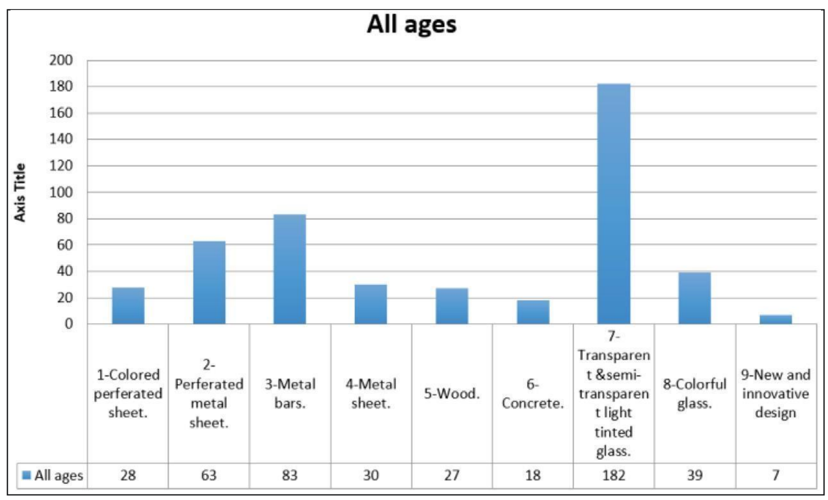


Table 1: Continued.

Views from balcony
The overweening most popular view is the nature. The least popular view is a secondary street



Material of the balcony's balusters
The most popular material of the balcony's balusters is "Transparent and Semi-transparent light tinted glass." The least popular is "Concrete"



to what extent the developed projects meet community preferences. Moreover, during the planning phase, project developers can modify any proposed projects to fit the preferences of the community. The text that follows explains how to utilize it. The assessment matrix assigns scores between 1 and 10 for different types of attributes in each category. Weighting is done using the formula (number of people)/(the highest number of people in the category) × 10 = points, rounded to the nearest whole number. The matrix's weighting is based on the results of completed interviews, with 10 points assigned to the most preferred attribute. We generate other points by dividing the number of people who voted for the attribute by the "maximum number of votes" in the category, multiplying by 10, and rounding to the nearest whole number. Various attributes should receive fair points as a result, with the most appreciated attribute consistently receiving 10 points. A system with "score limits" (e.g., 50 points equals 10 points, 45 votes equals nine points, etc.) would inevitably result in poor scores for some categories with scattered results, as no attribute would reach 50 points. A ranking system would also cause some skew in the results due to the fact that different categories have different numbers of attributes.

4. Discussion

The study addresses contemporary challenges in urban development, such as the need for greater public participation and the issues arising from private sector dominance. The study introduces a participatory planning approach that incorporates residents' visual preferences into urban design, promoting social sustainability, and community involvement. In other words, such an approach fosters democracy by putting residents' voices at the center of urban development and promoting social sustainability. The study conducted a visual preference survey, interviewing an average of 457 Swedish citizens of various backgrounds and ages. The authors believe that the sample size is sufficient to illustrate trends in societal preferences. The age groups of 18–25 and 25–30, which represent students typically engaged in college or university, form the highest proportion of the respondents, equals to 68.9% of the overall sample size. Since the majority of the interviews took place in university settings, we generally assume that the interviewed residents possess a higher level of education and are more urban than the average person. According to the authors of the article, this may lead to a slight distortion of the result. But in a broad sense, the study provides empirical evidence on the preferred physical and urban features. However, the aesthetic appeal of design features may vary among individuals, with some finding them acceptable while others find them objectionable. The author intended to quantify "the aesthetic of the design features," which are challenging because of their subjectivity. One way to accomplish this goal is to quantify what most people consider aesthetic features. For this reason, the study's results hold significant interest. Deriving a matrix from the preferred features can help gauge the value of specific design features for citizens. The results revealed the following values.

Future projects should prioritize these features based on the highest rating: large courtyard districts with building blocks consist of timber-slatted houses with asymmetrical window articulations, dormer roofs, and a front cantilevered balcony with balusters made of "transparent and semitransparent light-tinted glass." In addition to providing a view of nature, the balcony must face south. Furthermore, the basements of residential buildings should house parking lots. The most popular color schemes are yellow–red and dark gray–black. The façade includes an aligned entrance and additional height.

However, the matrix does not provide 100% reasonable results. Overall, the study's results indicate that it is impossible to identify a single residential area as ideal. This is because categories create conflict. For instance, slatted (thin) houses, typically arranged freestanding "in a row," are the most popular building type, whereas large building blocks, requiring a distinct building type, are the most popular urban configuration. In other words, there is probably no built environment that meets all the preferences presented in the study.

We cannot, and should not, build all areas according to this matrix. Nevertheless, the matrix aims to provide only an indication of what Swedish people value in terms of urban and architectural features in local development projects. The research employs photoelicitation, a qualitative method, to bridge the gap between technical urban planning and layperson understanding. But at the same time, we can say that this method's drawback lies in the interviewee's tendency to fixate on the presented image, preventing them from considering alternative images that accurately represent the given attribute. Some findings suggest that this phenomenon may have occurred during the study. For example, the dormer roof received the most votes, while the gable roof received (surprisingly) few votes. The image that embodied the dormer roof featured a gable roof with dormers, potentially contributing to the low number of votes for gable roofs.

Overall, however, the assessment was that the advantages of this method outweighed the disadvantages. First and foremost, photoelicitation simplifies concepts for interviewees. Most likely, a majority of the Swedish population would not be able to say whether they prefer a mansard roof or gable roof without explanation, but with pictures that explain concepts, this becomes much easier. This means that the number of interview responses should increase and become more reliable.

The results clearly show that residents consistently rank the lowest attributes associated with large-scale modernism, such as slab houses and large-scale suburbs. This could suggest that modernism's approach to building societies overlooked the social dimension. The communities have all the necessary functions but lack homey elements. The media's frequently unfavorable portrayal of the predominantly modernist suburbs may provide another explanation. These attributes have become associated with negative events, and as a result, the inhabitants do not want to live in areas with them. We developed an assessment matrix based on the quality ranking of 12 built environment features, providing urban planners, architects, and project developers with a practical tool to evaluate and adjust built projects.

The study specifically focuses on Nordic cities, adding to the regional literature on urban planning and offering insights applicable to similar urban environments worldwide. The study aims to facilitate knowledge transfer and conduct quality evaluations of developed projects within Nordic urban areas, rather than concluding which built environments are good or bad. The multidisciplinary approach enriches the academic literature on urban planning and design. The findings have significant policy implications, suggesting that urban planning policies should prioritize community engagement and incorporate residents' visual and functional preferences.

5. Conclusions

This study introduced a participatory planning approach that incorporates residents' visual preferences into urban design. The research, which used a visual preference survey with 457 participants, aims to align urban development with community desires and needs. The study uses photoelicitation, a qualitative method, to engage participants and gather their preferences. An assessment matrix based on the quality ranking of 12 built environment features is developed, providing a practical tool for urban planners, architects, and project developers. The study contributes to the discourse on social sustainability in urban planning and highlights the importance of involving residents in decision-making. The findings have significant policy implications, suggesting that urban planning policies should prioritize community engagement and incorporate residents' visual and functional preferences.

6. Future Studies and Limitations

The major emphasis was placed on the "aesthetic values" of the physical characteristics rather than the structural attributes, energy efficiency, maintenance, or other important factors. Sweden has a multitude of regulations and laws in place to support these concerns, guaranteeing their exceptional quality and surpassing expectations. The research omitted the economic and ecological aspects of the built environment, as these matters have already been extensively examined in previous studies. This study yielded an abundance of data due to the inclusion of extensive survey samples from various regions of Sweden. Furthermore, the varied genders and ethnicities of the participants in Sweden, as well as their broad age range of 18–90 years, offer prospects for additional study and statistical analysis. This has the potential to help numerous disciplines engaged in the planning process. In addition to this research, the authors performed a separate study to assess how different Swedish groups perceive and rank two main color schemes used in local development initiatives in Stockholm. The emphasis was mostly on the variety of sociodemographic characteristics. The study yielded findings for a total of 19 attributes. We specifically chose 12 attributes for this study. The remaining seven criteria can facilitate further investigation with a more specific emphasis.

Appendix A

This section displays the defining categories and common variations in the built environment's urban and physical features. The appendix includes Figures A1–A12.

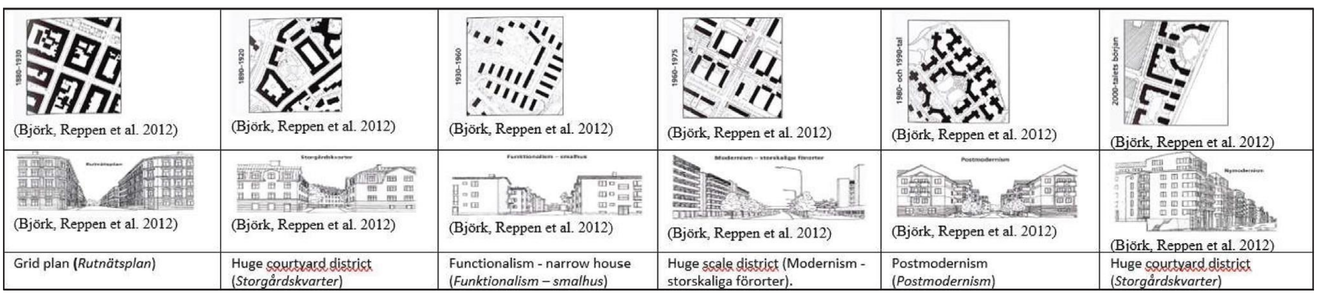


Figure A1: This figure illustrates the common morphologies for urban planning types in Stockholm, resembling the urban morphology in the Så byggdes staden [26]. Reference: The authors.

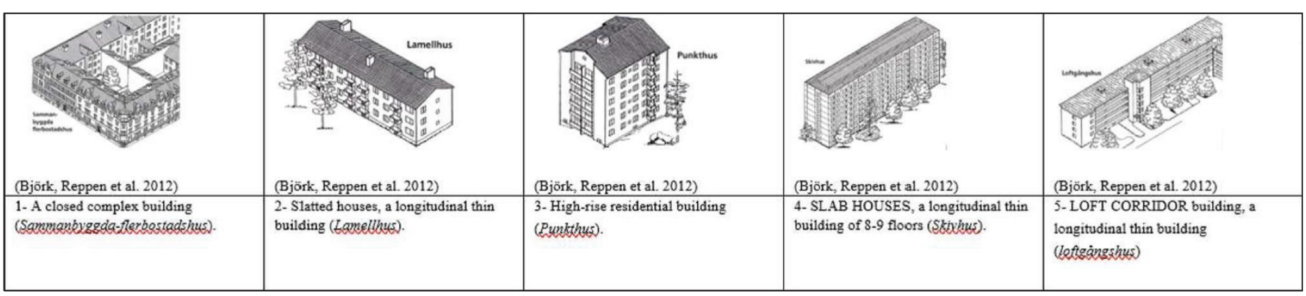


Figure A2: This figure illustrates the common morphologies for building mass configuration types in Stockholm, resembling the building mass morphology in the Så byggdes staden [26]. Reference: The authors.

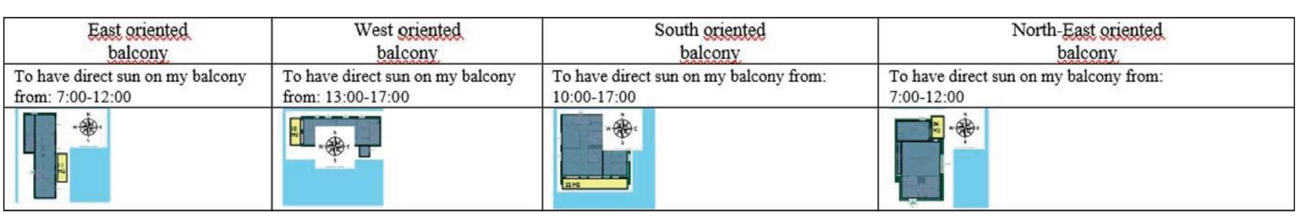


Figure A3: This figure illustrates the typical morphologies for balcony orientation and sunlight access, resembling the Swedish types. Reference: The authors.

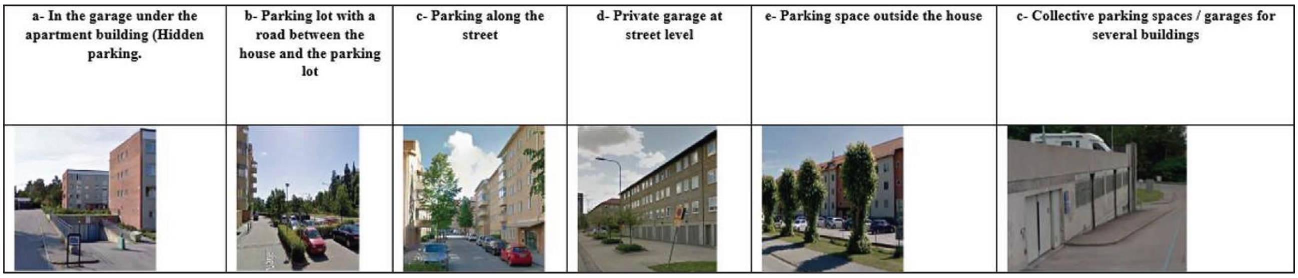


Figure A4: This figure illustrates the typical morphologies for parking planning, resembling the Swedish parking planning types. Reference: The authors.

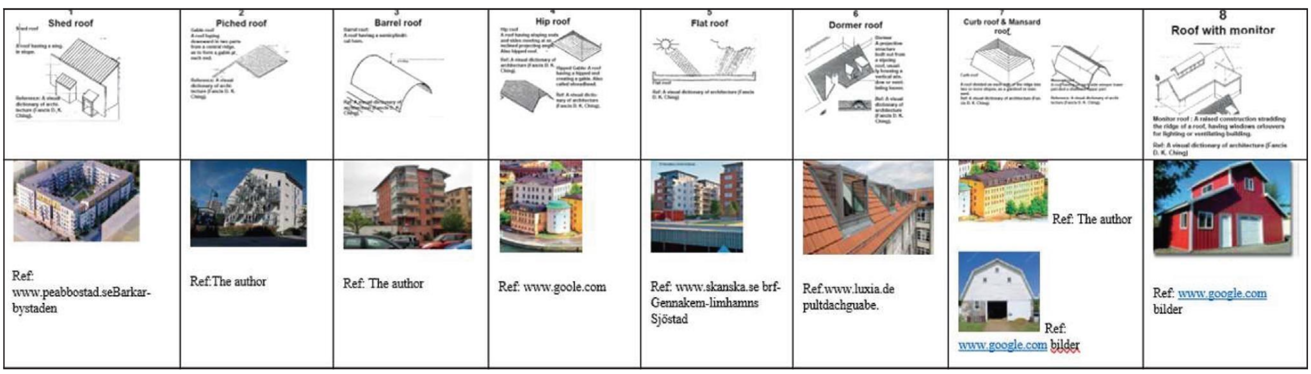


Figure A5: This figure illustrates the typical morphologies for roof articulations, resembling the roof morphologies in the visual dictionary of architecture. Reference: The authors.

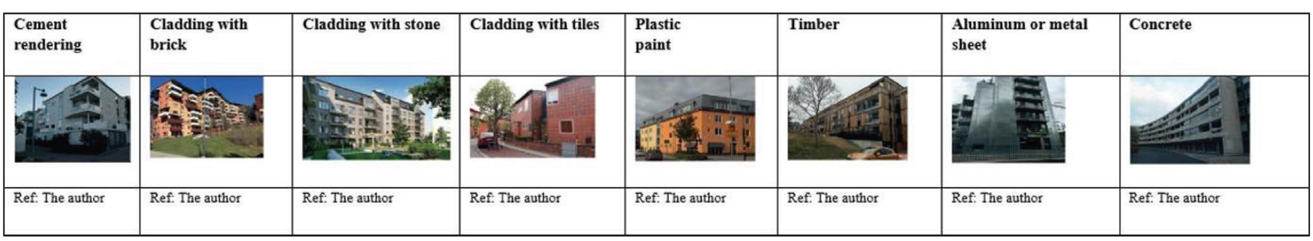


Figure A6: This figure illustrates the common types of building materials, resembling the Swedish building material types. Reference: The authors.

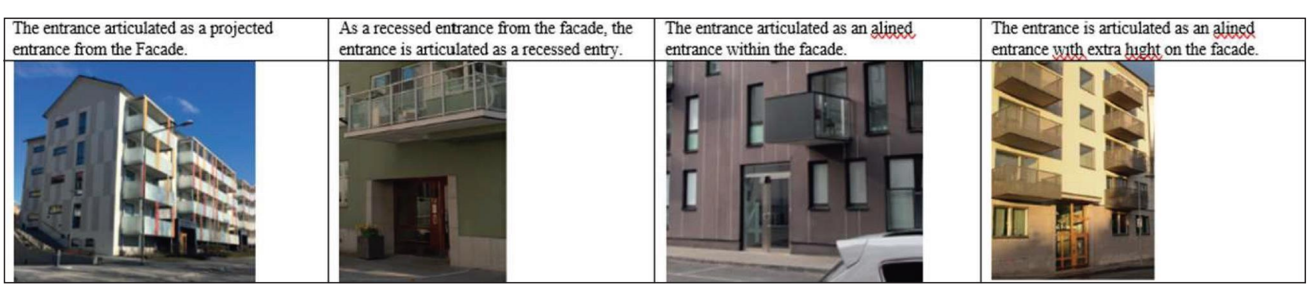


Figure A7: This figure illustrates the typical morphologies for entrance articulation, resembling the Swedish types. Reference: The authors.

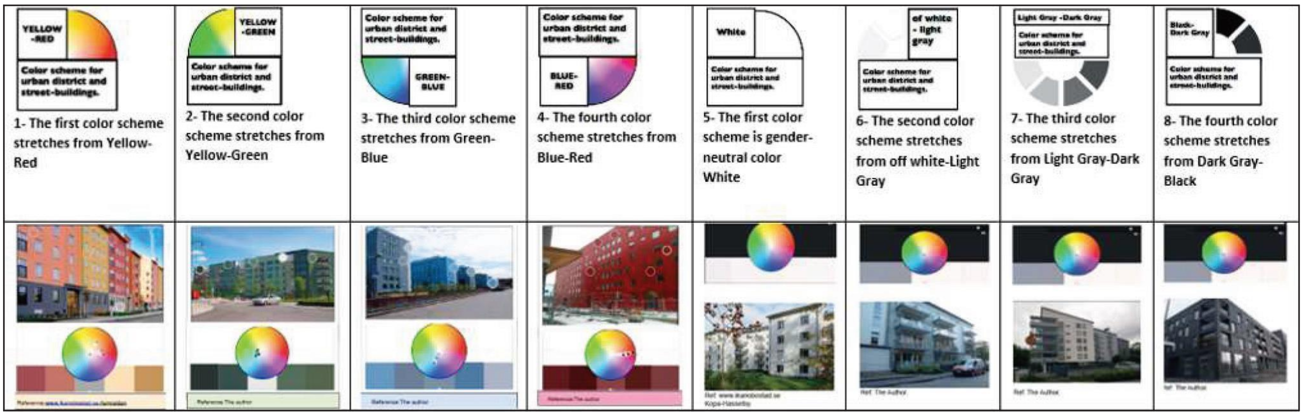


Figure A8: This figure illustrates the typical morphologies for the buildings and streetscape colors, resembling the Swedish types. Reference: The authors.

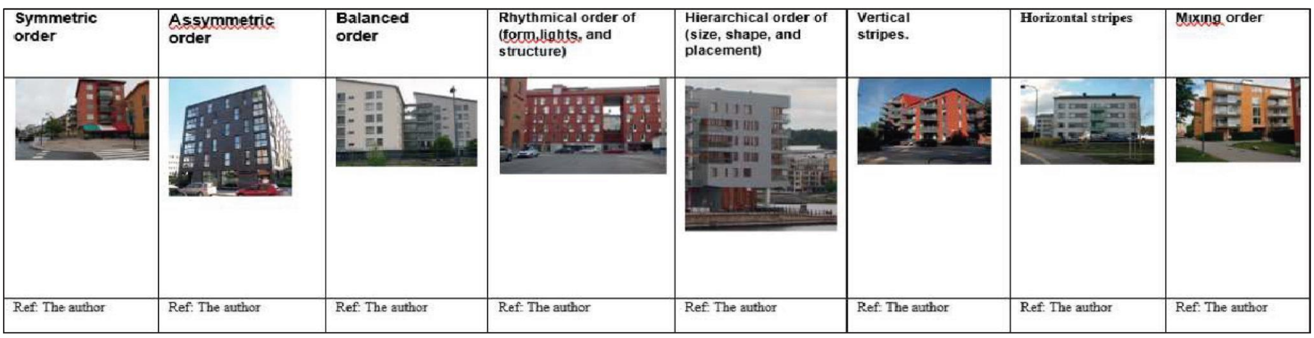


Figure A9: This figure illustrates the typical morphologies for windows articulation, resembling the Swedish types. Reference: The authors.

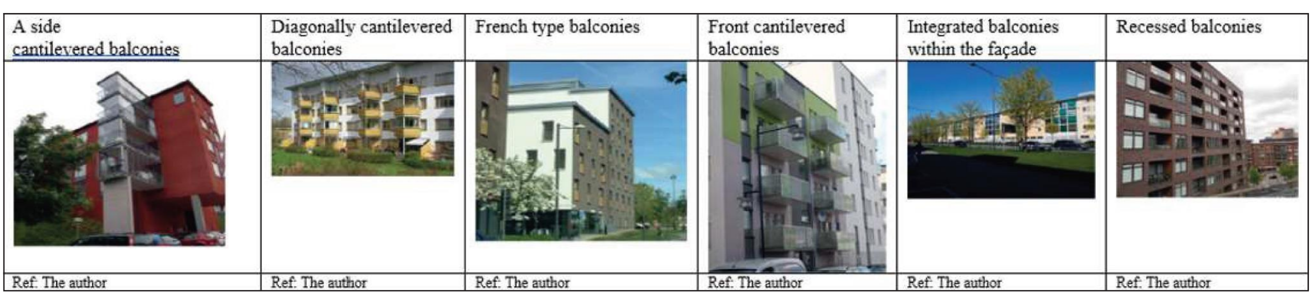


Figure A10: This figure illustrates the typical morphologies for balcony articulation, resembling the Swedish types. Reference: The authors.

Figure A11: This figure illustrates the typical types for balconies balusters materials, resembling the Swedish types. Reference: The authors.

I wish my balcony face:							
The courtyard	**The large open green field**	**The main square**	**The Pedestrian walkway**	**A secondary street**	**A small open green field between blocks**	**The main street**	**The nature**
							
Ref: www.peabbostad.se Barkarbystaden	Ref: The author	Ref: www.veidekkebostad.se Barkarbystaden	Ref: The author	Ref: The author	Ref: The author	Ref: The author	Ref: The author

Figure A12: This figure illustrates the different views from the balconies, resembling the Swedish types. Reference: The authors.

Appendix B

This section presents the 13 testing tools utilized in the exhibitions.

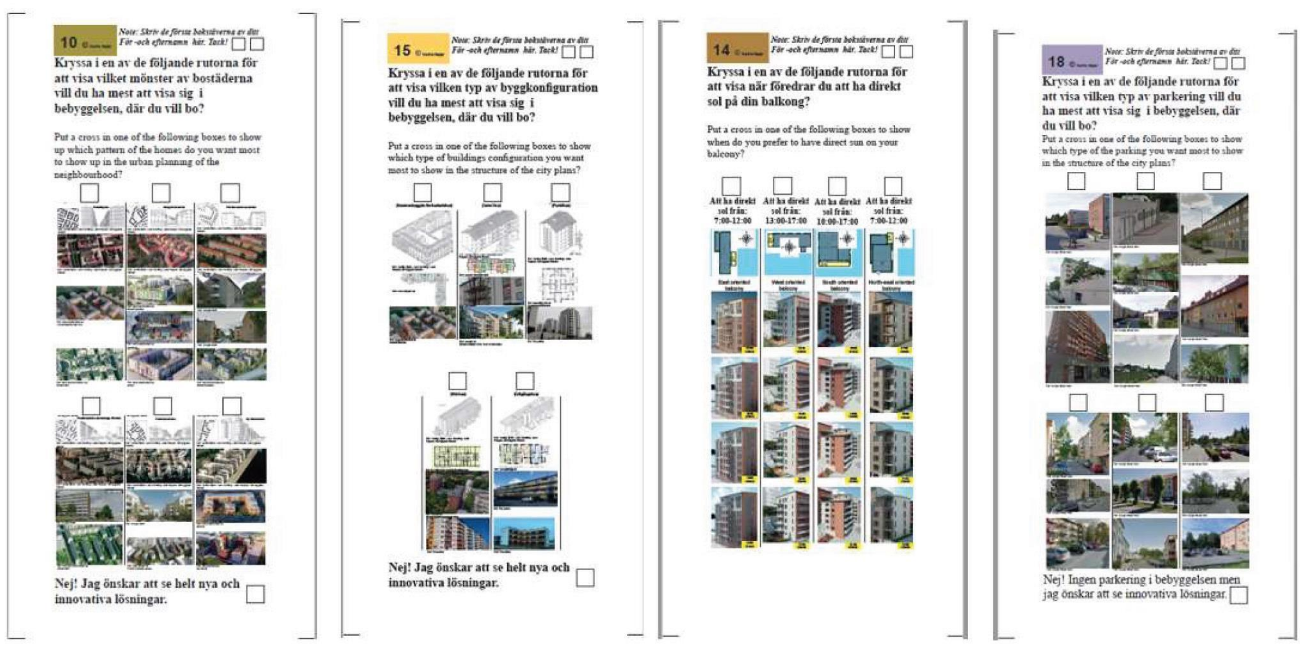


Figure A13: This figure shows the testing tools for urban planning, building mass configurations, building orientation, and parking planning.

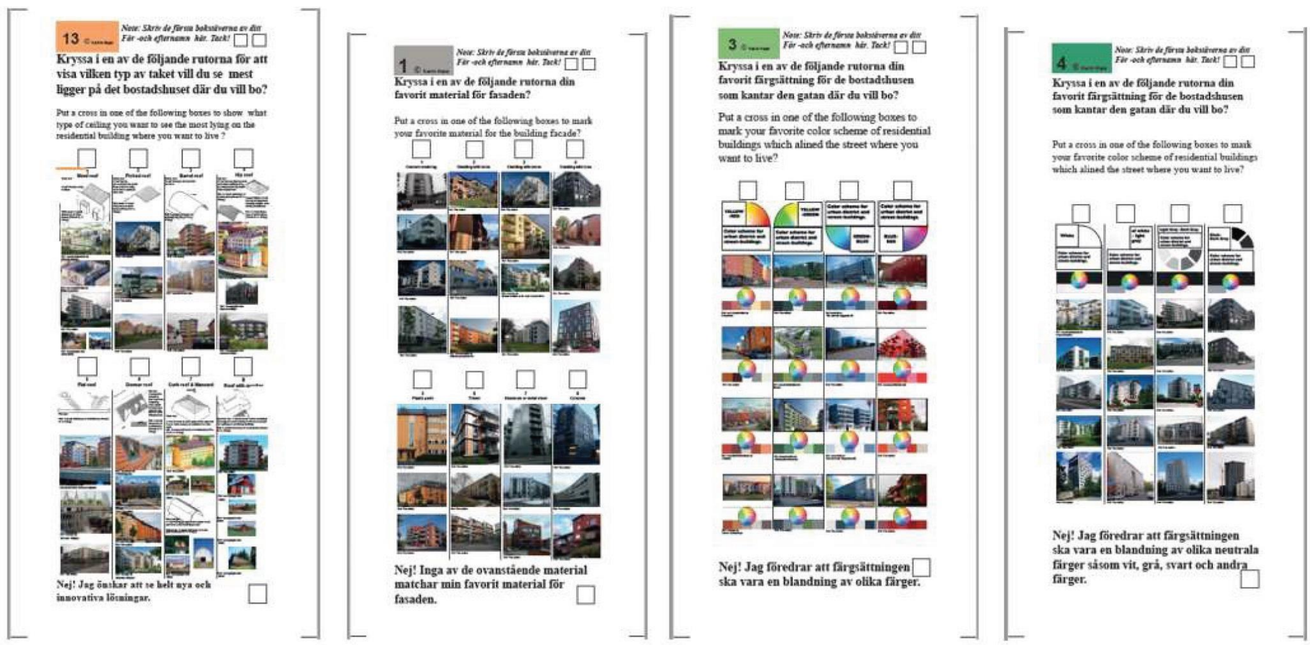


Figure A14: This figure shows the testing tools for roof articulation, building materials, and the color scheme.

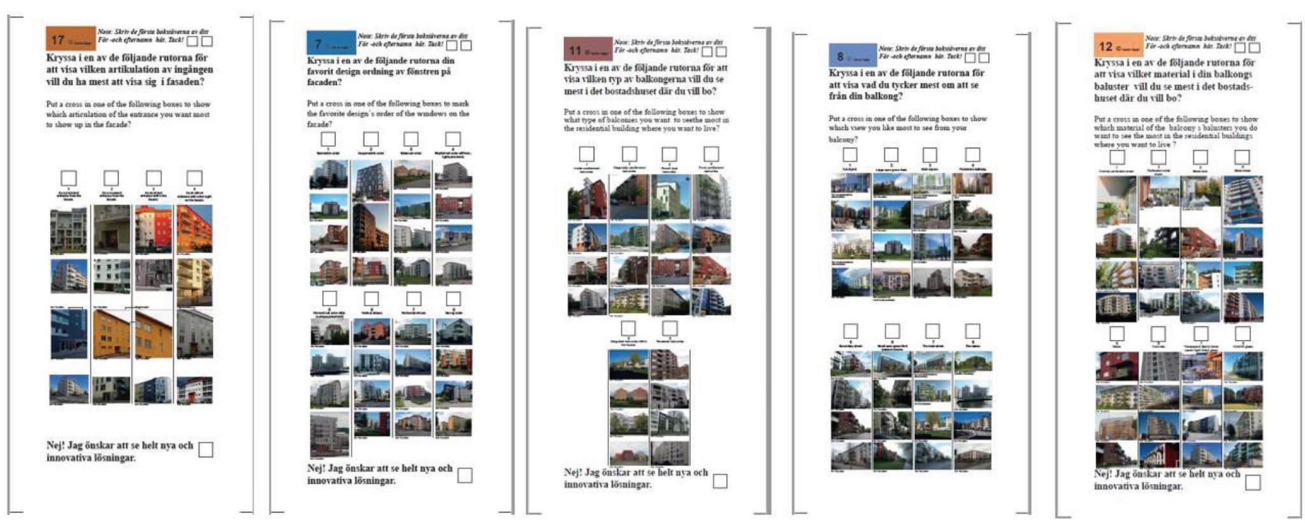


Figure A15: This figure shows the testing tools for entrance articulation, fenestration, views from balconies, and balcony articulation and placement.

Appendix C

Table A1: This table shows the main features of the built environment and their subfeatures.

The context	The two features	The subfeatures
The built environment	Urban planning features	Urban planning
		Building mass configurations
		Building orientation
		Parking planning
	Physical design features	Roof articulation
		Building materials
		Color scheme
		Entrance articulation
		Fenestration
		Balcony articulation

Appendix D

Table A2: This table displays the statistical profiles of respondents defined by age group, gender, and ethnicity.

Voters participation by age group, gender, and ethnicity for 11 local development project physical and urban qualities	Age groups 18–25	25–30	30–40	40–50	50–60	60–70	70–80	Total gender and ethnicity participations numbers	Total gender and ethnicity participations percentage (%)
The votes for urban planning by gender and ethnicity									
Swedish male	66	33	12	11	6	2	5	135	28.66
Swedish female	61	17	16	5	7	5	0	111	23.56
Non-Swedish male	44	36	23	6	7	10	1	127	26.96
Non-Swedish female	54	18	15	4	4	1	2	98	20.80
Total and percentage of urban planning votes by age group	225 (47.7%)	104 (22%)	66 (14%)	26 (5.5%)	24 (5%)	18 (3.8%)	8 (1.69%)	Total number 471	—
The votes for building mass configuration by gender and ethnicity									
Swedish male	59	37	10	13	7	3	4	133	30
Swedish female	56	15	16	5	6	4	0	102	23
Non-Swedish male	45	32	21	4	6	8	3	119	26.86
Non-Swedish female	47	18	13	4	4	1	2	89	20.09
Total and percentage for building mass configuration votes by age group	207 (45.7%)	102 (23%)	60 (13.5%)	26 (5.8%)	23 (5.1%)	16 (3.6%)	9 (2%)	Total number 443	—
The votes for balcony Sun orientation by gender and ethnicity									
Swedish male	57	34	10	12	6	2	4	125	30.63
Swedish female	55	18	16	4	6	4	0	103	25.24
Non-Swedish male	34	28	19	4	5	8	2	100	24.50
Non-Swedish female	40	16	14	5	4	0	1	80	19.60
Total and percentage for balcony Sun orientation votes by age group	186 (45.5%)	96 (23.5%)	59 (14.5%)	25 (6.1%)	21 (5.1%)	14 (3.43%)	7 (1.7%)	Total number 408	—
The votes for parking planning by gender and ethnicity									
Swedish male	58	33	12	14	7	3	4	131	30.04
Swedish female	58	14	17	5	7	5	0	106	24.31
Non-Swedish male	43	31	18	5	6	10	2	115	26.37
Non-Swedish female	47	13	13	4	4	1	2	84	19.26
Total and percentage for parking planning votes by age group	206 (47.2%)	91 (20.8%)	60 (13.7%)	28 (6.4%)	24 (5.55)	19 (4.3%)	8 (1.8%)	Total number 436	—
The votes for façade material by gender and ethnicity									
Swedish male	72	40	14	14	6	2	5	153	29.08%
Swedish female	64	17	17	4	8	6	0	116	22.05%
Non-Swedish male	50	40	28	5	10	11	3	147	27.94%
Non-Swedish female	54	22	18	5	8	1	2	110	20.91%
Total and percentage for façade material votes by age group	240 (45.6%)	119 (22.6%)	77 (14.6%)	28 (5.3%)	32 (6.1%)	20 (3.8%)	10 (1.9%)	Total number 526	—
The votes for balcony types by gender and ethnicity									
Swedish male	33	35	11	12	7	2	7	107	24.76
Swedish female	58	17	16	5	6	5	0	107	24.76
Non-Swedish male	43	34	22	6	8	10	2	125	28.93
Non-Swedish female	47	19	16	4	4	1	2	93	21.52

Table A2: Continued.

Voters participation by age group, gender, and ethnicity for 11 local development project physical and urban qualities	Age groups 18–25	25–30	30–40	40–50	50–60	60–70	70–80	Total gender and ethnicity participations numbers	Total gender and ethnicity participations percentage (%)
Total and percentage for balcony types building votes by age group	181 (41.9%)	105 (24.3%)	65 (15%)	27 (6.3%)	25 (5.8%)	18 (4.2%)	11 (2.5%)	Total number 432	—
The votes for façade color schemes (colorful) by gender and ethnicity									
Swedish male	57	31	13	12	6	2	6	127	30.67
Swedish female	54	13	17	4	6	4	0	98	23.67
Non-Swedish male	36	29	20	5	5	9	2	106	25.60
Non-Swedish female	45	16	13	4	3	1	1	83	20.04
Total and percentage for façade color schemes votes by age group	192 (46.3%)	89 (21.4%)	63 (15.2%)	25 (6%)	20 (4.8%)	16 (3.9%)	9 (2.2%)	Total number 414	—
The votes for façade color schemes (neutral) by gender and ethnicity									
Swedish male	60	34	12	12	6	2	4	130	30.66%
Swedish female	58	13	17	4	6	4	0	102	24.05%
Non-Swedish male	33	34	18	6	5	9	2	107	25.23%
Non-Swedish female	46	18	12	4	3	1	1	85	20.04%
Total and percentage for façade color schemes (neutral) votes by age group	197 (46.4%)	108 (25.4%)	49 (11.6%)	26 (6.1%)	20 (4.7%)	16 (3.8%)	7 (1.7%)	Total number 424	—
The votes for window articulation by gender and ethnicity									
Swedish male	76	42	12	14	6	3	6	159	31.23
Swedish female	59	20	16	4	4	5	0	108	21.21
Non-Swedish male	46	39	26	7	8	10	2	138	27.11
Non-Swedish female	56	21	14	6	4	1	2	104	20.43
Total and percentage for window articulation votes by age group	237 (46.6%)	122 (23.9%)	68 (13.4%)	31 (6%)	22 (4.3%)	19 (3.7%)	10 (1.9%)	Total number 509	—
The votes for roof type by gender and ethnicity									
Swedish male	66	36	11	14	7	2	5	141	29.68
Swedish female	59	17	18	5	7	6	0	112	23.57
Non-Swedish male	43	31	18	5	12	12	2	123	25.89
Non-Swedish female	48	20	20	4	4	1	2	99	20.84
Total and percentage for roof type votes by age group	216 (45.5%)	104 (21.9%)	67 (14.1%)	28 (5.9%)	30 (6.3%)	21 (4.42%)	9 (1.9%)	Total number 475	—
The votes for entrance articulation by gender and ethnicity									
Swedish male	55	32	12	11	6	3	4	123	30.90
Swedish female	54	13	16	4	6	4	0	97	24.37
Non-Swedish male	36	28	15	5	4	7	2	97	24.37
Non-Swedish female	41	17	13	4	4	1	1	81	20.35
Total and percentage for entrance articulation votes by age group	186 (46.7%)	90 (22.6%)	56 (11.8%)	24 (6%)	20 (5%)	15 (3.8%)	7 (1.8%)	Total number 398	—
The votes for views from balcony by gender and ethnicity									
Swedish male	71	47	10	15	7	4	6	160	29.25
Swedish female	69	27	15	4	6	6	0	127	23.21
Non-Swedish male	40	40	26	6	10	13	3	138	25.22
Non-Swedish female	63	27	17	7	4	2	2	122	22.30
Total and percentage for views from balcony votes by age group	243 (44.4%)	141 (25.8%)	68 (12.4%)	32 (5.9%)	27 (4.9%)	25 (4.8%)	11 (2%)	Total number 547	—

Appendix E

Part 2- Swedish urban environment assessment matrix

Place:

Name:

That's how you do it

1. Select the location to assess. Limit the assessment to the buildings adjacent to the site.

2. Start the assessment. The recommended approach is to methodically go through all categories (except city patterns) for each house. Make sure to count correctly!

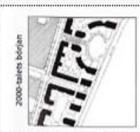
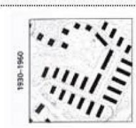
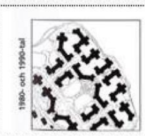
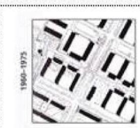
3. When all the houses are passed through, the points for each "part" are counted out.
(Example: 3 "lamella" houses and 2 "Punkhus" were noted in an area. "Lamellhus" gives 10 points, "Punkhus" gives 6 points. This means that the score for the area in the category of housing types will be 42 points. (3*10+2*6=42))

4. Calculate the average score for each category.
(Example: In the example above there were a total of 5 houses. The average score is therefore 8.4. (42/5=8,4))

5. Enter the result in the radar chart

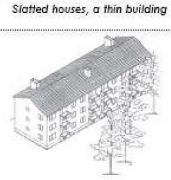
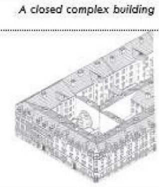
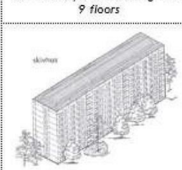
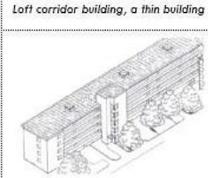
Figure A16: This figure shows five steps for utilizing the Swedish urban environment assessment matrix to assess built environment categories.

Urban Planning Patterns

	10 p	8 p	7p	6p	6p	2p	1p
	Huge courtyard district	New-modernism	Grid plan	Functionalism - narrow house	Postmodernism	Huge scale district	Other solutions
							?
The main pattern of the area							

Points	

Building Types (Multi-residential houses)

	10 p	8p	6p	3p	1p	1p
	Slatted houses, a thin building	*A closed complex building*	*High-rise residential building*	*Slab houses, a thin building of 8-9 floors*	*Loft corridor building, a thin building*	Other solutions
						?
Number						
The total points						

Total number		The total points		Average Score (Total points/total number)	

Figure A17: This figure displays two assessment matrices: one for patterns of urban planning and one for building types (multi-residential houses) in the urban environment.

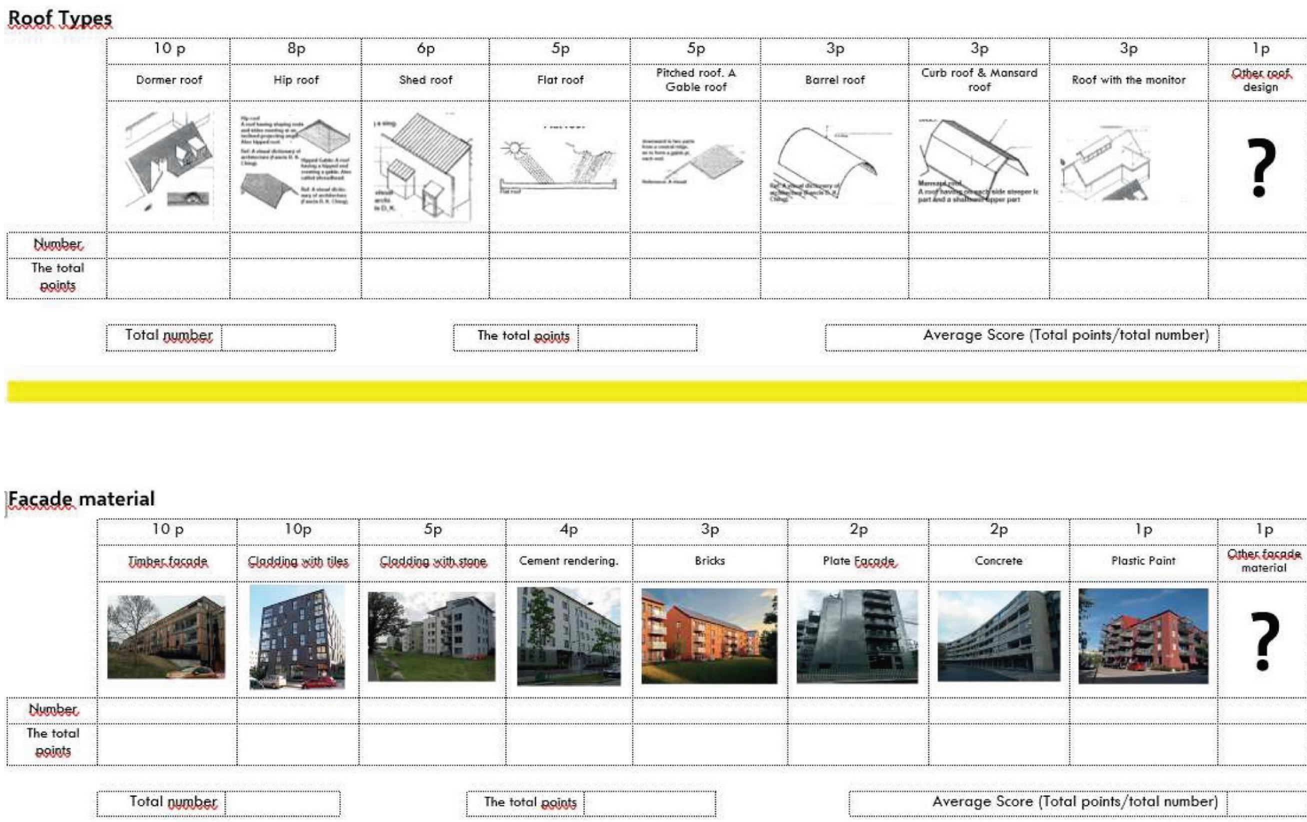


Figure A18: This figure displays two assessment matrices: one for roof types and one for façade materials in the urban environment.

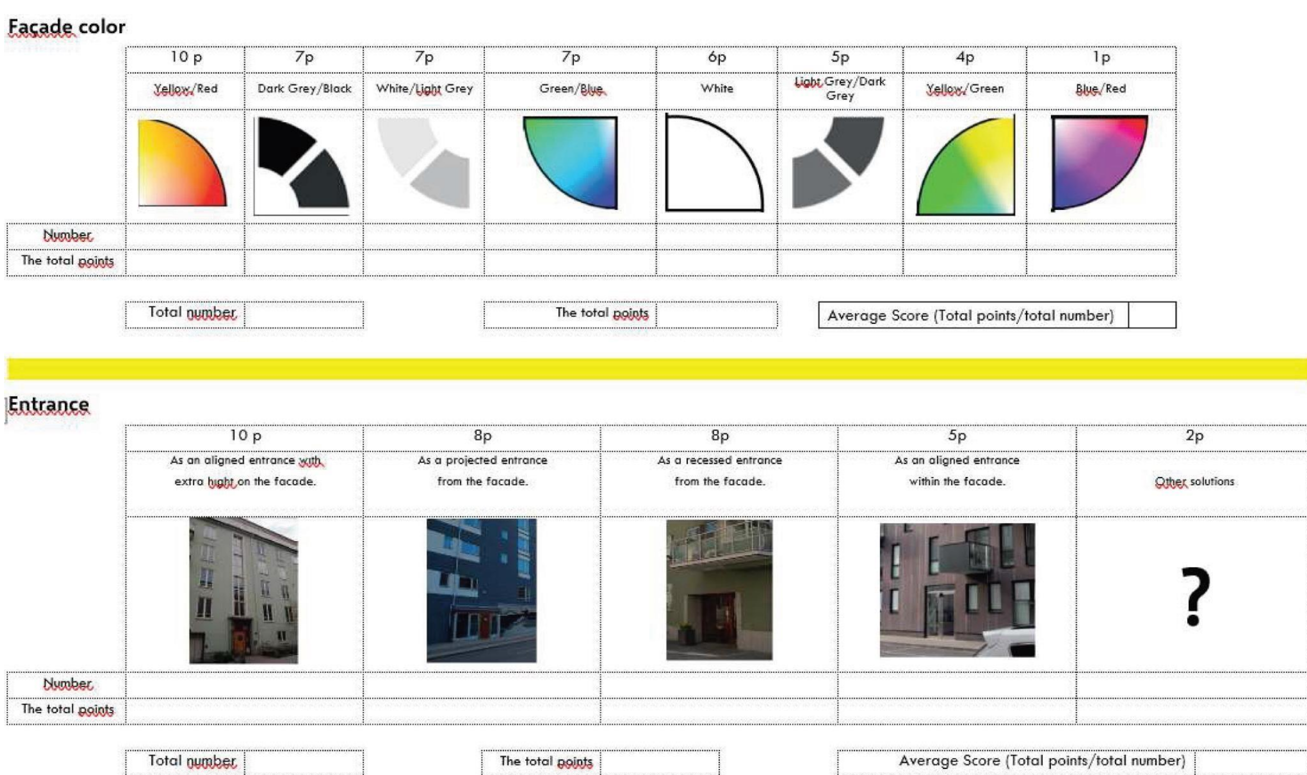


Figure A19: This figure displays two assessment matrices: one for façade color and one for entrance articulation in the urban environment.

Windows articulation

	10 p	5p	4p	3p	3p	3p	2p	2p	2p
	Asymmetric order	Balanced order	Symmetric order	Rhythmical order	Mixing order	Vertical stripes	Hierarchical order	Horizontal stripes	Another windows articulation
									?
Number									
The total points									

Total number		The total points		Average Score (Total points/total number)	

Balcony type

	10 p	8p	6p	6p	3p	2p	1p
	Front cantilevered balconies	Diagonally cantilevered balconies.	Recessed balconies.	A side cantilevered balconies.	Integrated balconies within the facade.	French type balconies.	Other balcony design
							?
Number							
The total points							

Total number		The total points		Average Score (Total points/total number)	

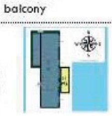
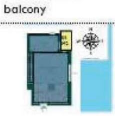
FIGURE A20: This figure displays two assessment matrices: one for window articulation and one for balcony type in the urban environment.

Type of balkongs baluster

	10 p	5p	3p	2p	2p	2p	1p	1p	1p
	Transparent &semi-transparent light tinted glass.	Metal bars.	Perforated metal sheet.	Colorful glass.	Metal sheet.	Colored perforated sheet.	Wood.	Concrete	Other solutions
									?
Number									
The total points									

Total number		The total points		Average Score (Total points/total number)	

Balcony's oreintation

	10 p	6p	3p	1p
	South oriented balcony	West oriented balcony	East oriented balcony	North-east oriented balcony
	S 	V 	Ö 	N 
Number				
The total points				

Total number		The total points		Submedium Points (Total points/totalnumber)	
				Average Score (Supplementary Points Sum/3	

FIGURE A21: This figure displays two assessment matrices: one for the type of balcony baluster and one for balcony orientation in the urban environment.

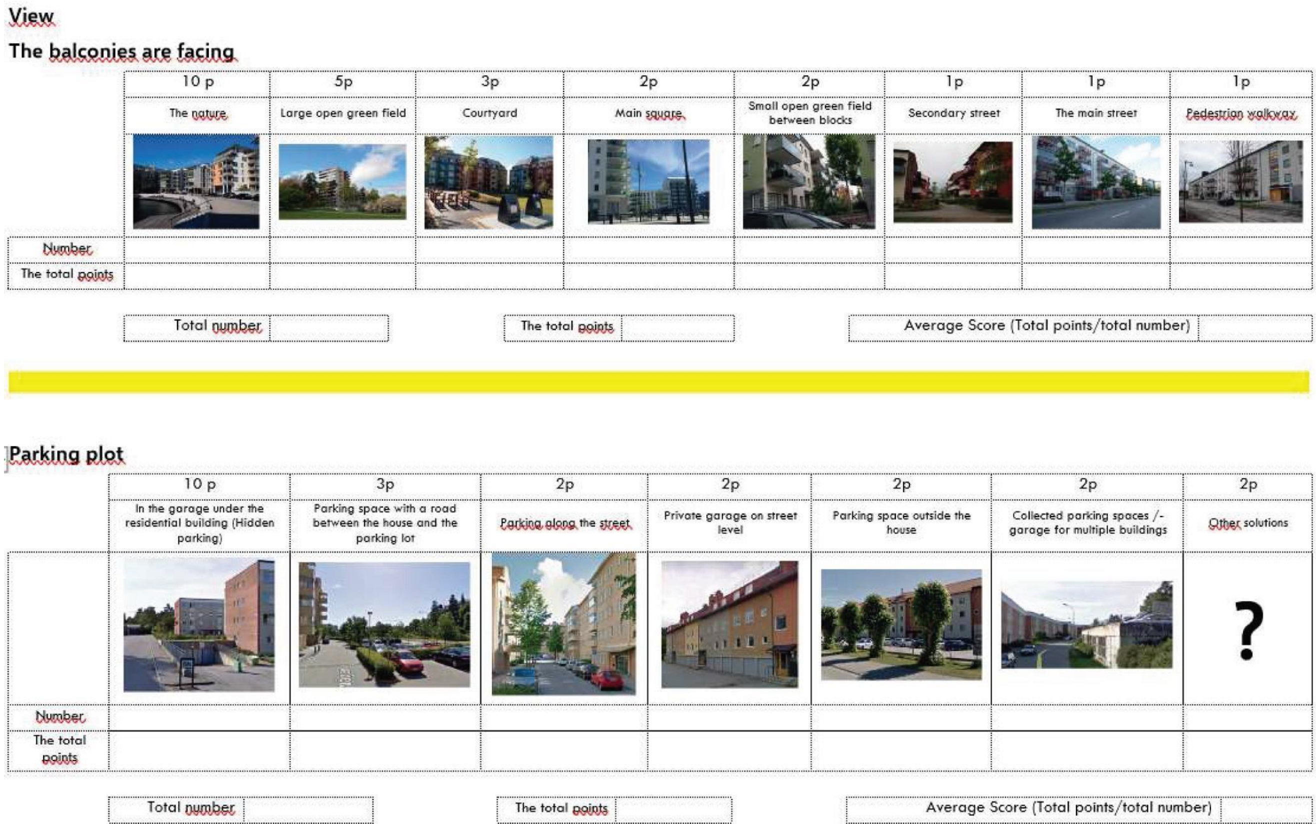
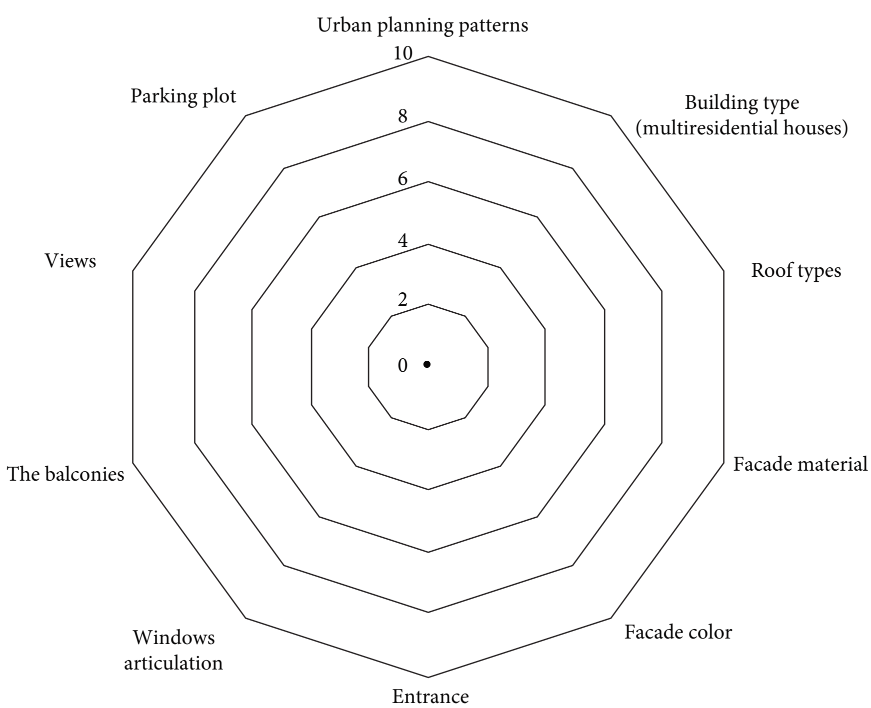


Figure A22: This figure displays two assessment matrices: one for the view from balconies and one for parking plot placement in the urban environment.



How to easily fill in right:

1. Calculate the average score for all categories.
2. Place the average score out in the chart. For example, if the average score is 4.5, place the point in the middle of the line for 5 and the line of 4 at the current category.
3. Drag lines between points.
4. The assessment is done! Now you can see where the site has potential for improvement

Tips!
Use a linear at the draw

Figure A23: This figure shows the radar chart illustrating the outcomes of the urban environment assessment matrices.

Data Availability Statement

The study's conclusions are supported by the data that are given in the publication.

Conflicts of Interest

The authors declare no conflicts of interest.

Author Contributions

Karim Najar was responsible for the general concept, methodology, writing, data collection, discussion, and conclusions. William Woxnerud assisted with the review, discussion, editing, and visualization of the final version of the publication. Ola Nylander supported the whole research process, provided various insightful opinions, and oversaw all of the text that were included in the article. Following a peer review process, all of the authors have provided their approval.

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