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Social Space Ratio: Calculating the Rate of Public Space Activities That Enhance Social Interaction on a Pedestrian Street in Karlstad, Sweden

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Abstract: William H. Whyte took on the challenge of assessing the amount of public space in a city based on its carrying capacity, pointing out that popular public spaces offer more room for social activities. However, the absence of qualitative characteristics makes this assessment even more challenging to implement. This study aims to find a method to gauge the carrying capacity of urban public spaces by calculating the social space ratio for pedestrian-only streets in Karlstad, Sweden, and quantifying this relationship. The social space ratio represents the proportion of public spaces that foster social interaction throughout their entire area. The method began by selecting the most relevant conceptual framework for social public spaces and then sought theory-based characteristics to assign to seven social activities on Karlstad's pedestrian-only streets. The authors performed a comprehensive search of the literature utilizing the PRISMA approach, gathering information from credible references, placemaking toolkits, transportation toolkits, and academic sources. This was performed to determine the weighting factors and effective social areas by evaluating these activities in terms of nine categories of the chosen framework: accessibility, traffic, social infrastructure, security, places to meet, senses and experience, architecture and aesthetics, development and maintenance, and control and programming. We devised a method to calculate the carrying capacity and social space ratio of Karlstad's pedestrian-only streets, resulting in a ratio of 0.38. The research led to the development of eight quality-control tools to analyze the seven social activities in public places. This innovative approach helps researchers and municipal planners evaluate the benefits and drawbacks of these spaces, contributing significantly to Swedish urban planning and enabling future studies to create a social area factor.

Keywords: social space ratio; social area factor; pedestrian-only streets; weighting factors

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1. Introduction

Even today, determining the correct square footage of public space has not received priority in planning even though, in the 1980s, William Whyte documented and measured public spaces and the social interactions therein. Whyte [1] argued that many planning boards are concerned about carrying capacity and worry that adding additional facilities and sitting areas may encourage excessive usage and increase pedestrian congestion; however, they need to be more concerned about the opposite—mal use, perhaps? Overuse is the main issue. The majority of urban open areas are capable of supporting more people than they are supporting currently, and there are positive examples to learn from Whyte [1]. Moreover, Whyte (1980) [1] stated that an appropriate amount of primary seating is therefore an important consideration regarding age-friendly and inclusive design.

More space promotes social comfort because it gives people and groups more room to arrange themselves, which improves perception and choice Whyte [1]. According to Sennett [2], public spaces promote human development by providing a variety of opportunities for social interaction, varied experiences, and imaginative play. Meaningful public space, as defined by Oldenburg [3], is an important alternative to our private, home, and work spaces because it may support, encourage, and stimulate social life. In addition, public spaces meet our needs for enjoyment, relaxation, and involvement (Mehta [4]). Gehl [5] also suggests that the large number of visitors who gravitate towards their public areas is a reliable indicator of successful cities. When individuals move about in the same locations, social activities take place. Observation, listening, social interaction, and both passive and active engagement are some of these activities (Gehl [5]). Some conservationists were certain that the amount of space would be the deciding factor in urban spaces. According to their view, people look for wide spaces as a break from the traffic they often encounter; thus, it seems logical that the areas with the most light and space would draw the most visitors (Whyte [1]). Gehl, J. [5] asserted that areas with the highest traffic density also make the most efficient use of the available space; while Whyte [1] argued that people determine the level of crowding.

Whyte argued that if we ranked plazas by the amount of space, there would surely be a positive correlation between the size of the public spaces and the number of people using them, but there was no clear relationship. Whyte [1] discovered, after much investigation, that the busiest plazas typically contain significantly more seating than less frequented ones; but the relationship is rough. A foot of concrete ledge is equal to a foot of pleasant bench space, which is one of the reasons Whyte [1] said that there are no qualitative considerations in determining the quantity of sitting space. Whyte [1] thought of allocating a certain number of points for each foot of a bench with a backrest, armrests, and so on. This may have resulted in a more harmonious alignment between the seating area and the space's appeal (Whyte [1]).

There is a growing understanding that having both good quality and an adequate amount of public space is essential for the social and psychological health of contemporary communities (Mehta [4]).

But urban planners, architects, designers, and experts in urbanism have long placed a high value on public space quality more than quantity. Zhang et al. (2023) [6] developed a SEM-based "social–ecological model" framework for identifying factors influencing the vitality of public open spaces, based on 34 eligible articles from 970 papers, with nine articles [7–15] investigating the impact of open space quantity. While key qualities identified by researchers include the following: control, access, and equality (Lynch and Carr [16]); inclusivity, meaningfulness, safety, comfort, and enjoyment (Mehta [4]); and various qualitative approaches such as permeability and safety (Jacobs [17]); fit, control, access, and sense (Lynch [18]); and variety, permeability, and personalization (Bentley et al. [19]). Other significant qualities include the following: liveability and dignity (Jacobs and Appleyard [20]); security and comfort (Francis [21,22]); availability and safety (Carr [23]); accessibility and mixed uses (Tibbalds [24]); visibility (Nasar [25]); comfort and activity opportunities (Gehl [26]); recognition and uniqueness for individuals with mental disabilities (Burton and Mitchell [27]); microclimate comfort and inclusiveness (Shaftoe [28]); and a comprehensive assessment of development, social infrastructure, traffic, security, architecture and senses, and place to meet (Woxnerud [19,29]).

The focus of this research is on effective capacity, the authors are trying to "quantify the carrying capacity of urban social public spaces that are open and accessible at a given spot during periods of high usage". Widok, A.H. [30] stated that, it is crucial to quantify sustainability to ensure its practical implementation, rather than simply treating it as a meaningless buzzword.

Ewing, R., and S. Handy [30], in their study, attempted to comprehensively and objectively measure the subjective qualities of the urban street environment. Using ratings from an expert panel, it was possible to measure five urban design qualities in terms of the

physical characteristics of streets and their edges: imageability, enclosure, human scale, transparency, and complexity [30].

Twelve researchers examined the elements affecting the vitality of public open spaces from a quantitative perspective. From 2016 to 2022, eleven researchers identified park size and area as determinants affecting the viability of public open spaces [7,10–13,31–34]. According to a study, the proportion of open public spaces also has an impact [8].

In his book, *The Social Life of Small Urban Spaces*, Whyte [1] attempted to quantify the carrying capacity of urban social public spaces by connecting the plaza's size with the quantity of seating areas. Figure 3 in his book indicates that, on the busiest plazas, seating areas comprise between 6 and 10 percent of the overall open space. For more comparisons, Whyte [1] resorted to linear feet. Compared to square feet, this measurement of seating area is more accurate and insightful. Whyte [1] suggests that urban plazas should provide at least 1 linear foot (30.48 cm) of seating per 30 square feet (2.79 m^2) of plaza area, with even more seating recommended for through-block or street-fronted plazas, where 2.25 feet (68.6 cm) of seating is suggested per 40 square feet (3.72 m^2) of area. Therefore, Whyte [1] recommends that outdoor cafés can occupy up to 20 percent of the open space; if they supply a kiosk, its area should not surpass 13.93 square meters. Additionally, developers are required to plant a tree for every 25 feet of walkway (Whyte [1]). According to Whyte [1], to discourage strip plazas, the plaza width must not be less than a third of their length. There shall be facilities for parking two bicycles for every 92.9 m^2 of primary space (Whyte [1]). These data were obtained from a study in a large city with a dense downtown population. Although this density presents challenges, it also offers a substantial pool of potential customers for open spaces across most of the central business area. Even when 3000 people visit a site per hour, many design errors may still occur. The authors of this paper noticed that the density is lower in smaller cities, such as Karlstad city center, where only 1500 people visit per hour. Whyte [1] states that lower density, slower-moving pedestrians, and less social contact are characteristics of smaller cities, as opposed to high-traffic places. Pedestrian patterns are comparable in most other ways (Whyte [1]). This suggests that supply is an important factor.

There was also a consistent proportion of people sitting compared to people standing or moving. Given the smaller urban context of Karlstad, it is necessary to reduce the size of the measures mentioned by Whyte.

This research will assign characteristics to seven social activities that occur on Karlstad's pedestrian-only streets. The main methodologies in this study will be both a qualitative and a quantitative approach. We can quantify intangible qualities using existing statistics or by conducting new research. This paper restricts its calculation of public open space to the city center's pedestrian-only streets in Karlstad. This paper focuses on all public spaces that encourage public usage and active or passive social behavior. In this paper, public spaces refer only to the open areas between buildings in Swedish and other small Nordic cities.

The objectives were as follows:

1. Determine the weighting factors and effective social areas (sociable areas) of public spaces on a point basis of quality using theories and practices supported by empirical data.
2. Determine a method for measuring the carrying capacity of urban public spaces by calculating the social space ratio for Karlstad's pedestrian-only streets.
3. Provide urban planners and municipal authorities in Sweden with a tangible tool to assess and enhance the social utility of public spaces, which can foster community interaction and enhance social cohesion among city dwellers.

The researchable question:

1. How high are the rate of public space activities that enhance social interaction, to the whole area, "the social space ratio", of Karlstad's pedestrian-only streets'?

2. Method

This study will be carried out in the five steps shown in Figure 1. After the figure, there is a more detailed explanation of what each part entails.

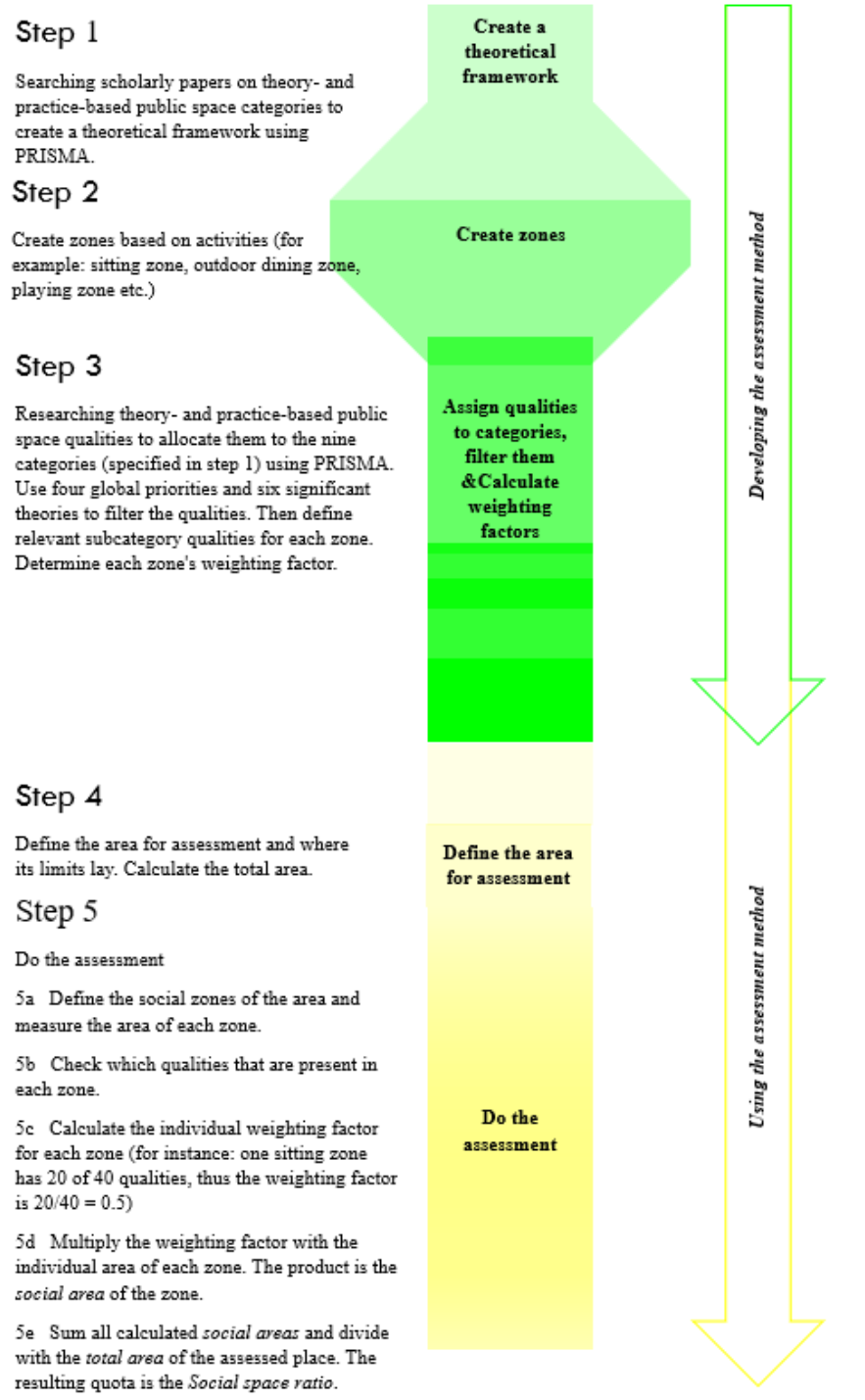


Figure 1. Simplified flow chart of this study. Each step is further explained in text below.

2.1. Developing the Assessment Method

The first and third steps of the method involved a thorough review of the literature. This systematic review employed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) method to identify and scrutinize relevant material. PRISMA is a systematic approach to reviewing literature, consisting of four steps: identification,

screening, eligibility, and inclusion. In the first step, the authors searched for an appropriate theoretical framework. In the third step, they conducted a search for qualities prevalent in public spaces. In both steps, they examined academic and practice-based scholarly papers. The challenge was to move from highly qualitative definitions of urban design to more operational definitions that have been implemented in real-world projects.

2.1.1. Step 1—Searching for Scholarly Papers on Theory- and Practice-Based Public Space Qualities to Create a Theoretical Framework Using PRISMA

During the identification phase, Boolean operations were used to search Google Scholar for scholarly papers related to keywords like "quality criteria", "assessment method", "conceptual framework for social public spaces", and "public-space quality". From an initial pool of 20 researchers, the authors evaluated abstracts, methodologies, and full texts to ensure they met the inclusion criteria, focusing on peer-reviewed studies proposing qualities essential for identifying effective public spaces that promote social behavior. Only articles in English or Swedish were considered, emphasizing the vitality and sociability of public areas. This process yielded 12 articles (refer to Table 1), but eight were excluded for assigning fewer than five qualities to public spaces.

The remaining four were analyzed thoroughly, with Woxnerud (2022–2024) [29,35] selected due to the development of an evidence-based assessment method tailored to Swedish conditions. This method identified eight categories—architecture and aesthetics, places to meet, social infrastructure, accessibility, traffic, security, senses and experiences, and development. An additional category, "maintenance, control, and programming", was added based on Lynch and Carr [16], Carr [23], and Lynch [18].

Table 1. The display of twelve articles provides details about the author, date, and the qualities of ideal public spaces, according to the researchers.

Year	The Authors	A Good Public Place Has:							
1979	Lynch & Carr [16]	control	access	equality					
2014	Mehta [4]	inclusivity	Meaningfulness	safety	comfort	Pleasurability			
1961	Jacobs [17]	permeability	safety						
1984	Lynch [18]	fit	access	control	sense				
2013	Bentley et al. [19]	variety	permeability	personalization					
1987	Francis [21,22]	security	comfort						
1992	Carr [23]	Easily accessible	Safety and security	Physiologically comfortable	Democratic	Sense of attachment	Programmes		
2022	Woxnerud [29,35]	accessibility	traffic	social infrastructure	security	places to meet	senses and experience	architecture and aesthetics	development
1992	Tibbalds [24]	accessibility	mixed uses						
2002	Gehl [26]	Protection	Comfort	Enjoyment					
2006	Burton & Mitchell [27]	recognition	uniqueness						
2012	Shaftoe [28]	microclimate	comfort	inclusiveness	Animation Individuality	uniqueness			

These nine categories were confirmed by comparing them with factors identified by Zhang et al. (2023) [6] from a social–ecological model framework and based on a thorough analysis of 34 relevant publications out of a total of 970 papers [6].

This survey uses nine categories:

- Accessibility verified using [7–11,13–15,31,32,36–48] results.
- Verified architecture and aesthetics using [7,13,14,33,36,39–42,48–52] results.
- Development evaluated and verified using [9,13,37,39,41,44,47,53,54] results.
- Validated and verified places to meet using [10,14,31,32,39,54] results.
- Verified maintenance, control, and programming with [9,12,31,32,37,55] results.
- Verified security with [9,12,13,31–33,36,42,44,46,51,54] results.

- Validated senses and experience with [7,10,11,13–15,32,37–39,41,42,44–49,51,54,55] results.
- Social infrastructure verified with [7–10,12–14,32–34,36–38,40,42–44,46–48,50–52,55,56] results.
- Verified traffic with [7,9,11,34,36,37,52] results.

These categories facilitate the analysis of results, allowing for a detailed examination of subcategories if certain areas lack qualities, such as a seating zone that is accessible but lacks security.

2.1.2. Step 2—Creating Zones

- Gehl [57] identifies three types of public space activities: necessary, optional, and social, with optional and social activities being crucial for city quality. Social activities occur when people share spaces, engaging in observation, interaction, and both passive and active participation (Gehl [57]). A successful city offers a variety of essential and enjoyable optional activities, fostering ample social interaction due to the high number of people (Gehl [57]).
- To assess public spaces, the area is divided into zones based on social activities, such as sitting, standing, or waiting. These zones were derived from the literature and categorized into designated areas, like moving, outdoor dining, parking, playing, sitting, standing, and waiting (Figure 2).

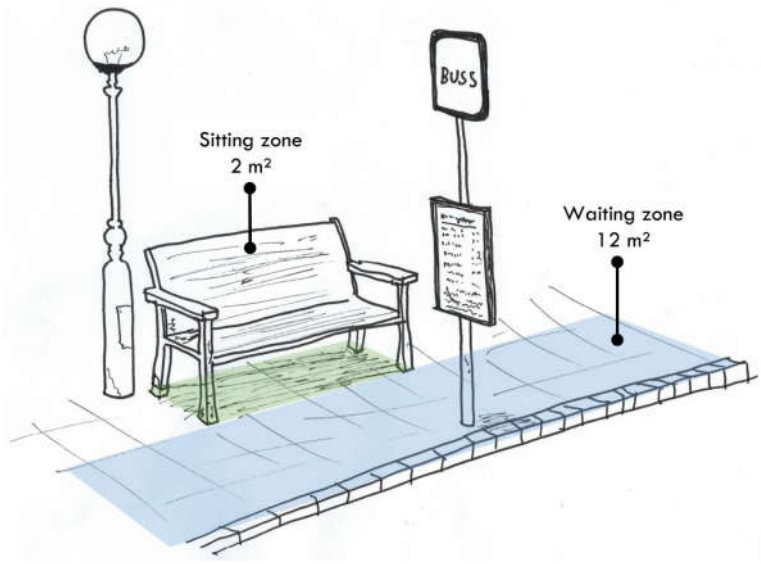


Figure 2. Example of dividing a place into social zones. Image created by (author).

Each zone is matched with relevant subcategories (e.g., accessibility, architecture) to identify applicable qualities. For instance, not all "traffic" qualities apply to outdoor dining areas. The next step determines the "value" of each relevant quality. These social activities will be measured in square meters to determine their area in the assessment.

2.1.3. Step 3—We Assign Qualities to Each of the Nine Categories (Defined in Step 1) across the Different Activity Zones (Defined in Step 2), Drawing on 110 Extensive Empirical Research Studies and Scholarly Works

In the identification phase, Step 3 of the research employed Boolean operations on Google Scholar to find articles related to the qualities of public places, focusing on categories like "architecture and aesthetics", "places to meet", "maintenance, control, and programming", "social infrastructure", "accessibility", "traffic", "security", "senses and experiences", and "development". The initial search identified 324 qualities from over 110 researchers (see Table 2).

Table 2. This table summarizes the PRISMA method's four phases—identification, screening, eligibility, and inclusion—in assigning key characteristics to each of the nine categories across different activity zones [1–5,16–30,35,57–122].

Identification			Screening		Eligibility	Inclusion		Assigning Relevant Qualities to Each of the Nine Categories in Different Activity Zones.								
Scholarly Papers	**More than 110 References**	**Qualities-Numbers**	**Nine Categories/Woxnerud (2022–2024)**	**Six Critical Theories and Global Priorities**	**Chosen Numbers of Qualities for Each Category.**	**The Activity Zones**	**Total Quali-ties**	**Ac**	**Ar**	**De**	**MCP Pl**	**Se**	**Sen**	**So**	**Tr**
Academic studies, references, Placemakin-gtoolkits, transportati-on toolkits, and quality standards.	Whyte, W.H. 1980; Sennett, R. 2021; Oldenburg, R. 1981; Mehta, V. 2014; Gehl, J. 2013; Lynch, K.; Carr, S. 1979; Jacobs, J. 1961; Lynch, K. 1984; Bentley, I.; McGlynn, S.; Smith, G.; Alcock, A.; Murrain, P. 2013; Jacobs, A.; Appleyard, D. 1987; Francis, M. 1987; Francis, M. 1989; Carr, S. 1992; Tibbalds, F. 1992; Nasar, J.L. 1990; Gehl, J.; Søholt, H. 2002; Burton, E.; Mitchell, L. 2006; Shaftoe, H., 2012; Woxnerud, W. 2022; Woxnerud; Najar, K.; Nylander, O. 2024; Gehl, J. 1980; (n.d.)., N.N., 2023; [SCB]., S.S. december 2022; Bauer, K. 2000; Boussauw, K.; Neutens, T.; Witlox, F. 2012; Cushing, D.F.; Miller, E. 2019; Perrault, E.; Lebisch, A.; Uittenbogaard, C.; Andersson, M.; Skunke, M.; Segerström, M.; Svensson, P.; Pere, P.-P. 2024; Stevens, B.; Franck, L.; Gibbins, S.; McGrath, P.J.; Dupuis, A.; Yamada, J. 2007; Rockefeller Philanthropy Advisors, Inc. 2016; Madden, K.; Schwartz, A. 2000; Active Design Guidelines. 2010; Peyton, A. 2019; PPS. 2015; Purciel, M.; Neckerman, K.M.; Lovasi, G.S.; Quinn, J.W.; Weiss, C.; Bader, M.D.; Ewing, R.; Rundle, A. 2009; Rodríguez, D.A.; Joo, J. 2004; Rundle, A.; Roux, A.V.D.; Freeman, L.M.; Miller, D.; Neckerman, K.M.; Weiss, C.C. 2007; Whyte, W.F. 1979; Franck, K.; Stevens, Q. 2006; Ciolek, M.T. 1978; Coley, R.L.; Sullivan, W.C.; Kuo, F.E. 1997; Grey, A.L. 1970; Hass-Klau, C. 1994; Joardar, S.; Neill, J. 1978; Lynch, K. 1960; Mehta, V. 2007; Sullivan, W.C.; Kuo, F.E.; Depooter, S.F. 2004; Hester, R.T. 1984; Hester, R.T. 1993; Jacobs, J. 1961; Loukaitou-Sideris, A.; Ehrenfeucht, R. 2011; Seamon, D. 2015; Alexander, C. 2018; Cooper, C.C. 1975; De Jonge, D. 1967; De Jonge, J.A. 1968; Rapoport, A. 2013; Gehl, J. 1987; Linday, N. 1978; Woodcraft, S.; Hackett, T.; Caistor-Arendar, L. 2011; Clarke, A.; Dornfeld, M.J. 1994; Craig, C.L.; Brownson, R.C.; Cragg, S.E.; Dunn, A.L. 2002; Gehl, J.; Matan, A. 2009; Hope, T.; Shaw, M.H.M. 1988; Newman, O. 1973; Perkins, D.D.; Meeks, J.W.; Taylor, R.B. 1992; Perkins, D.D.; Wandersman, A.; Rich, R.C.; Taylor, R.B. 1993; Pucher, J.; Dill, J.; Handy, S. 2010; Skogan, W.G.; Maxfield, M.G. 1981; Arnold, H. 1993; Barker, R. 1968; Bell, P.; Fisher, J.; Baum, A.; Green, T. 1990; Bosselmann, P.; Flores, J.; Gray, W.; Priestley, T.; Anderson, R.; Arens, E.; Dowty, P.; So, S.; Kim, J.-J. 1984; Elsheshtawy, Y. 1997; Heath, T.; Smith, S.; Lim, B. 2000; Lang, J. 1987; Porteous, J.D. 2013; Rapoport, A. 1969; Rapaport, A. 1977; Zacharias, J.; Stathopoulos, T.; Wu, H. 2001; Banerjee, T.; Loukaitou-Sideris, A. 1992; Liebermann, E. 1984; Maslow, A.H.A. 1943; Maslow, A.H. 1954; Gehl, J.; Gemzoe, L.; Kirknaes, S. 2008; MacKay, M. 2003; RE, I.; et al. 2009; Ridgers, N.D.; Stratton, G.; Fairclough, S.J.; Twisk, J.W. 2007; Gehl, J. 2013; Lund, H.; Willson, R.W.; Cervero, R. 2006; Shaw, L. 2016.	324		Affordance												
			Accessibility (No.46).	Prospect-refuge	Accessibility (No.23).											
			Traffic (No.21)	Personal space	Traffic (No.11)	Moving zone	35	5	4	3	2	3	6	6	3	3
			Social infrastructure (No.34)	Sense of place	Social infrastructure (No.19)	Outdoor dining zone	33	5	4	2	1	3	5	6	4	3
			Security (No.53)	Place attachment	Security (No.29)	Parking zone	31	6	4	2	1	3	5	3	4	3
			places to meet (No.28)	Biophilic design	places to meet (No.15)	Playing zone	34	5	4	3	1	3	5	6	4	3
			Senses and experience (No.65)	*Global priorities*	Senses and experience (No.24)	Sitting zone	35	5	4	3	2	3	5	6	4	3
			Architecture and aesthetics (No.43)	Salutogenic design	Architecture and aesthetics (No.14)	Standing zone	34	4	4	3	2	4	5	6	4	3
			Development (No.22)	Child-friendly design	Development (No.13)	Waiting zone	33	5	4	2	1	3	5	6	4	3
			(Maintenance, Control, and Programming) (No.12)	Age friendly and inclusive design	(Maintenance, Control, and Programming) (No.3)											
				Sustainable design												

During the first screening phase, these qualities were categorized into nine groups: 46 for accessibility, 21 for traffic, 34 for social infrastructure, 53 for security, 28 for places to meet, 65 for senses and experiences, 43 for architecture and aesthetics, 22 for development, and 12 for maintenance.

In the second screening, duplicates were removed, and a two-part filter based on four global priorities and six significant theories (Cushing and Miller, 2019) [58] was applied (see Table 3). This reduced the list to 151 qualities. These were further divided as follows: 23 for accessibility, 11 for traffic, 19 for social infrastructure, and so on (see Table 2).

Table 3. The two-part filter used to ensure the quality of the developed questions. Each filter quality comes with a simplified explanation. Source: [25].

Filter Quality		Assigned Color	Simplified Explanation	Source
Six critical theories	Affordance		Does the layout of the place give cues to how it should/can, and shouldn't/can't, be used?	[25]
	Prospect-refuge		People feel safer when they can observe without being observed. Does the design of the place make this possible?	
	Personal space		Each culture has a built-in "distance scale" in which personal, social, and public distances differ. Does the design consider this?	
	Sense of place		Some places have a special, unique characteristic. Are the special values of the place brought forward through design?	
	Place attachment		Place attachment features all the elements that help people develop emotional bonds with the place.	
	Biophilic design		Humans have a need for connection with nature. Studies have shown that nature has a healing effect. Does the design consider this?	
Global priorities	Salutogenic design		People in general need to live healthier lifestyles. Does the place enable this?	
	Child-friendly design		Games and playing are very important for children's development. It is therefore important that the place enable this.	
	Age friendly and inclusive design		The world's population is getting older, and it is therefore increasingly important that places are accessible for everyone.	
	Sustainable design		To combat ongoing climate change, there is a need to rethink the design of public places and enable green transportation, etc.	

In the final inclusion phase, the authors assigned qualities to different activity zones, such as 35 for sitting and 34 for playing (see Table 2).

The weighting factors for each activity zone were calculated after the authors selected the relevant number of qualities from the remaining 151 in the final inclusion step. The site assessment multiplier for each quality depended on this factor. For example, in Table 2, 35 qualities apply to a sitting zone, and each quality is assigned a weighting factor of $1/35 = 0.028$.

2.2. Using the Assessment Method

2.2.1. Step 4—Define the Area for Assessment

To use the method, one first needs to define which area is to be assessed. This is important to obtain a reliable total area, which is crucial in the calculation of the social space ratio.

Case study: Pedestrian-only streets in Karlstad city center

In this study, pedestrian-only streets in Karlstad city center were studied. Karlstad, the capital of Värmland län, is located on the island of Tingvalla, near Lake Vänern, and was chartered in 1584 by Charles IX. and the municipality has almost 100,000 inhabitants. This makes Karlstad Sweden's 23rd largest municipality [60]. In this study, the pedestrian parts of Drottninggatan , Tingvallagatan and Västra Torggatan, as well as the town square Stora Torget, were studied; see Appendix B, Figures A1–A4.

2.2.2. Step 5—Do the Assessment

To conduct the assessment, there are five steps. These are as follows:

5a—Define the social zones of the area

The first step is to define the social zones of the area and measure their individual areas in square meters.

5b—Check which qualities are present in each zone

After defining and measuring the zones, each zone was assessed based on the relevant qualities identified in Step 3. For example, sitting zones were evaluated according to their applicable qualities. The authors visited pedestrian-only streets in Karlstad city center three times during July, spending six hours each visit (10 a.m. to 4 p.m.) on sunny days to assess zone qualities and count the hourly foot traffic.

5c—Calculate the individual weighting factor for each zone.

After verifying the number of fulfilled qualities in Step 5b, the individual weighting factor for each zone is calculated. This differs from the weighting factor in Step 3. Here, the number of fulfilled qualities is multiplied by the zone's weighting factor from Step 3. For example, if a sitting zone fulfills 11 qualities and the weighting factor is 0.05, the individual weighting factor will be $11 \times 0.05 = 0.55$.

5d—Calculate the social areas

In this step, each zone's individual weighting factor is multiplied by the zone's area. For instance, if the previously mentioned sitting zone (with an individual weighting factor of 0.55) has an area of 2 m^2, then the social area of the zone will be: $0.55 \times 2 = 1.1$ m^2.

5e—Calculate the Social space ratio

In this step, the sum of all social areas is divided by the total area of the assessed site. The extent of the total area is determined by the boundaries made in Step 4. The total area includes all the streetscape within these boundaries, i.e., the areas not covered by the social zones.

3. Results

3.1. Development of the Assessment Method

The identified quality filters are presented in Tables 4–12, sorted by nine categories.

Accessibility

Table 4. The qualities associated with the subcategory "accessibility" compared with the filter. Sources: Bauer (2000) [61], Boussauw (2012) [62], Cushing and Miller (2019) [58], [63] Perrault et al., Franck and Stevens (2007) [64], Gehl (2013) [5], Initiative and Officials (2016) [65], Madden (2018) [66], Mehta (2014) [4], York (2010) [67], Peyton (2019) [68], PPS (2015) [69], Purciel (2009) [70], Rodriguez (2004) [71], Rundle (2007) [72], Whyte (1979) [73].

Quality		Source[s]	Filter Quality	
			Six Critical Theories	Global Priorities
Ac1	Supportive wayfinding and distinctive signage are key to ensuring sustainability (Cushing and Miller, 2019).	[58]		

Table 4. *Cont.*

Quality		Source[s]	Filter Quality: Six Critical Theories / Global Priorities
Ac2	Sidewalk widths should be consistent with their use (Bauer, 2000; Boussauw, 2012; Purciel, 2009; Rodriguez, 2004).	[61,62,70,71]	
Ac3	Equal access to transportation and spaces. More autonomy and independence for vulnerable groups (PPS, 2015).	[69]	
Ac4	A clear path on the sidewalks that meets accessibility and pedestrian volume requirements (Peyton, 2019).	[68]	
Ac5	There is enough room for two people to walk side by side on sidewalks (Peyton, 2019).	[68]	
Ac6	Is the space accessible? (Gehl, 2013)?	[5]	
Ac7	Is there any physical element that might enhance or limit personal mobility when walking, sitting in a wheelchair, or pushing a stroller? (Gehl, 2013)?	[5]	
Ac8	Are shared spaces accessible to everyone (Placemaking in the Nordics, 2020)?	[63]	
Ac9	How accessible the space is to varying individuals and groups and how well their various activities and behaviors are supported or not (Franck and Stevens, 2007; Mehta, 2014).	[4,64]	
Ac10	Is there at least one path of travel for the physically disabled to major portions of primary space with a minimum width of 1.5 m? (Whyte, 1979)?	[73]	
Ac11	Does the space function for people of all ages and abilities? (Madden, 2000)?	[66]	
Ac12	Is it clear how to move through space without illogical detours? (PPS, 2015)?	[69]	
Ac13	Do public spaces enforce the right to public urban amenities regardless of age, gender, income, or ethnicity? (Placemaking in the Nordics, 2020)?	[63]	
Ac14	Is there space for wheelchair seating, and can people in wheelchairs easily access any features or viewing platforms? (Cushing and Miller, 2019)?	[58]	
Ac15	Park signage should use simple language and symbols to communicate the rules to young people (Cushing and Miller, 2019).	[58]	
Ac16	Did the planner understand that well-designed cycling networks offer independence to young people and allow families to enjoy more freedom? (Peyton, 2019)?	[68]	
Ac17	Provide accessibility ramps and tactile paving to assist the visually impaired (Franck and Stevens, 2006).	[74]	
Ac18	Was the planner aware that in cities where cycling is a safe and attractive way to travel, it serves the needs of children? (Peyton, 2019)?	[68]	
Ac19	Provide marked, measured walking paths on sites as part of a wayfinding system targeted at pedestrians and bicyclists (York, 2010).	[67]	
Ac20	Create paths that are smooth, sufficiently wide, and that have curb cuts and a turning radius adequate for a wheelchair or walker (York, 2010).	[67]	
Ac21	Locate buildings and building entrances near public transit stops and along transit corridors (Rundle, 2007).	[72]	
Ac22	Provide signage at buildings, transit stops, and major intersections showing a map and the distance, time, route, and calories burned to the nearest or next transit stop (York, 2010).	[67]	
Ac23	Provide parking for people with disabilities (York, 2010).	[67]	

Legend:

Affordance	Personal space	Sense of place	Salutogenic design	Child-friendly design	Age friendly and inclusive design	Sustainable design

Architecture and aesthetics

Table 5. The qualities associated with the subcategory "architecture and aesthetics" compared with the filter. Sources: Ciolek (1978) [75], Coley et al. (1997) [76], Cushing and Miller (2019) [58], Placemaking in the Nordics (2020) [63], Grey et al. (1970) [77], Hass-Klau et al. (1999) [78], Joardar and Neil (1978) [79], Lynch (1960) [80], Mehta (2007) [81], Mehta (2014) [4], Peyton (2019) [68], PPS (2015) [69], Sullivan et al. (2004) [82], Whyte (1979) [73], Whyte (1980) [1].

Quality		Source[s]	Filter Quality	
			Six Critical Theories	Global Priorities
Ar1	Are there any pleasant sensory stimuli perceived from the space, like other people and activities, building features and personalized shop windows, signs, trees, and the density and variety of form, texture, and color of shrubs and plants? (Ciolek, 1978; Coley et al., 1997; Grey et al., 1970; Hass-Klau et al., 1999; Joardar and Neil, 1978; Mehta, 2007; Sullivan et al., 2004; Whyte, 1979; Whyte, 1980)?	[1,73,75–79,81,82]		
Ar2	Is there a sense that the place possesses a varied and mixed architectural typology, including old and newly constructed buildings, adding to its identity? (Placemaking in the Nordics, 2020)?	[63]		
Ar3	Do the physical elements in the spaces correspond to the size of our bodies and body parts? Spaces achieve human scale by way of the size, texture, and patterns of the materials and elements that make up the floor, vertical edges, and overhead elements, as well as any fixed or movable elements (Mehta, 2014; Whyte, 1979).	[4,73]		
Ar4	Does the space feel like an enclosure? This means it has a room-like quality that evokes the feeling of being "inside" the space as opposed to being outside of it (Mehta, 2014).	[4]		
Ar5	Does public space provide community members with a sense of belonging (PPS. 2015)? Place identity shapes a person's sense of self, as well as their perception of their community's history, social life, and how they see themselves (PPS, 2015).	[69]		
Ar6	Does a physical object possess a "quality that gives it a high probability of evoking a strong image in any given observer" (Lynch, 1960)? "Most imageable places are ones where several factors come together to create a coherent impression" (Lynch, 1960). "It is that shape, color, or arrangement that facilitates the making of vividly identified, powerfully structured, highly useful mental images of the environment" (Lynch, 1960).	[80]		
Ar7	The unique sense of place should also be reinforced through framed views of the surroundings, references to the historic and contemporary cultural context, and design themes (Cushing and Miller, 2019).	[58]		
Ar8	A multi-use trail should: provide benches or platforms for people to safely sit on the side to watch others or simply rest; incorporate good sight lines at corners and intersections (Cushing and Miller, 2019).	[58]		
Ar9	Did the designer take into account textures, materials, paving, color, lighting, wayfinding, and interactive elements? (Peyton, 2019)?	[68]		
Ar10	Is the public space beautiful? Is it evident that there is good design both in terms of how things are shaped as well as their durability? (Gehl, 2013)?	[5]		
Ar11	The design should incorporate local materials for paving surfaces, seating, retaining walls, plantings, fences and railings, signage, and sculptures (Cushing and Miller, 2019).	[58]		
Ar12	Consider the prospect and ensure pillars do not block a seated view of an arriving bus and integrate recesses, so rubbish skips do not block the path of travel (Cushing and Miller, 2019).	[58]		
Ar13	Refuge can be enhanced for older people through thoughtful bench design (armrests and higher seats), while digital visual displays of arrival and departure times benefit people with hearing impairments, dementia, or autism sensory disorders (Cushing and, Miller 2019).	[58]		

Table 5. *Cont.*

Quality		Source[s]	Filter Quality	
			Six Critical Theories	Global Priorities
Ar14	Trail surfaces should also be appropriate for the intended uses (Cushing and Miller, 2019).	[58]		

Legend:

Affordance	Personal space	Sense of place	Salutogenic design	Child-friendly design	Age friendly and inclusive design	Sustainable design

Development

Table 6. The qualities associated with the subcategory "Development" compared with the filter. Sources: Cushing and Miller (2019) [58], Placemaking in the Nordics (2020) [63], Hester (1984) [83], Hester (1993) [84], Jacobs (1961) [85], Loukaitou-Sideris and Ehrenfeucht (2011) [86], Madden (2000) [66], Mehta (2014) [4], Oldenburg (1989) [3], Peyton (2019) [68], PPS (2015) [69], Seamon (1980) [87], Whyte (1980) [1].

Quality		Source[s]	Filter Quality	
			Six Critical Theories	Global Priorities
De1	Can public spaces serve as a venue for protests and activism where people can engage, collaborate, and exercise their democratic and civic rights? (PPS, 2015)?	[69]		
De2	Regardless of income or position, can public spaces serve as venues for meetings, discussions, demonstrations, and public advocacy (Loukaitou-Sideris and Ehrenfeucht, 2011)?	[86]		
De3	Are public spaces suitable for organizing events like parades, music festivals, holiday celebrations, and outdoor art shows? People-oriented streets can connect the community's cultures and interests, further enhancing each main street's unique character (PPS, 2015).	[69]		
De4	Do public spaces attract different kinds of people at different times, making them livelier? (Placemaking in the Nordics, 2020)?	[63]		
De5	Has the environment the ability to satisfy special needs to gather, display, express, discuss, debate, demand, and protest (Jacobs, 1961; Mehta, 2014; Seamon, 1980)?	[4,85,87]		
De6	Are public spaces capable of promoting social interaction and fostering community cohesion? (PPS, 2015)?	[69]		
De7	Are public spaces suitable to serve as a community's main gathering place and a focal point for a neighborhood's distinct social activities? (PPS, 2015)?	[69]		
De8	Does the space accommodate various types and sizes of events? (Madden, 2000)?	[66]		
De9	Does the planner realize that games, play, and art provide opportunities for their development? (Peyton, 2019)?	[68]		
De10	Did the planner realize that other elements, such as public toilets, drinking fountains, and Wi-Fi, make moving through cities more comfortable and encourage kids and caregivers to spend time on urban streets? (Peyton, 2019)?	[68]		
De11	Is the planner aware that kids and their caregivers need bus stops or stations with fun activities? (Peyton, 2019)? Waiting for a bus or train can be highly boring for kids, but transit stops offer plenty of possibilities for their development through games, play, and art (Peyton, 2019).	[68]		
De12	Do small local businesses or informal community gathering places, often referred to as 'third places', exist in public spaces? These spaces could include streets, sidewalks, storefronts, alleys, parks, and more (Hester, 1984; Hester, 1993; Oldenburg, 1989; Whyte, 1980).	[1,3,83,84]		
De13	Provide adequate facilities for bicyclists to park along their route or at a final destination (Cushing and Miller, 2019).	[58]		

Legend:

Affordance	Prospect-refuge	Personal space	Sense of place	Salutogenic design	Child-friendly design	Age friendly and inclusive design	Sustainable design

Maintenance, Control, and Programming

Table 7. The qualities associated with the subcategory "Maintenance, Control, and Programming" compared with the filter. Sources: Placemaking in the Nordics (2020) [63], Madden (2000) [66].

Quality		Source[s]	Filter Quality: Six Critical Theories	Filter Quality: Global Priorities
MCP1	Before other actions, such as event planning, are public spaces properly maintained, such as through cleaning, renovation, and aesthetics? (Placemaking in the Nordics, 2020)?	[63]		
MCP2	Did different events in public space have programming, from stage performances and art exhibitions to activities, seating, and decorations? (Placemaking in the Nordics, 2020)?	[63]		
MCP3	Upgrade maintenance, including daily cleaning and preventative maintenance of physical facilities. Establish a community policing program (Madden, 2000).	[66]		

Legend:

Affordance	Personal space	Salutogenic design	Sustainable design

Places to meet

Table 8. The qualities associated with the subcategory "Places to Meet" compared with the filter. Sources: Alexander et al. (1977) [88], Cooper (1975) [89], Cushing and Miller (2019) [58], De Jonge (1967) [90], De Jonge (1968) [91], Rapoport (2013) [92], Gehl (1987) [93], Gehl (2013) [5], Hass-Klau et al. (1999) [78], Joardar and Neill (1978) [79], Linday (1978) [94], Mehta (2007) [81], York (2010) [67], Peyton (2019) [68], PPS, (2015) [69], Purciel (2009) [70], Sullivan et al. (2004) [82], Woodcraft et al. (2011) [95], Whyte (1979) [73], Whyte (1980) [1].

Quality		Source[s]	Filter Quality: Six Critical Theories	Filter Quality: Global Priorities
Pl1	Available physical characteristics that can contribute to comfort in public spaces include sitting space, other street furniture and physical artifacts, generous sidewalk width, trees, shade and shelter, a high degree of articulation with nooks and corners, small setbacks in adjacent walls, and landscape elements such as ledges and planters, among others (Alexander et al., 1977; Cooper, 1975; De Jonge, 1967; De Jonge, 1968; Rapoport, 1990; Gehl, 1987; Hass-Klau et al., 1999; Joardar and Neill, 1978; Linday, 1978; Mehta, 2007; Sullivan et al., 2004; Whyte, 1979; Whyte, 1980).	[1,73,78, 79,81,82, 88–94]		
Pl2	Are there at least 50 percent of the total movable seating or chairs required in the sitting zones? The chair should have a back and be comfortable, especially if it has an armrest (Whyte, 1979).	[73]		
Pl3	Did the designer create areas where families can relax and enjoy a restful break in tiny pockets of space? Children and caregivers can benefit from these places to pause, sit, and stay (Peyton, 2019).	[68]		
Pl4	Does the place have details that make it possible to stop and lean against it? (*Gehl, 2013*)? (e.g., bus shelters, benches, facades, trees, niches, or ledges).	[5]		
Pl5	Does the public space frequently provide unique amenities that attract visitors, such as historical sites, architecture, music, trails, outdoor recreation, shopping, dining, entertainment, and lodging? (PPS, 2015)?	[69,95]		
Pl6	Are at least 5 percent of the seating spaces with backrests available in the public space for the disabled? (Whyte, 1979)?	[73]		
Pl7	How is the place's sound environment? For example, is it possible to have a conversation, or is the noise too loud? (Gehl, 2013)?	[5]		
Pl8	Are there traditional adventure playgrounds available in public spaces? (Cushing and Miller, 2019)?	[58]		
Pl9	Did the designer provide spaces that made caregivers with children feel more welcome? (Peyton, 2019)?	[68]		
Pl10	Parks can provide spaces designed specifically for children, including cubby houses, tents, huts, caves, hobbit holes, teepees, and other intimate spaces where they can go to be separated from adults but remain safe (Cushing and Miller, 2019).	[58]		
Pl11	Transform bus stops into places for collaborative digital art, creative writing, and games, perhaps chess or scrabble (Cushing and Miller, 2019).	[58]		
Pl12	Furnish bus stop shelters with seating or places to lean (Purciel, 2009).	[70]		
Pl13	Encourage transit use by furnishing transit stops with pedestrian conveniences (York, 2010).	[67]		

Table 8. *Cont.*

Quality		Source[s]	Filter Quality	
			Six Critical Theories	Global Priorities
Pl14	Does the designer provide well-lit, inviting building edges, resting and walking areas with shade, and areas for play, socializing, and wayfinding on sidewalks? (Peyton, 2019)?	[68]		
Pl15	Is there access to places near the site that allow for larger events? (Woodcraft et al., 2011)? (e.g., squares, parks, wide sidewalks)	[95]		

Legend:

Affordance	Prospect-refuge	Personal space	Sense of place	Place Attachment	Biophilic design	Salutogenic design	Child-friendly design	Age friendly and inclusive design	Sustainable design

Security

Table 9. (**a**) The qualities associated with the subcategory "Security" compared with the filter. Sources: Clarke and Dornfield (1994) [96], Craig et al. (2002) [97], Cushing and Miller (2019) [58], Placemaking in the Nordics (2020) [63], Gehl (2009) [98], Hope and Shaw (1988) [99], Jacobs (1961) [85], Madden (2000) [66], Mehta (2014) [4], Newman (1972) [100], Perkins et al. (1992) [101], Perkins et al. (1993) [102], Peyton (2019) [68], PPS, (2015) [69], Pucher (2010) [103], Skogan and Maxfield (1981) [104]. (**b**) The qualities associated with the subcategory "Security" compared with the filter. Source: York (2010) [67].

(a)

Quality		Source[s]	Filter Quality	
			Six Critical Theories	Global Priorities
Se1	Do the sitting zones create hiding places or obstruct visibility or overview? (Placemaking in the Nordics, 2020)?	[63]		
Se2	Is it safe to sit without worrying about a car or bike hitting you? (Gehl, 2009)?	[98]		
Se3	Did you perceive the public space to be a safe place to sit both day and night? (Gehl, 2009)?	[98]		
Se4	Does the public space feel safe, playful, and lovable, in addition to triggering comfort and a sense of homeliness? (Placemaking in the Nordics, 2020)?	[63]		
Se5	Refuge means providing comforting and nurturing spaces for retreat, which might include cozy alcoves and corners that provide safe spaces to observe others (Cushing and Miller, 2019).	[58]		
Se6	Are litter, graffiti, vandalism, and poorly maintained buildings visible in public spaces? These presences make places appear unsafe (Hope and Shaw, 1988; Perkins et al., 1992; Skogan and Maxfield, 1981).	[99,101,104]		
Se7	As a result of activity and pedestrian traffic all day, every week, and all year long, streets with more regular eyes on the street provide us with safety (PPS, 2015).	[69]		
Se8	Is the public space safe from traffic? (Clarke and Dornfield, 1994; Craig et al., 2002)?	[96,97]		
Se9	Is the lighting safe at night and aesthetically pleasing? (Gehl, 2009)?	[98]		
Se10	Is there a presence of stores and other non-residential properties in the public space? (Perkins et al., 1993)?	[102]		
Se11	Are there in city streets the presence of stores, bars, restaurants, and other 'third places' as basic components of surveillance and safety (*Jacobs, 1961*).	[85]		
Se12	Do public spaces have lights during the day to brighten up dark places? (Placemaking in the Nordics, 2020)?	[63]		
Se13	Does the area, for example, have both residents, shops, and offices at all hours of the day? (Gehl, 2009)?	[98]		
Se14	Does the lighting provide nighttime safety and a pleasant atmosphere? (Gehl, 2009)?	[98]		
Se15	Is the public space comfortable, pleasant, well-lit, and safe to walk through even on a winter night? (Placemaking in the Nordics, 2020)?	[63]		
Se16	Minimum clear paths should be maintained to allow emergency vehicle access (Initiative and Officials, 2016).	[65]		

Table 9. *Cont.*

Se17	Is there a constant presence of people and 'eyes on the street' that make the space self-policed (Mehta, 2014; Newman, 1972)?	[4,100]
Se18	Does the design of public spaces allow for more visibility? (Placemaking in the Nordics, 2020)?	[63]
Se19	Did the designer know that studies show people who live near nature have better relationships with their neighbors and feel safer than those who live away from nature? (Peyton, 2019)?	[68]
Se20	Constructed or naturally occurring hills can enable parents or caregivers to look out over their children playing (Cushing and Miller, 2019).	[58]
Se21	Does the space feel welcoming, attractive, and safe? (Madden, 2000)?	[66]
Se22	Use durable and slip-resistant materials (Initiative and Officials, 2016).	[65]
Se23	Was the planner aware that urban elements like street lighting, trash cans, and wayfinding play a significant role in making public spaces safe and accessible? (*Peyton, 2019*)?	[68]
Se24	Protected overhead and from behind (refuge) and offer a long-range view, so a person can watch for an approaching bus in a visually safe environment (prospect) (Cushing and Miller, 2019).	[58]
Se25	Where conditions warrant, separate bikeways and vehicular traffic lanes with physical demarcations (Pucher, 2010).	[103]
	(b)	
Se26	Pay special attention to the treatment of bikeways at intersections and other points where the street form changes in order to mitigate potential visibility issues and turning conflicts (York, 2010).	[67]
Se27	Avoid potential conflicts between cyclists and opening car doors, for example, by widening parking lanes where appropriate (York, 2010).	[67]
Se28	Provide exterior lighting along streets and outdoor paths (York, 2010).	[67]
Se29	Designate bicycle-specific crossings and signals to organize the movements of pedestrians, cyclists, and motorists at busy intersections (York, 2010).	[67]

Legend:

Affordance	Prospect-refuge	Personal space	Sense of place	Place Attachment	Biophilic design	Salutogenic design	Child-friendly design	Age friendly and inclusive design	Sustainable design

Senses and experience

Table 10. (**a**) The qualities associated with the subcategory "Senses and experience" compared with the filter. Sources: Arnold (1993) [105], Barker (1968) [106], Bell et al. (1990) [107], Bosselmann et al. (1984) [108], Cushing and Miller (2019) [58], Elshestawy (1997) [109], Placemaking in the Nordics (2020) [63], Heath et al. (2000) [110], Lang (1987) [111], Mehta (2007) [81], Mehta (2014) [4], New York City [67], Porteous (1996) [112], Rapoport (1969) [113], Rapoport (1977) [114], Whyte (1979) [73], Whyte (1980) [1], Zacharias et al. (2001) [115]. (**b**) The qualities associated with the subcategory "Senses and experience" compared with the filter. Sources: Banerjee and Loukaitou-Sideris (1992) [116], Cushing and Miller (2019) [58], Placemaking in the Nordics (2020) [63], Hass-Klau et al. (1999) [78], Liebermann (1984) [117], Lynch (1960) [80], Maslow (1943) [118], Maslow (1954) [119], York (2010) [67], PPS (2015) [69], Whyte (1979) [73], Whyte (1980) [1].

(a)

Quality		Source[s]	Filter Quality	
			Six Critical Theories	Global Priorities
Sen1	Are there any pleasant sensory experiences or stimuli perceived from the environment—from lights, sounds, smells, touches, colors, shapes, patterns, and textures of the natural and man-made fixed, semi-fixed, and movable elements? (Arnold, 1993; Bell et al., 1990; Elshestawy, 1997; Heath et al., 2000; Lang, 1987; Porteous, 1996; Whyte, 1979)?	[73,105,107,109–112]		
Sen2	Do environmental factors support outdoor activities in public spaces, like comfortable microclimatic conditions including temperature, sunlight, shade, and wind? (Bosselmann et al., 1984; Mehta, 2007; Mehta, 2014; Whyte, 1980; Zacharias et al., 2001)?	[1,4,81,108,115]		
Sen3	Are fun elements available in public spaces for young people that encourage jumping, climbing, balancing, swinging, and other movements to develop agility and motor skills? (Cushing and Miller, 2019)?	[58]		
Sen4	Do trees in public spaces have a closer relationship with seating areas than they typically do? The tree provides a satisfying enclosure; people feel cuddled and protected, much like they do under a tree's awning. (Whyte, 1979)?	[73]		

Table 10. *Cont.*

Sen5	In a public space, is the seating socially comfortable? (Whyte, 1979)? This means that you have the choice of sitting up front, in back, to the side, in the sun, in the shade, in groups, or off alone (Whyte, 1979).	[73]	
Sen6	Maximize biophilia connections by including views of and interactions with animals and nature (for example, ensuring birds, insects, fish, and animals are visible from walkways and windows) and focusing on natural light, vegetation, living walls, natural textures, and materials (Cushing and Miller, 2019).	[58]	
Sen7	Are there public spaces with large awnings that trap warmth and provide shelter from the rain? (Placemaking in the Nordics, 2020)?	[63]	
Sen8	Are the designs of the places stimulating interactions between (diverse) people? (Placemaking in the Nordics, 2020)?	[63]	
Sen9	In the design of parks and playgrounds, create a variety of climate environments to facilitate activity in different seasons and weather conditions (*York, 2010*).	[67]	
Sen10	Can public spaces produce quality public spaces that contribute to a safe and enjoyable urban environment? (Placemaking in the Nordics, 2020)? Moreover, they are democratic rights for all citizens.	[63]	
Sen11	Is the public space's design anthropometrically and ergonomically sensitive (Barker, 1968; Lang, 1987; Rapoport, 1969; Rapoport, 1977)?	[106,111,113,114]	
	(b)		
Sen12	Does the public space satisfy the basic physiological needs, including environmental comfort, protection from the natural elements, and the provision of shelter? (Placemaking in the Nordics, 2020; Heath et al., 2000)?	[118,119]	
Sen13	Do the spaces have a high level of spatial quality and sensory complexity that make them pleasurable? Can people orient and navigate the city? (Lynch, 1960)?	[80]	
Sen14	Do the streets incorporate shade trees, plants, and green spaces that contribute to the sustainability of the environment (PPS, 2015)?	[69]	
Sen15	Do the people-oriented streets provide more access to green space, physical activity, social interaction, safe environments, affordable transportation options, and cleaner air—all of which improve emotional well-being and can help prevent mental health issues? (PPS, 2015)?	[69]	
Sen16	Does the public space provide water in all sorts of forms: waterfalls, waterwalls, rapids, sluiceways, tranquil pools, water tunnels, meandering brooks, fountains, etc.? (Whyte, 1979)?	[73]	
Sen17	Is there plenty of sunlight in the public open spaces? Is there wind protection to encourage social activities? (Banerjee and Loukaitou-Sideris, 1992; Hass-Klau et al., 1999; Liebermann, 1984; Whyte 1980)?	[1,78,116,117]	
Sen18	Can the public space implement a variety of functions, such as recreation, creativity, and play? Games, dancing, climbing, painting, and water play are among the non-commercial activities people seek (Whyte, *1979*).	[63]	
Sen19	Use gamification to integrate hearing, vision, exercise, and mental health games, or use a water fountain to assess and prompt water intake (Cushing and Miller, 2019).	[58]	
Sen20	Smart lights integrate motion sensors, automatically extend pedestrian crossing times, provide beacon navigation for blind people, and blink for an arriving bus (Cushing and Miller, 2019).	[58]	
Sen21	Handrails in bus shelters and places to rest, as well as helping users to maintain their balance, provide a sense of personal space and safety in busy shared public walkways (Cushing and Miller, 2019).	[58]	
Sen22	Create bus stop shelters that protect users from the sun, wind, and rain (York, 2010).	[67]	
Sen23	A multi-use trail should provide adequate cover or refuge from intense sun and inclement weather (Cushing and Miller, 2019).	[58]	
Sen24	Further develop greenways—alternative routes that are integrated into the regional park system (York, 2010).	[67]	

Legend:

Affor-dance	Prospect-refuge	Personal space	Sense of place	Place Attachment	Biophilic design	Salutogenic design	Child-friendly design	Age friendly and inclusive design	Sustainable design

Social infrastructure

Table 11. The qualities associated with the subcategory "Social infrastructure" compared with the filter. Sources: Cushing and Miller (2019) [58], Placemaking in the Nordics (2020) [63], Gehl (2008) [120], Gehl (2013) [5], Jacobs (1961) [85], MacKay (2003) [121], Madden (2000) [66], Mehta (2014) [4], Peyton (2019) [68], PPS (2015) [69], Purciel (2009) [70], Ridgers (2007) [30], Seamon (1980) [87], Whyte (1979) [73], Woodcraft et al. (2011) [95].

Quality		**Source[s]**	**Filter Quality**	
			Six Critical Theories	**Global Priorities**
So1	A place with unique characteristics that people feel about it, a version of existing social connections, attachments, stories, and history that links individuals together (Placemaking in the Nordics, 2020).	[63]		

Table 11. *Cont.*

Quality		Source[s]	Filter Quality	
			Six Critical Theories	Global Priorities
So2	Has the environment the ability to satisfy basic needs for shopping, eating, entertainment, and so on? (Jacobs, 1961; *Mehta, 2014*; Seamon, 1980)?	[4,85,87]		
So3	Has the designer provided areas where kids or adults can pause, rest, change, socialize, distract, or calm down? (Peyton, 2019)?	[68]		
So4	Can public spaces meet basic needs? (Placemaking in the Nordics, 2020)? They include public toilets, dining facilities, and seating areas. As a result, people will stay longer and use the place more.	[63]		
So5	Does the public space support symbolic and culturally meaningful activities for individuals or groups, as well as sociability? (Mehta, 2014)?	[4]		
So6	Has the environment the ability to provide the goods and services in and adjacent to it by businesses and other uses that make the environment useful? (Jacobs, 1961; Mehta, 2014; Seamon, 1980)?	[4,85,87]		
So7	Did the designer provide enough space for conversation and play on sidewalks? (Peyton, 2019)?	[68]		
So8	Can social interaction and social capital development occur in public spaces? (Placemaking in the Nordics, 2020)?	[63]		
So9	Does the public space have a food and drink area? (Placemaking in the Nordics, 2020)?	[63]		
So10	Is there access to shops, gyms, etc. near the location? (Woodcraft et al., 2011)?	[95]		
So11	Is there regular physical activity available in public spaces? This is crucial to improving health and wellbeing (PPS, 2015).	[69]		
So12	Did the designer consider that well-designed recreation areas in public spaces can be both playful and educational, as well as fostering social interaction? (Peyton, 2019)?	[68]		
So13	Is it possible to use the entire area for activities and play? (*Gehl, 2010*)? Are there major obstacles to this? (Gehl, 2013)?	[5]		
So14	When designing playgrounds, include ground markings indicating dedicated areas for sports and multiple uses. (MacKay, 2003; Ridgers, 2007).	[30,121]		
So15	Triangulation refers to the practice of locating features in close proximity to one another so that they generate more activity than they would separately (*Madden, 2000*).	[66]		
So16	Provide additional space for passengers to wait by adding bus bulbs (Gehl, 2008; Purciel, 2009;).	[70,120]		
So17	Is there access to community facilities, green spaces, etc. in the vicinity of the location? (Woodcraft et al., 2011)?	[95]		
So18	Are there in the public spaces glass canopies, small pavilions, or semi-outdoor spaces that could be created that would be usable in all but the worst weather? (*Whyte, 1979*)?	[73]		
So19	A trail should be sufficiently wide to afford multiple activities such as cycling, scooting, inline skating, running, pushing a baby stroller or wheelchair, and walking (Cushing and Miller, 2019).	[58]		

Legend:

Affordance	Prospect-refuge	Personal space	Sense of place	Biophilic design	Salutogenic design	Child-friendly design	Age friendly and inclusive design	Sustainable design

Traffic

Table 12. The qualities associated with the subcategory "Traffic" compared with the filter. Sources: Cushing and Miller (2019) [58], Initiative and Officials (2016) [65], Lund (2006) [121], Madden (2000) [66], Mehta (2014) [4], Peyton (2019) [68], Purcher et al. (2010) [103], PPS (2015) [69], Shaw (2016) [122], Whyte (1979) [73], Woodcraft et al. (2011) [95].

Quality		Source[s]	Filter Quality	
			Six Critical Theories	Global Priorities
Tr1	Is the public space inclusive and accessible? Is there the ability to enter and use the space? It means proximity and connectivity to other parts of the city (Mehta, 2014; Whyte, 1979).	[4,73]		

Table 12. *Cont.*

Quality		Source[s]	Filter Quality	
			Six Critical Theories	Global Priorities
Tr2	Do a variety of transportation options provide access to the place, including buses, trains, cars, and bicycles? (Madden, 2000)?	[66]		
Tr3	Is the planner aware that children and caregivers use transit most when it is frequent, reliable, accessible, and affordable? (Peyton, 2019)?	[68]		
Tr4	Use on-street markings or signage to visually reinforce the separation of areas for bicyclists and motorists (Purcher et al., 2010).	[103]		
Tr5	Pedestrian-only streets must be well connected to collective transit, cycle routes, and walking paths (Initiative and Officials, 2016).	[65]		
Tr6	People on bicycles and scooters often require greater personal space bubbles because they are going faster and need to balance (Cushing and Miller, 2019).	[58]		
Tr7	Are there accessible transportation options that enable more people and vulnerable groups to participate fully in economic and social life? (PPS, 2015)?	[69]		
Tr8	Place public transit stops along well-connected streets (Lund, 2006).	[121]		
Tr9	Make links between bicycling and transit (Purcher et al., 2010).	[103]		
Tr10	Provide bicyclists with directions, distances, and times to various destinations on bikeways (Purcher et al., 2010; Shaw, 2016).	[103,122]		
Tr11	Is environmentally friendly transportation possible via foot and bicycle? Are pedestrian and bicycle networks well developed? (*Woodcraft* et al., *2011*)?	[95]		

Legend:

Affordance	Personal space	Sense of place	Salutogenic design	Child-friendly design	Age friendly and inclusive design	Sustainable design

Once we assigned qualities to each nine categories, we then assigned those qualities to zones. Table 13 presents the qualities related to each zone.

Table 13. The qualities identified for each zone. Numbers correspond to Tables 4–12. The total number of identified qualities is also presented with the calculated weighting factor for each zone. Note: To facilitate text readability, the authors assign the following colors to the different tables for each zone.

	Ac	Ar	De	MCP	Pl	Se	Sen	So	Tr	Total Qualities	Weighting Factor
Moving zone	5 10 12 17 20	1 2 5 8	2 5 7	1 2	1 3 5	6 13 14 15 16	1 2 12 13 14 15	1 2 4	1 2 3	35	0.029
Outdoor dining zone	1 7 13 14 17	1 4 6 7	4 6	1	1 6 7	5 7 10 11 12	1 2 6 10 11 12	1 8 9 10	1 2 5	33	0.030
Parking zone	6 16 18 19 22	1 2 9 14	12 13	1	5 14 15	25 26 27 28 29	14 23 24	3 4 18 19	9 10 11	31	0.032
Playing zone	3 8 13 15 16	4 6 9 10	2 8 9	3	8 9 10	15 17 18 19 20	2 3 16 17 18 19	11 12 13 14	1 3 6	34	0.029
Sitting zone	4 7 9 11 23	1 2 3 4	1 2 3	1 2	1 2 3	1 2 3 4 5	1 2 3 4 5 6	1 2 3 4	1 2 3	35	0.029
Standing zone	2 6 11 14	1 2 4 5	2 4 5	2 3	1 4 5 6	5 6 7 8 9	2 6 7 8 9 16	1 5 6 7	1 3 4	34	0.029
Waiting zone	3 6 14 21 22	4 11 12 13	10 11	3	11 12 13	7 21 22 23 24	8 12 14 20 22	2 15 16 17	2 7 8	33	0.030

3.2. Using the Developed Method

Below (Tables 14–21), we will present the results of our site assessment on pedestrian-only streets in Karlstad city center.

Table 14. This table shows an assessment of four steps for places to sit on pedestrian-only streets in the centre of Karlstad. These are, as shown in the method part, 5a, 5b, 5c, and 5d. The applicable numbers for the qualities listed in column 5b for sitting zones S1–S15 are shown in Table A1 of Appendix A.

Step 5—Do the Assessment.	**5a—Define the Social Zones of the Area.**	**5b—Check Which Qualities Are Present in Each Zone out of 35. See Table A1 in Appendix A.**	**5c—Calculate the Individual Weighting Factor for Each Zone.**	**5d—Calculate the Social Areas.**
 Sitting zones	Area m^2	Number	The weighting factor is 0.029; see Table 13.	Area multiplied by individual weighting factor for each zone equals social area.
S1	24 m^2	10	10 × 0.029 = 0.29	24 m^2 × 0.29 = 6.96
S2	75 m^2	25	25 × 0.029 = 0.73	75 m^2 × 0.73 = 54.75
S3	60 m^2	19	19 × 0.029 = 0.55	60 m^2 × 0.55 = 33
S4	16 m^2	25	25 × 0.029 = 0.73	16 m^2 × 0.73 = 11.68
S5	15 m^2	26	26 × 0.029 = 0.754	15 m^2 × 0.754 = 11.31
S6	54 m^2	27	27 × 0.029 = 0.783	54 m^2 × 0.783 = 42.282
S7	7 m^2	23	23 × 0.029 = 0.667	7 m^2 × 0.667 = 4.669
S8	5 m^2	21	21 × 0.029 = 0.61	5 m^2 × 0.61 = 3.1
S9	4 m^2	21	21 × 0.029 = 0.61	4 m^2 × 0.61 = 2.44
S10	7 m^2	21	21 × 0.029 = 0.61	7 m^2 × 0.61 = 4.27
S11	4 m^2	23	23 × 0.029 = 0.667	4 m^2 × 0.667 = 2.668
S12	12 m^2	10	10 × 0.029 = 0.29	12 m^2 × 0.29 = 3.48
S13	30 m^2	31	31 × 0.029 = 0.899	30 m^2 × 0.899 = 26.97
S14	35 m^2	30	30 × 0.029 = 0.87	35 m^2 × 0.87 = 30.45
S15	10 m^2	27	27 × 0.029 = 0.783	10 m^2 × 0.783 = 7.83
	358 m^2 is the total area for sitting zones.			245.9 m^2 is the total social area for sitting zones.

Table 15. This table shows four steps for assessing places to stand on pedestrian-only streets in the center of Karlstad. These are 5a, 5b, 5c, and 5d, as shown in the method part. Table A2 of Appendix A displays the applicable numbers for the qualities listed in column 5b for standing zones ST1–ST5.

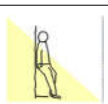
Step 5—Do the Assessment.	**5a—Define the Social Zones of the Area.**	**5b—Check Which Qualities Are Present in Each Zone out of 34. See Table A2 in Appendix A.**	**5c—Calculate the Individual Weighting Factor for Each Zone.**	**5d—Calculate the Social Areas.**
 Standing zones	Area m^2	Number	The weighting factor is 0.029; see Table 13.	Area multiplied by individual weighting factor for each zone equals social area.

Table 15. *Cont.*

Step 5—Do the Assessment.	5a—Define the Social Zones of the Area.	5b—Check Which Qualities Are Present in Each Zone out of 34. See Table A2 in Appendix A.	5c—Calculate the Individual Weighting Factor for Each Zone.	5d—Calculate the Social Areas.
ST1	24 m^2	20	20 × 0.029 = 0.58	24 m^2 × 0.58 = 13.92
ST2	16 m^2	20	20 × 0.029 = 0.58	16 m^2 × 0.58 = 9.28
ST3	18 m^2	20	20 × 0.029 = 0.58	18 m^2 × 0.58 = 10.44
ST4	20 m^2	23	23 × 0.029 = 0.667	20 m^2 × 0.667 = 13.34
ST5	25 m^2	14	14 × 0.029 = 0.406	25 m^2 × 0.406 = 10.15
	103 m^2 is the total area for standing zones.			57.13 m^2 is the total social area for standing zones.

Table 16. This table shows the assessment of four steps for outdoor dining places on pedestrian-only streets in the center of Karlstad. These are 5a, 5b, 5c, and 5d, as shown in the method part. Table A3 of Appendix A displays the applicable numbers for the qualities listed in column 5b for out-door dining zones OD1–OD8.

Step 5—Do the Assessment.	5a—Define the Social Zones of the Area.	5b—Check Which Qualities Are Present in Each Zone out of 33. See Table A3 of Appendix A.	5c—Calcualte the Individual Weighting Factor for Each Zone.	5d—Calculate the Social Areas.
 Outdoor dining zones	Area m^2	Number	The Weighting factor is 0.03; see Table 13.	Area multiplied by individual weighting factor for each zoneequals social area.
OD1	37.5 m^2	23	23 × 0.03 = 0.69	37.5 m^2 × 0.69 = 24
OD2	80 m^2	26	26 × 0.03 = 0.78	80 m^2 × 0.78 = 62.4
OD3	100 m^2	30	30 × 0.03 = 0.9	100 m^2 × 0.9 = 90
OD4	110 m^2	31	31 × 0.03 = 0.93	110 m^2 × 0.93 = 102.3
OD5	170 m^2	21	21 × 0.03 = 0.63	170 m^2 × 0.63 = 107.1
OD6	100 m^2	26	26 × 0.03 = 0.78	100 m^2 × 0.78 = 78
OD7	840 m^2	32	32 × 0.03 = 0.95	840 m^2 × 0.95 = 798
OD8	150 m^2	29	29 × 0.03 = 0.87	150 m^2 × 0.87 = 130.5
	1587.5 m^2 is the total area for outdoor dining zones.			1392.3 m^2 is the total social area for outdoor dining zones.

Table 17. This table shows four steps for assessing places for moving people on feet and wheels on pedestrian-only streets in the center of Karlstad. These are 5a, 5b, 5c, and 5d, as shown in the method part. Table A4 of Appendix A displays the applicable numbers for the qualities listed in column 5b for people moving on feet and wheels in zones M1–M15.

Step 5—Do the Assessment.	**5a—Define the Social Zones of the Area.**	**5b—Check Which Qualities Are Present in Each Zone out of 35 Qualities. See Table A4 of Appendix A.**	**5c—Calcualte the Individual Weighting Factor for Each Zone.**	**5d—Calculate the Social Areas.**
 Zones for moving people on feet and wheels	Area m^2	Number	The weighting factor is 0.029; see Table 13.	Area is multiplied by individual weighting factor for each zone equals social area.
M1	480 m^2	31	31 × 0.029 = 0.899	480 m^2 × 0.899 = 431.52
M2	625 m^2	31	31 × 0.029 = 0.899	625 m^2 × 0.899 = 561.875
M3	750 m^2	31	31 × 0.029 = 0.899	750 m^2 × 0.899 = 674.25
M4	240 m^2	32	32 × 0.029 = 0.928	240 m^2 × 0.928 = 222.72
M5	510 m^2	32	32 × 0.029 = 0.928	510 m^2 × 0.928 = 473.28
M6	300 m^2	32	32 × 0.029 = 0.928	300 m^2 × 0.928 = 278.4
M7	150 m^2	32	32 × 0.029 = 0.928	150 m^2 × 0.928 = 139.2
M9	150 m^2	29	29 × 0.029 = 0.841	150 m^2 × 0.841 = 126.15
M10	300 m^2	29	29 × 0.029 = 0.841	300 m^2 × 0.841 = 252.3
M11	200 m^2	33	33 × 0.029 = 0.957	200 m^2 × 0.957 = 191.4
M12	120 m^2	33	33 × 0.029 = 0.957	120 m^2 × 0.957 = 114.84
M13	100 m^2	33	33 × 0.029 = 0.957	100 m^2 × 0.957 = 95.7
M15	450 m^2	28	28 × 0.029 = 0.812	450 m^2 × 0.812 = 365.4
	4375 m^2 is the total area for moving zones.			3927m^2 is the total social area for moving zones.

Table 18. This table shows four steps for assessing places to play on pedestrian-only streets in the center of Karlstad. These are 5a, 5b, 5c, and 5d, as shown in the method part. Table A5 of Appendix A displays the applicable numbers for the qualities listed in column 5b for playing zones PL1–PL5.

Step 5—Do the Assessment.	**5a—Define the Social Zones of the Area.**	**5b—Check Which Qualities Are Present in Each Zone out of 34 Qualities. See Table A5 of Appendix A.**	**5c—Calcualte the Individual Weighting Factor for Each Zone.**	**5d—Calculate the Social Areas.**
 Zones for playing	Area m^2	Number	The weighting factor is 0.029; see Table 13.	Area multiplied by individual weighting factor for each zone equals social area.
PL1	80 m^2	25	25 × 0.029 = 0.725	80 m^2 × 0.725 = 58
PL2	80 m^2	17	17 × 0.029 = 0.493	80 m^2 × 0.493 = 39.44

Table 18. *Cont.*

Step 5—Do the Assessment.	**5a—Define the Social Zones of the Area.**	**5b—Check Which Qualities Are Present in Each Zone out of 34 Qualities. See Table A5 of Appendix A.**	**5c—Calcualte the Individual Weighting Factor for Each Zone.**	**5d—Calculate the Social Areas.**
PL3	150 m^2	27	27 × 0.029 = 0.783	150 m^2 × 0.783 = 117.45
PL4	300 m^2	25	25 × 0.029 = 0.725	300 m^2 × 0.725 = 217.5
PL5	120 m^2	30	30 × 0.029 = 0.87	120 m^2 × 0.87 = 104.4
	730 m^2 is the total area for playing zones.			536.79 m^2 is the total social area for playing zones.

Table 19. This table shows four steps for assessing places for bus, taxi, and tramway waiting places on pedestrian-only streets in the center of Karlstad. These are 5a, 5b, 5c, and 5d, as shown in the method part. Table A6 of Appendix A displays the applicable numbers for the qualities listed in column 7b for the bus, taxi, and tramway waiting zones W1–W2.

Step 5—Do the Assessment.	**5a—Define the Social Zones of the Area.**	**5b—Check Which Qualities Are Present in Each Zone out of 33 Qualities. See Table A6 of Appendix A.**	**5c—Calcualte the Individual Weighting Factor for Each Zone.**	**5d—Calculate the Social Areas.**
 Bus, taxi, and tramway waiting zones	Area m^2	Number	The weighting factor is 0.03; see Table 13.	Area multiplied by individual weighting factor for each zone equals social area.
W1	100 m^2	26	26 × 0.03 = 0.78	100 m^2 × 0.78 = 78
W2	240 m^2	26	26 × 0.03 = 0.78	240 m^2 × 0.78 = 187.2
	340 m^2 is the total area for waiting zones.			265.2 m^2 is the total social area for waiting zones.

Table 20. This table shows four steps for assessing places for bicycle tracks and parking places on pedestrian-only streets in the center of Karlstad. These are 5a, 5b, 5c, and 5d, as shown in the method part. Table A7 of Appendix A displays the applicable numbers for the qualities listed in column 5b for bicycle tracks and parking zones TR1–TR3 and P1–P16.

Step 5—Do the Assessment.	**5a—Define the Social Zones of the Area.**	**5b—Check Which Qualities Are Present in Each Zone out of 31 Qualities. See Table A7of Appendix A.**	**5c—Calcualte the Individual Weighting Factor for Each Zone.**	**5d—Calculate the Social Areas.**
 Bicycle track and parking zones	Area m^2	Number	The weighting factor is 0.032; see Table 13.	Area multiplied by individual weighting factor for each zone equals social area.
Tr1 + P1 + P2 + P3 + P4 + P5 + P6 + P7	520 + 40 + 12 + 16 + 17 + 16 + 24 + 6 = 651 m^2	27	27 × 0.032 = 0.864	651 m^2 × 0.864 = 562.464
Tr2 + P8 + P9	90 + 32 + 16 + 32 = 170 m^2	27	27 × 0.032 = 0.864	170 m^2 × 0.864 = 146.88

Table 20. *Cont.*

Step 5—Do the Assessment.	5a—Define the Social Zones of the Area.	5b—Check Which Qualities Are Present in Each Zone out of 31 Qualities. See Table A7of Appendix A.	5c—Calcualte the Individual Weighting Factor for Each Zone.	5d—Calculate the Social Areas.
Tr3+ P10 + P11	150 + 32 + 48 = 496 m^2	27	27 × 0.032 = 0.864	496 m^2 × 0.864 = 428.544
Tr4 + P12 + P13 + P14 + P15 + P16	750 + 55 + 7+20 + 55 + 20 = 907 m^2	28	28 × 0.032 = 0.896	907 m^2 × 0.896 = 812.672
Tr5 + P17 + P18 + P19	450 + 80 + 15 + 45 = 590 m^2	27	27 × 0.032 = 0.864	590 m^2 × 0.864 = 509.76
	2814 m^2 is the total area for bicycle track and parking zones.			2460.32 m^2 is the total social area for bicycle track and parking zones.

Table 21. This table shows the social and actual areas for each of the seven zones, along with the social space ratio calculation.

7e—Calculate the Social Space Ratio	The Areas for All Seven Zones	The Social Areas for All Seven Zones	The Social Space Ratio for Each Zone Individually	
	358 m^2 = Total area for sitting zones	245.9 m^2 = Total social area for sitting zones	0.010	
	103 m^2 = Total area for standing zones	57.13 m^2 = Total social area for standing zones	0.002	
	1587.5 m^2 = Total area for outdoor dining zones	1392.3 m^2 = Total social area for outdoor dining zones	0.060	The total social area for all seven zones is 8885 m^2. The public space has a total area of 23,357 m^2. If we divide 8885 m^2 over 23,357 m^2. The result will be 0.38 So the social space ratio for Karlstad's pedestrian-only streets is 0.38
	4375 m^2 = Total area for moving zones	3927 m^2 = Total social area for moving zones	0.168	
	730 m^2 = Total area for playing zones	536.79 m^2 = Total social area for playing zones	0.023	
	340 m^2 = Total area for waiting zones	265.2 m^2 = Total social area for waiting zones	0.011	
	2814 m^2 = Total area for bicycle track and parking zones	2460.32 m^2 = Total social area for bicycle track and parking zones	0.105	
The total area	10,307.5 areas for all seven zones	8884.68 m^2 = Total social area for all seven zones	0.38	

Table 21 shows the social space ratio calculation for Karlstad's pedestrian-only streets, which is equal to 0.38 of the total social space.

3.3. Eight Quality-Control Tools for the Assessment of the Public Space's Strengths and Weaknesses

In this study, eight quality-control tools have been created: one for calculating collectively the weighting factor for all public spaces activities to examine the public space's

strengths and weaknesses, as illustrated in Figure 3; the other seven to calculate the weighting factor for individual public space activity to examine its strengths and weaknesses.

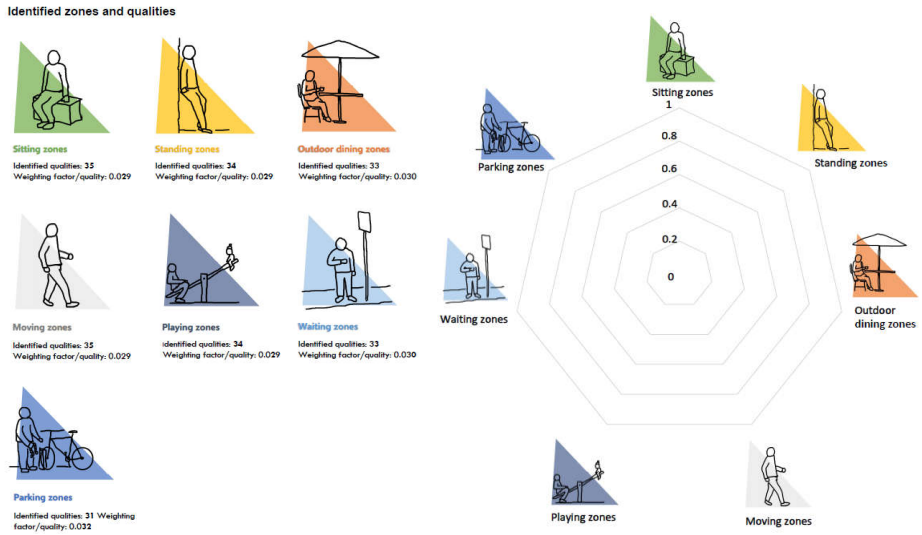


Figure 3. This figure shows a quality-control tool with its seven distinct social zones to examine the public space's strengths and weaknesses collectively. Source: the authors. Read below how to use the diagram.

3.4. Using the Diagram

1. Take note of every quality present on the site in each of the corresponding filters, then determine a weighting factor for each category. Every category will have a unique weighting factor.
2. In the radar diagram, place a point on the appropriate axes to represent the weighting factor.
3. Create a line connecting the spots, then fill in the resulting space.

This will provide the public space's strengths and weaknesses in relation to its seven distinct social zones with a clear visual representation, providing a chance for further research and development. See Figure 4.

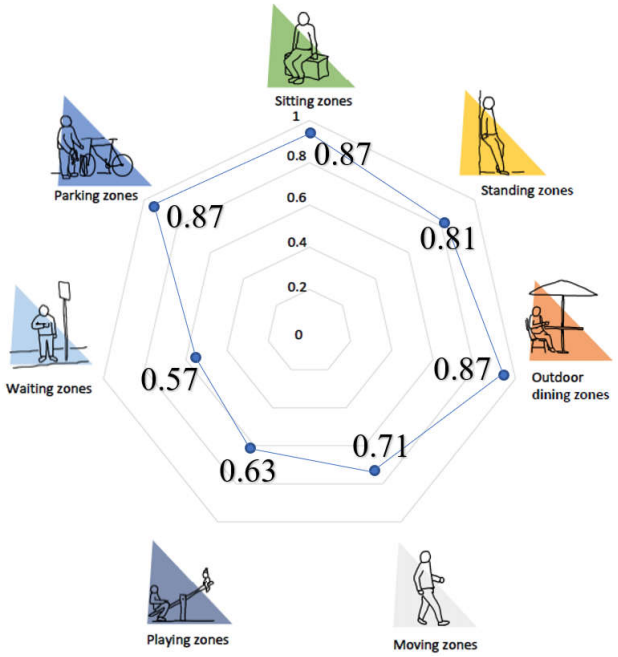


Figure 4. This figure shows an example of a collective assessment (all activities) of the public space's strengths and weaknesses using quality-control tools. Source: the authors.

3.5. Using the Diagrams

Each zones qualities are divided into nine subcategories. They are as follows: accessibility; architecture and aesthetics; development; places to meet; maintenance, control and programming; security; senses and experience; social infrastructure; and traffic. A radar diagram with all the subcategories is shown for each category. The researcher can assess the proportion of attained qualities for each subcategory to fill in this diagram. Plotting the percentages into the radar diagram is then possible. This will give each zone's strengths and weaknesses a clear visual representation, providing a chance for further investigation and development. See Figure 5.

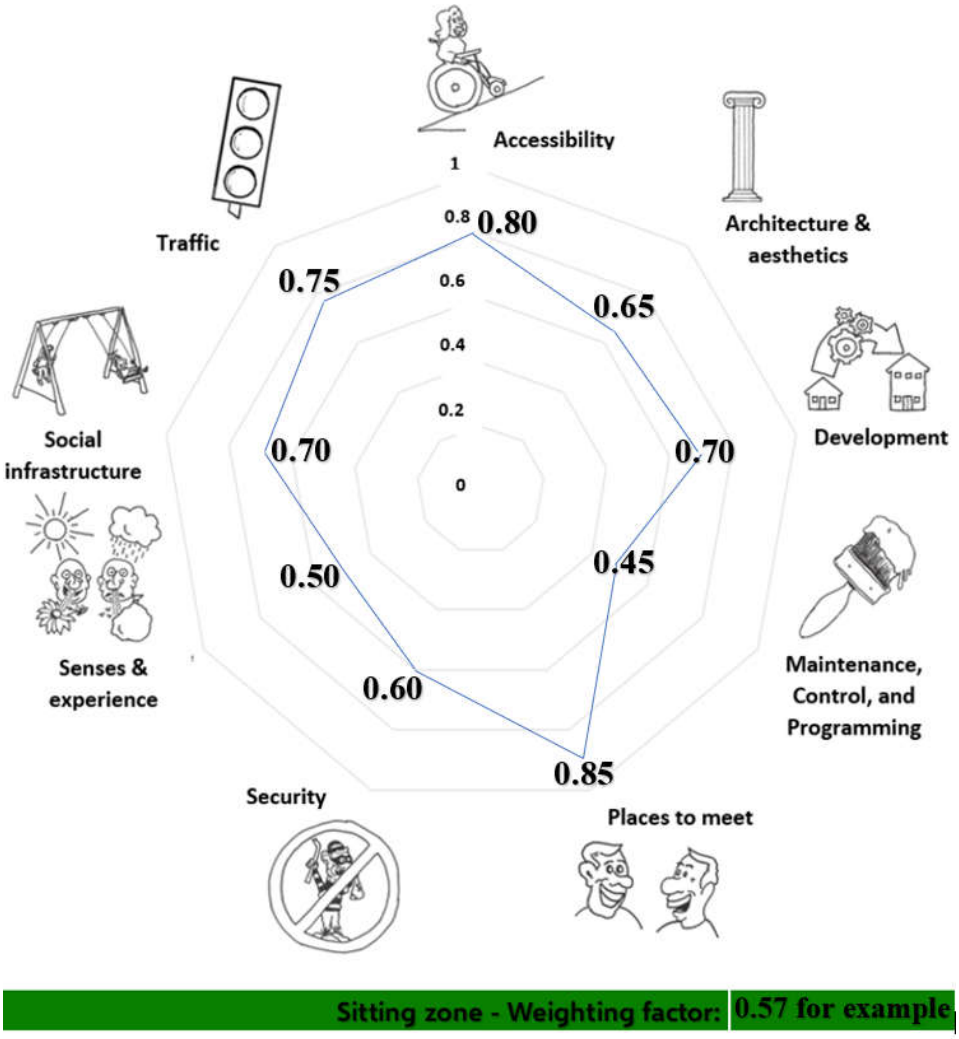


Figure 5. This figure shows an example of an individual assessment (one activity) of the public space's strengths and weaknesses using quality-control tools. Source: the authors.

3.6. The Advantage of a Radar Diagram

Once we have assessed the site and placed the category weighting factors on the appropriate axes in a radar diagram, we draw lines between the spots to form an area. This section is specific to the evaluated area and identifies its strengths and weaknesses. The empty white spaces not occupied by that area represent the site's potential for improvement. An ideal assignment would complete the entire diagram. A higher weighting factor (the sites imposition of many qualities) encourage both vitality and social contact across all activities in the public place or in any activity, The opposite is true with a lower weighting factor.

4. Discussion

This study's findings, which address public spaces in a broader and more specific context, are based on an important process. The first objective was more broadly focused, and several areas around the world, including some city centers, were considered. This means that we extracted from multiple contexts the optimal qualities for public spaces that attract a large number of individuals. The second objective of this study was to provide a broad overview; therefore, we conducted empirical research on a specific location within Karlstad's center to demonstrate the practical application of this method for assessing the carrying capacity of urban public spaces. The results of the third objective aim to concentrate on the urban centers of small Swedish and Nordic cities.

William H. Whyte's book, *The Social Life of Small Urban Spaces*, found a rough correlation between the size of public spaces and their utilization, showing that popular public places have more space for social activity than less popular ones. The absence of qualitative characteristics, however, makes this link weak. Therefore, the authors of this study investigated weighting the quality in terms of points to better match, for instance, the association between popularity and usable spaces. Based on a quality point system, theories and practices backed up by real-world data helped the authors figure out the weighting factors and effective social areas (sociable areas) for seven public space activities, using Karlstad's pedestrian-only streets as a model. This approach is considered a crucial addition to improving the quality of public spaces. Thus, the main methodologies in this study were both a qualitative and a quantitative approach.

We should note that the qualities that improve public places' vitality were the main focus of this study. We approached this from the perspective of social sustainability. Our approach differs from what Whyte, Gehl, Appleyard, Oldenburg, and even Kevin Lynch did in their research. Indeed, we drew inspiration from their research, yet we forged our own path. Our research is based on the idea that increasing the number of individuals in the area leads to a proportional increase in social contact. In this context, we classify welcoming environments as social spaces. By dividing the total number of high-quality social spaces by the whole area, we can calculate a ratio of these places. This method enables a quantitative evaluation of urban places in relation to their ability to facilitate social activities, which has previously been a qualitative and subjective aspect of urban planning.

The real implementation of this method was in quantifying the carrying capacity of Karlstad's pedestrian-only streets' social space ratio, which shows a value of 0.38. While all seven zones provide desirable qualities, the authors acknowledge that the level of social contact will vary in each zone. For instance, zones designed for sitting, outside dining, standing, and playing will facilitate more social interaction compared to zones intended for moving, waiting, and bicycle track and parking zones. This necessitates further research to determine the precise weighting factor value for each zone by employing appropriate methods and conducting additional field observations. This study supports future research because it reveals the social space ratio for each zone individually as well (see Table 21).

The crucial questions are as follows: Is this 0.38 social space ratio regarded as excellent or poor? How can we assess its value? Do public spaces have any literary significance or value that we can identify with? How do cultural, climate, and social differences affect this value? The answers are negative, as there has been no prior attempt to determine the optimal value of a social space ratio. Thus, it makes sense to establish a method for estimating the carrying capacity of urban public spaces.

Furthermore, this study developed eight quality-control measures to assess the positive and negative aspects of the public space as a whole, as well as each activity zone separately. To be clear, the goal is to evaluate the effectiveness of the weighting factors. A higher weighting factor, signifying the site's imposition of several qualities, fosters vitality and social interaction in all activities conducted within the public space or any other activity. A lower weighting factor, on the other hand, has the opposite effect. See Figures 3 and 6–12 for more information about how to use these eight quality-control tools. In other words, these tangible tools for urban planners and municipal authorities allow for

an objective evaluation of public spaces' designs and their effectiveness in promoting social interaction. This contributes to more informed decision-making in urban development and revitalization efforts.

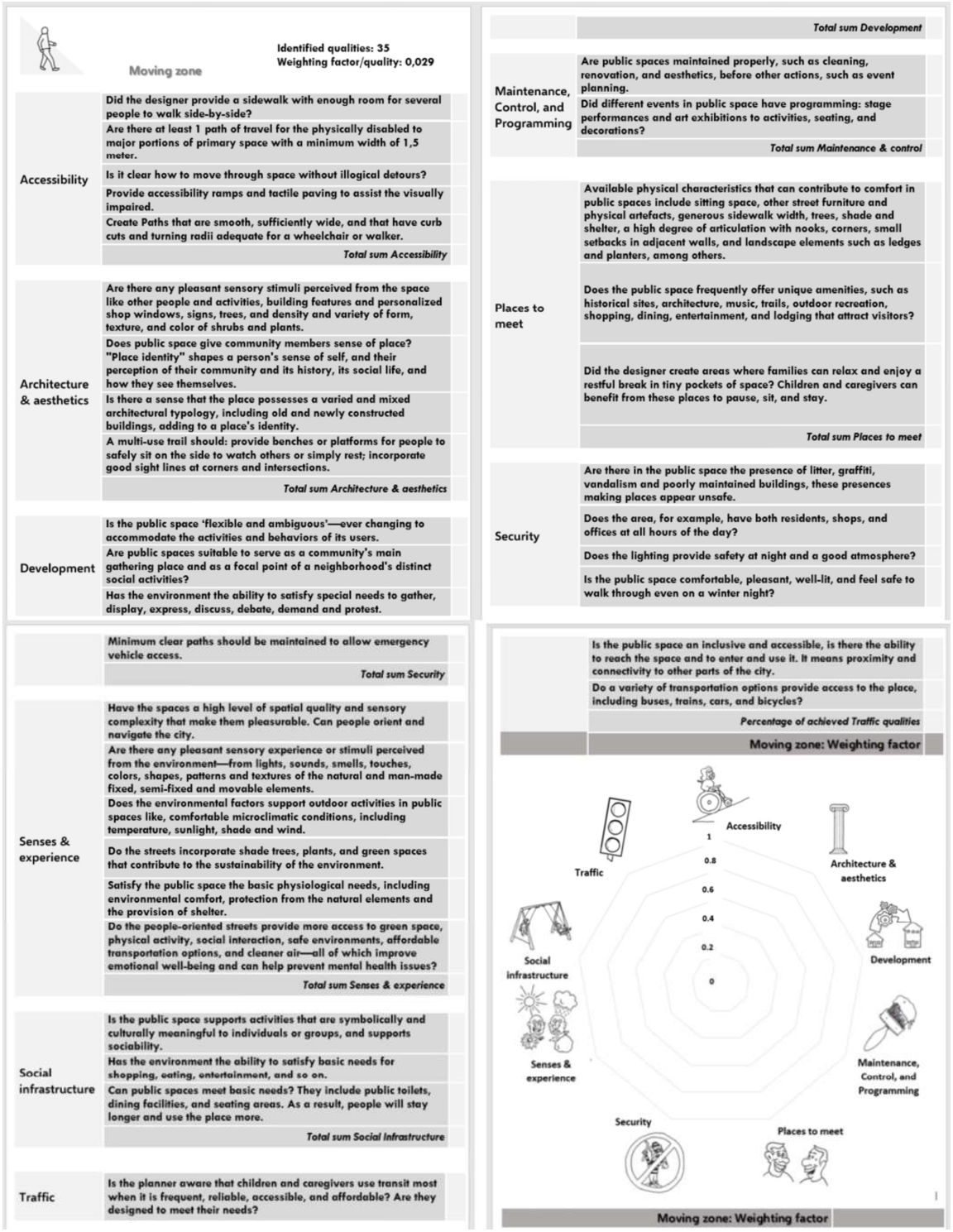
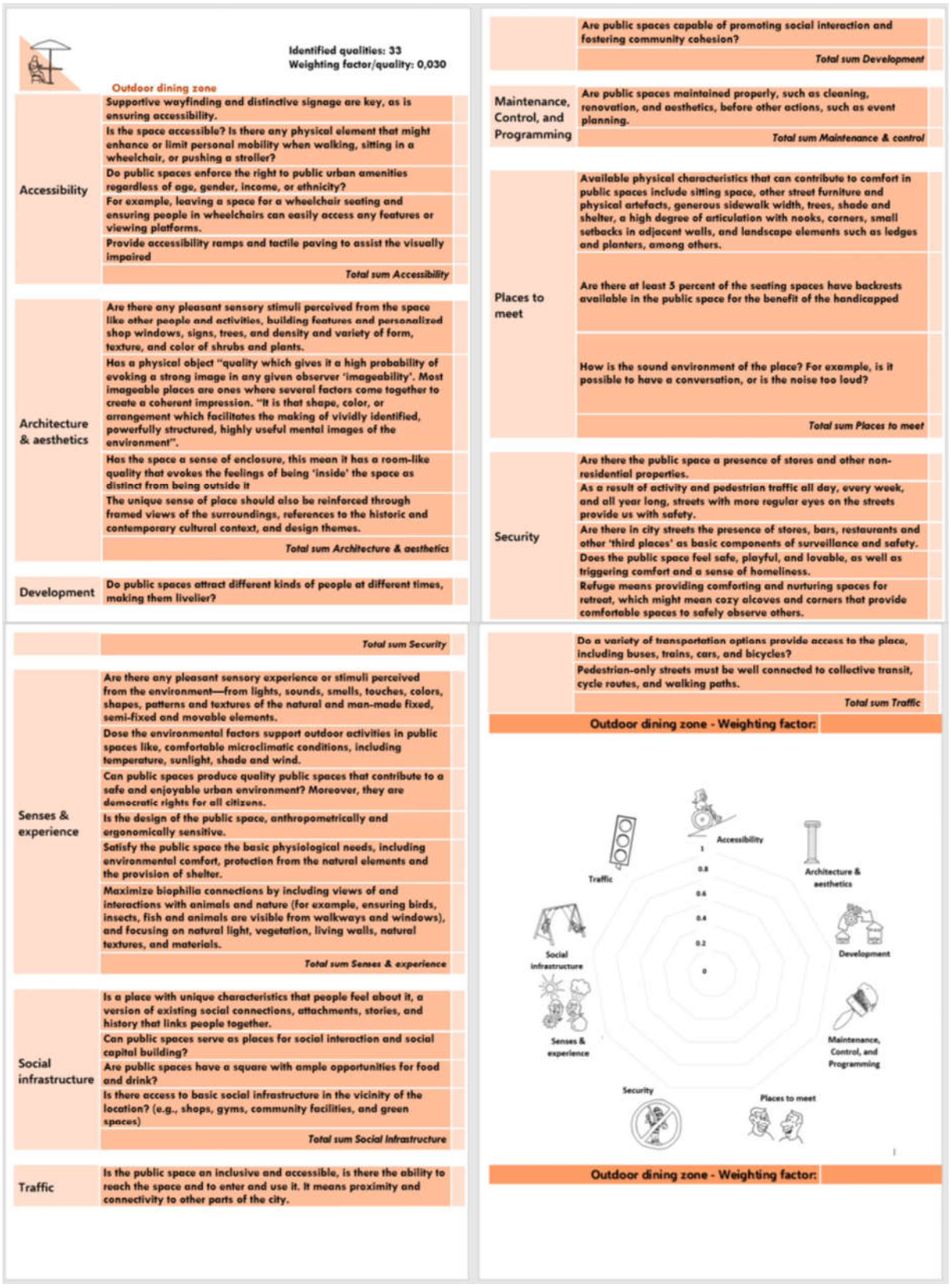


Figure 6. This figure shows a quality-control tool for analysing the strengths and weaknesses of the movement zone in a public space. The nine subcategories with relevant qualities are displayed by the tool. Ar, PI, So, AC, Tr, Se, Sen, De, Mcp. Source: the authors.



Identified qualities: 33 Weighting factor/quality: 0,030	Outdoor dining zone
Accessibility	Supportive wayfinding and distinctive signage are key, as is ensuring accessibility.
	Is the space accessible? Is there any physical element that might enhance or limit personal mobility when walking, sitting in a wheelchair, or pushing a stroller?
	Do public spaces enforce the right to public urban amenities regardless of age, gender, income, or ethnicity?
	For example, leaving a space for a wheelchair seating and ensuring people in wheelchairs can easily access any features or viewing platforms.
	Provide accessibility ramps and tactile paving to assist the visually impaired
	Total sum Accessibility
Architecture & aesthetics	Are there any pleasant sensory stimuli perceived from the space like other people and activities, building features and personalized shop windows, signs, trees, and density and variety of form, texture, and color of shrubs and plants.
	Has a physical object "quality which gives it a high probability of evoking a strong image in any given observer 'imageability'. Most imageable places are ones where several factors come together to create a coherent impression. "It is that shape, color, or arrangement which facilitates the making of vividly identified, powerfully structured, highly useful mental images of the environment".
	Has the space a sense of enclosure, this mean it has a room-like quality that evokes the feelings of being 'inside' the space as distinct from being outside it
	The unique sense of place should also be reinforced through framed views of the surroundings, references to the historic and contemporary cultural context, and design themes.
	Total sum Architecture & aesthetics
Development	Do public spaces attract different kinds of people at different times, making them livelier?
	Are public spaces capable of promoting social interaction and fostering community cohesion?
	Total sum Development
Maintenance, Control, and Programming	Are public spaces maintained properly, such as cleaning, renovation, and aesthetics, before other actions, such as event planning.
	Total sum Maintenance & control
Places to meet	Available physical characteristics that can contribute to comfort in public spaces include sitting space, other street furniture and physical artefacts, generous sidewalk width, trees, shade and shelter, a high degree of articulation with nooks, corners, small setbacks in adjacent walls, and landscape elements such as ledges and planters, among others.
	Are there at least 5 percent of the seating spaces have backrests available in the public space for the benefit of the handicapped
	How is the sound environment of the place? For example, is it possible to have a conversation, or is the noise too loud?
	Total sum Places to meet
Security	Are there the public space a presence of stores and other non-residential properties.
	As a result of activity and pedestrian traffic all day, every week, and all year long, streets with more regular eyes on the streets provide us with safety.
	Are there in city streets the presence of stores, bars, restaurants and other 'third places' as basic components of surveillance and safety.
	Does the public space feel safe, playful, and lovable, as well as triggering comfort and a sense of homeliness.
	Refuge means providing comforting and nurturing spaces for retreat, which might mean cozy alcoves and corners that provide comfortable spaces to safely observe others.
	Total sum Security
Senses & experience	Are there any pleasant sensory experience or stimuli perceived from the environment—from lights, sounds, smells, touches, colors, shapes, patterns and textures of the natural and man-made fixed, semi-fixed and movable elements.
	Dose the environmental factors support outdoor activities in public spaces like, comfortable microclimatic conditions, including temperature, sunlight, shade and wind.
	Can public spaces produce quality public spaces that contribute to a safe and enjoyable urban environment? Moreover, they are democratic rights for all citizens.
	Is the design of the public space, anthropometrically and ergonomically sensitive.
	Satisfy the public space the basic physiological needs, including environmental comfort, protection from the natural elements and the provision of shelter.
	Maximize biophilia connections by including views of and interactions with animals and nature (for example, ensuring birds, insects, fish and animals are visible from walkways and windows), and focusing on natural light, vegetation, living walls, natural textures, and materials.
	Total sum Senses & experience
Social infrastructure	Is a place with unique characteristics that people feel about it, a version of existing social connections, attachments, stories, and history that links people together.
	Can public spaces serve as places for social interaction and social capital building?
	Are public spaces have a square with ample opportunities for food and drink?
	Is there access to basic social infrastructure in the vicinity of the location? (e.g., shops, gyms, community facilities, and green spaces)
	Total sum Social Infrastructure
Traffic	Is the public space an inclusive and accessible, is there the ability to reach the space and to enter and use it. It means proximity and connectivity to other parts of the city.
	Do a variety of transportation options provide access to the place, including buses, trains, cars, and bicycles?
	Pedestrian-only streets must be well connected to collective transit, cycle routes, and walking paths.
	Total sum Traffic
	Outdoor dining zone - Weighting factor:

Outdoor dining zone - Weighting factor:

Figure 7. This figure shows a quality-control tool for analysing the strengths and weaknesses of the outdoor dining zone in a public space. The nine subcategories with relevant qualities are displayed by the tool. Ar, PI, So, AC, Tr, Se, Sen, De, Mcp. Source: the authors.

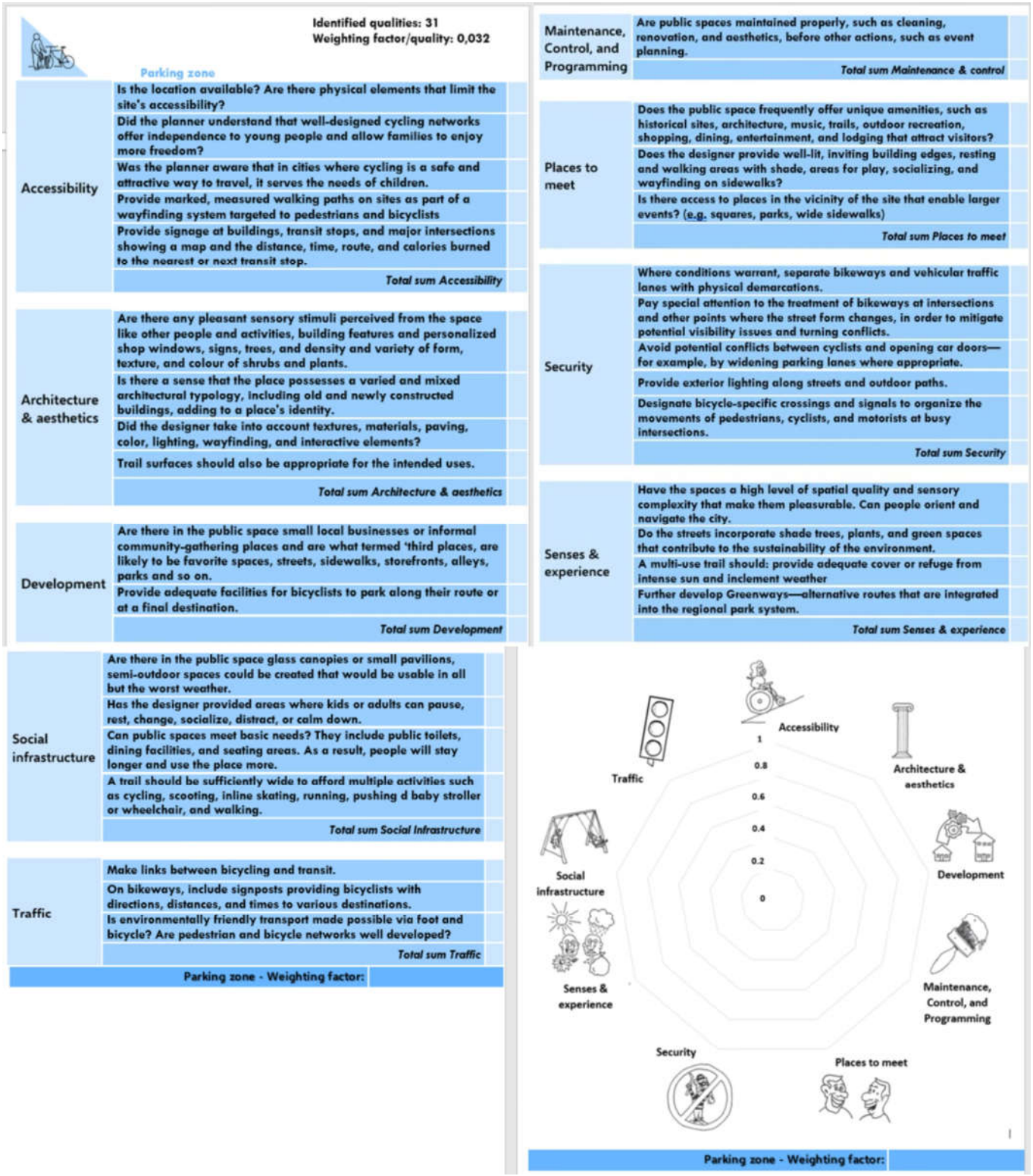
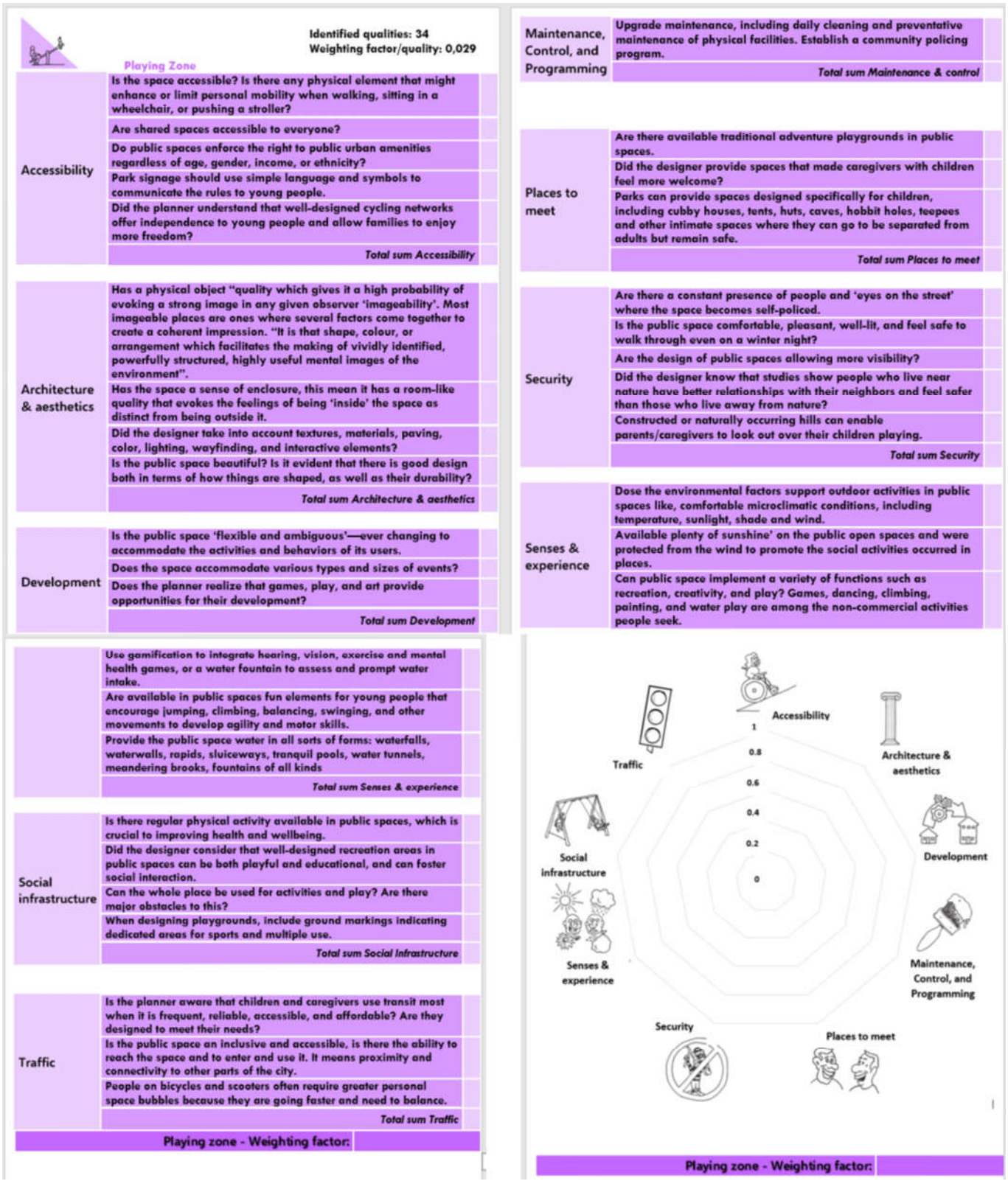


Figure 8. This figure shows a quality-control tool for analysing the strengths and weaknesses of the parking zone in a public space. The nine subcategories with relevant qualities are displayed by the tool. Ar, PI, So, AC, Tr, Se, Sen, De, Mcp. Source: the authors.

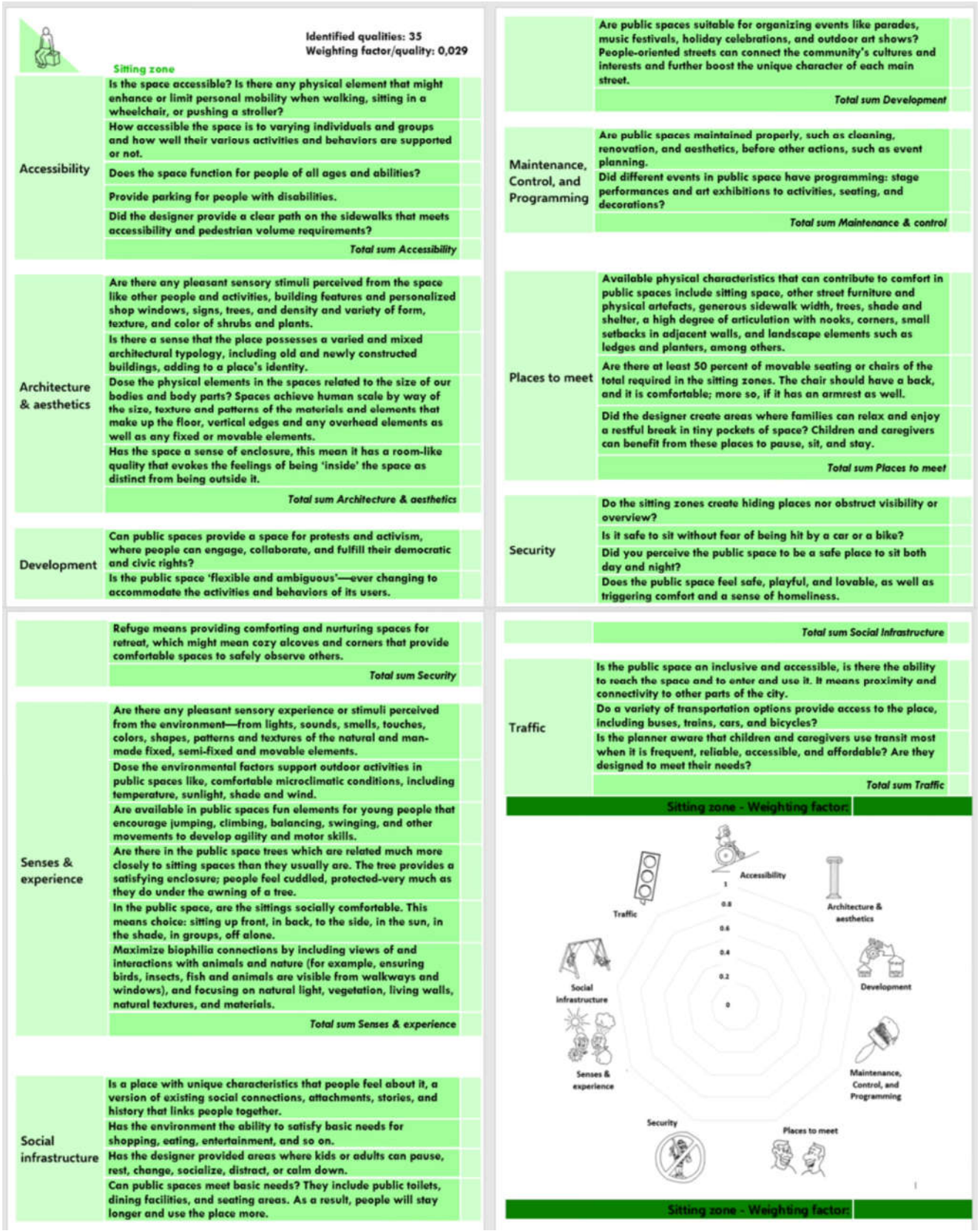


Playing Zone		Identified qualities: 34 Weighting factor/quality: 0,029
Accessibility	Is the space accessible? Is there any physical element that might enhance or limit personal mobility when walking, sitting in a wheelchair, or pushing a stroller?	
	Are shared spaces accessible to everyone?	
	Do public spaces enforce the right to public urban amenities regardless of age, gender, income, or ethnicity?	
	Park signage should use simple language and symbols to communicate the rules to young people.	
	Did the planner understand that well-designed cycling networks offer independence to young people and allow families to enjoy more freedom?	
	Total sum Accessibility	
Architecture & aesthetics	Has a physical object "quality which gives it a high probability of evoking a strong image in any given observer 'imageability'. Most imageable places are ones where several factors come together to create a coherent impression. "It is that shape, colour, or arrangement which facilitates the making of vividly identified, powerfully structured, highly useful mental images of the environment".	
	Has the space a sense of enclosure, this mean it has a room-like quality that evokes the feelings of being 'inside' the space as distinct from being outside it.	
	Did the designer take into account textures, materials, paving, color, lighting, wayfinding, and interactive elements?	
	Is the public space beautiful? Is it evident that there is good design both in terms of how things are shaped, as well as their durability?	
	Total sum Architecture & aesthetics	
Development	Is the public space 'flexible and ambiguous'—ever changing to accommodate the activities and behaviors of its users.	
	Does the space accommodate various types and sizes of events?	
	Does the planner realize that games, play, and art provide opportunities for their development?	
	Total sum Development	
	Use gamification to integrate hearing, vision, exercise and mental health games, or a water fountain to assess and prompt water intake.	
	Are available in public spaces fun elements for young people that encourage jumping, climbing, balancing, swinging, and other movements to develop agility and motor skills.	
	Provide the public space water in all sorts of forms: waterfalls, waterwalls, rapids, sluiceways, tranquil pools, water tunnels, meandering brooks, fountains of all kinds	
	Total sum Senses & experience	
Social infrastructure	Is there regular physical activity available in public spaces, which is crucial to improving health and wellbeing.	
	Did the designer consider that well-designed recreation areas in public spaces can be both playful and educational, and can foster social interaction.	
	Can the whole place be used for activities and play? Are there major obstacles to this?	
	When designing playgrounds, include ground markings indicating dedicated areas for sports and multiple use.	
	Total sum Social Infrastructure	
Traffic	Is the planner aware that children and caregivers use transit most when it is frequent, reliable, accessible, and affordable? Are they designed to meet their needs?	
	Is the public space an inclusive and accessible, is there the ability to reach the space and to enter and use it. It means proximity and connectivity to other parts of the city.	
	People on bicycles and scooters often require greater personal space bubbles because they are going faster and need to balance.	
	Total sum Traffic	
	Playing zone - Weighting factor:	

Maintenance, Control, and Programming	Upgrade maintenance, including daily cleaning and preventative maintenance of physical facilities. Establish a community policing program.	
	Total sum Maintenance & control	
Places to meet	Are there available traditional adventure playgrounds in public spaces.	
	Did the designer provide spaces that made caregivers with children feel more welcome?	
	Parks can provide spaces designed specifically for children, including cubby houses, tents, huts, caves, hobbit holes, teepees and other intimate spaces where they can go to be separated from adults but remain safe.	
	Total sum Places to meet	
Security	Are there a constant presence of people and 'eyes on the street' where the space becomes self-policed.	
	Is the public space comfortable, pleasant, well-lit, and feel safe to walk through even on a winter night?	
	Are the design of public spaces allowing more visibility?	
	Did the designer know that studies show people who live near nature have better relationships with their neighbors and feel safer than those who live away from nature?	
	Constructed or naturally occurring hills can enable parents/caregivers to look out over their children playing.	
	Total sum Security	
Senses & experience	Dose the environmental factors support outdoor activities in public spaces like, comfortable microclimatic conditions, including temperature, sunlight, shade and wind.	
	Available plenty of sunshine' on the public open spaces and were protected from the wind to promote the social activities occurred in places.	
	Can public space implement a variety of functions such as recreation, creativity, and play? Games, dancing, climbing, painting, and water play are among the non-commercial activities people seek.	

Playing zone - Weighting factor:

Figure 9. This figure shows a quality-control tool for analysing the strengths and weaknesses of the playing zone in a public space. The nine subcategories with relevant qualities are displayed by the tool. Ar, PI, So, AC, Tr, Se, Sen, De, Mcp. Source: the authors.

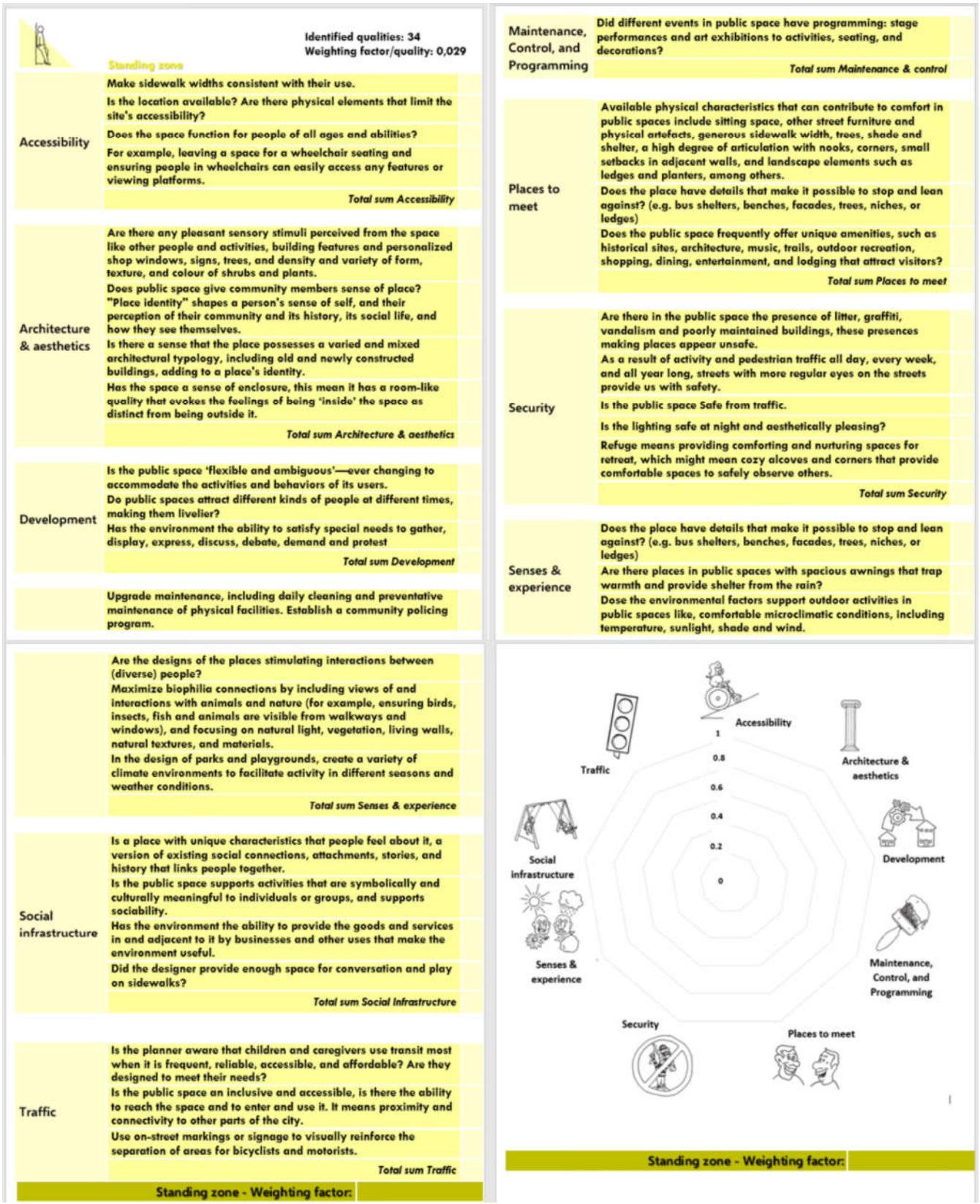


Identified qualities: 35 Weighting factor/quality: 0,029	Sitting zone
Accessibility	Is the space accessible? Is there any physical element that might enhance or limit personal mobility when walking, sitting in a wheelchair, or pushing a stroller?
	How accessible the space is to varying individuals and groups and how well their various activities and behaviors are supported or not.
	Does the space function for people of all ages and abilities?
	Provide parking for people with disabilities.
	Did the designer provide a clear path on the sidewalks that meets accessibility and pedestrian volume requirements?
	Total sum Accessibility
Architecture & aesthetics	Are there any pleasant sensory stimuli perceived from the space like other people and activities, building features and personalized shop windows, signs, trees, and density and variety of form, texture, and color of shrubs and plants.
	Is there a sense that the place possesses a varied and mixed architectural typology, including old and newly constructed buildings, adding to a place's identity.
	Dose the physical elements in the spaces related to the size of our bodies and body parts? Spaces achieve human scale by way of the size, texture and patterns of the materials and elements that make up the floor, vertical edges and any overhead elements as well as any fixed or movable elements.
	Has the space a sense of enclosure, this mean it has a room-like quality that evokes the feelings of being 'inside' the space as distinct from being outside it.
	Total sum Architecture & aesthetics
Development	Can public spaces provide a space for protests and activism, where people can engage, collaborate, and fulfill their democratic and civic rights?
	Is the public space 'flexible and ambiguous'—ever changing to accommodate the activities and behaviors of its users.
	Are public spaces suitable for organizing events like parades, music festivals, holiday celebrations, and outdoor art shows? People-oriented streets can connect the community's cultures and interests and further boost the unique character of each main street.
	Total sum Development
Maintenance, Control, and Programming	Are public spaces maintained properly, such as cleaning, renovation, and aesthetics, before other actions, such as event planning.
	Did different events in public space have programming: stage performances and art exhibitions to activities, seating, and decorations?
	Total sum Maintenance & control
Places to meet	Available physical characteristics that can contribute to comfort in public spaces include sitting space, other street furniture and physical artefacts, generous sidewalk width, trees, shade and shelter, a high degree of articulation with nooks, corners, small setbacks in adjacent walls, and landscape elements such as ledges and planters, among others.
	Are there at least 50 percent of movable seating or chairs of the total required in the sitting zones. The chair should have a back, and it is comfortable; more so, if it has an armrest as well.
	Did the designer create areas where families can relax and enjoy a restful break in tiny pockets of space? Children and caregivers can benefit from these places to pause, sit, and stay.
	Total sum Places to meet
Security	Do the sitting zones create hiding places nor obstruct visibility or overview?
	Is it safe to sit without fear of being hit by a car or a bike?
	Did you perceive the public space to be a safe place to sit both day and night?
	Does the public space feel safe, playful, and lovable, as well as triggering comfort and a sense of homeliness.
	Refuge means providing comforting and nurturing spaces for retreat, which might mean cozy alcoves and corners that provide comfortable spaces to safely observe others.
	Total sum Security
Senses & experience	Are there any pleasant sensory experience or stimuli perceived from the environment—from lights, sounds, smells, touches, colors, shapes, patterns and textures of the natural and man-made fixed, semi-fixed and movable elements.
	Dose the environmental factors support outdoor activities in public spaces like, comfortable microclimatic conditions, including temperature, sunlight, shade and wind.
	Are available in public spaces fun elements for young people that encourage jumping, climbing, balancing, swinging, and other movements to develop agility and motor skills.
	Are there in the public space trees which are related much more closely to sitting spaces than they usually are. The tree provides a satisfying enclosure; people feel cuddled, protected-very much as they do under the awning of a tree.
	In the public space, are the sittings socially comfortable. This means choice: sitting up front, in back, to the side, in the sun, in the shade, in groups, off alone.
	Maximize biophilia connections by including views of and interactions with animals and nature (for example, ensuring birds, insects, fish and animals are visible from walkways and windows), and focusing on natural light, vegetation, living walls, natural textures, and materials.
	Total sum Senses & experience
Social infrastructure	Is a place with unique characteristics that people feel about it, a version of existing social connections, attachments, stories, and history that links people together.
	Has the environment the ability to satisfy basic needs for shopping, eating, entertainment, and so on.
	Has the designer provided areas where kids or adults can pause, rest, change, socialize, distract, or calm down.
	Can public spaces meet basic needs? They include public toilets, dining facilities, and seating areas. As a result, people will stay longer and use the place more.
	Total sum Social Infrastructure
Traffic	Is the public space an inclusive and accessible, is there the ability to reach the space and to enter and use it. It means proximity and connectivity to other parts of the city.
	Do a variety of transportation options provide access to the place, including buses, trains, cars, and bicycles?
	Is the planner aware that children and caregivers use transit most when it is frequent, reliable, accessible, and affordable? Are they designed to meet their needs?
	Total sum Traffic

Sitting zone - Weighting factor:

Sitting zone - Weighting factor:

Figure 10. This figure shows a quality-control tool for analysing the strengths and weaknesses of the sitting zone in a public space. The nine subcategories with relevant qualities are displayed by the tool. Ar, PI, So, AC, Tr, Se, Sen, De, Mcp. Source: the authors.

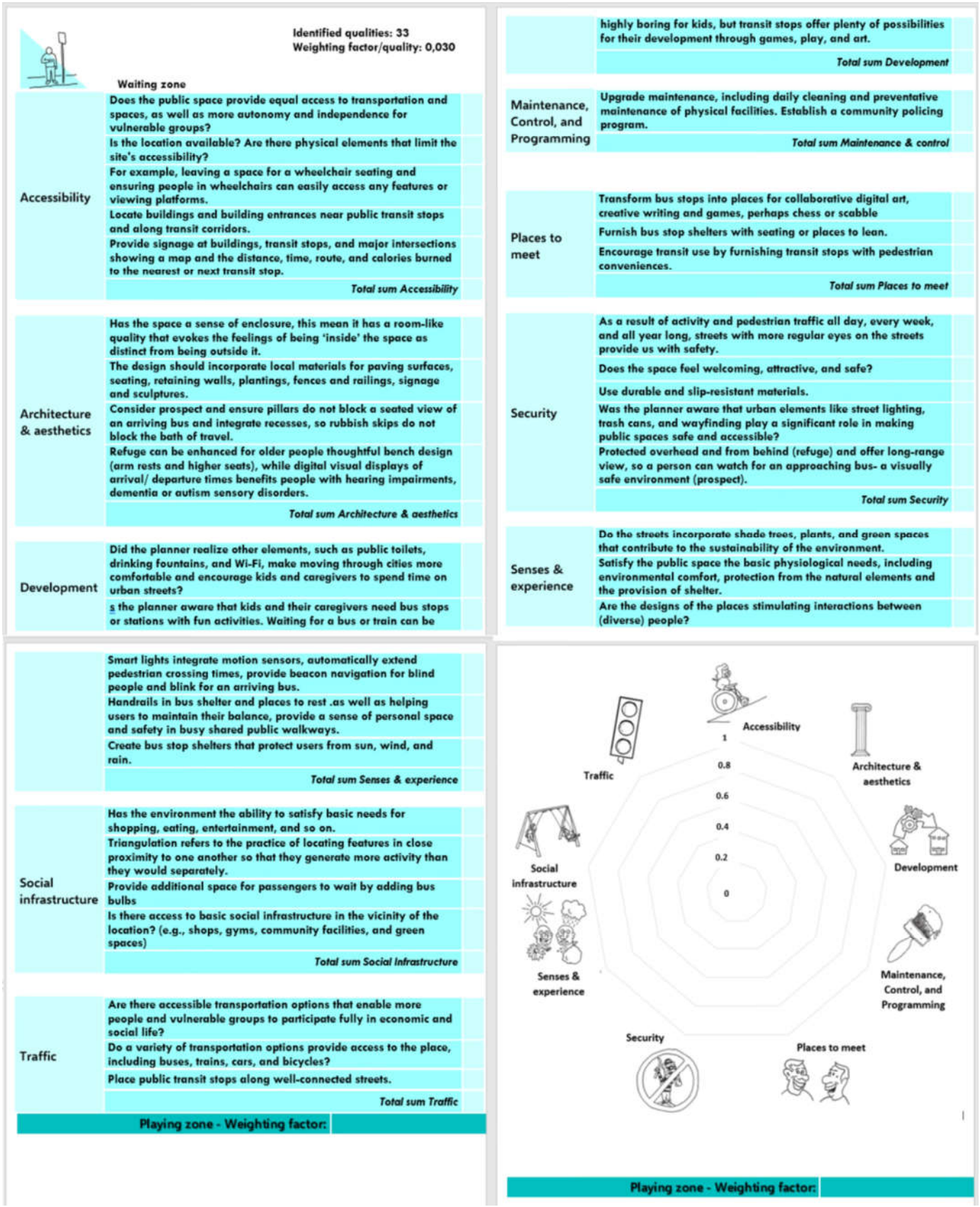


	Identified qualities: 34 Weighting factor/quality: 0,029
	Standing zone
Accessibility	Make sidewalk widths consistent with their use.
	Is the location available? Are there physical elements that limit the site's accessibility?
	Does the space function for people of all ages and abilities?
	For example, leaving a space for a wheelchair seating and ensuring people in wheelchairs can easily access any features or viewing platforms.
	Total sum Accessibility
Architecture & aesthetics	Are there any pleasant sensory stimuli perceived from the space like other people and activities, building features and personalized shop windows, signs, trees, and density and variety of form, texture, and colour of shrubs and plants.
	Does public space give community members sense of place? "Place identity" shapes a person's sense of self, and their perception of their community and its history, its social life, and how they see themselves.
	Is there a sense that the place possesses a varied and mixed architectural typology, including old and newly constructed buildings, adding to a place's identity.
	Has the space a sense of enclosure, this mean it has a room-like quality that evokes the feelings of being 'inside' the space as distinct from being outside it.
	Total sum Architecture & aesthetics
Development	Is the public space 'flexible and ambiguous'—ever changing to accommodate the activities and behaviors of its users.
	Do public spaces attract different kinds of people at different times, making them livelier?
	Has the environment the ability to satisfy special needs to gather, display, express, discuss, debate, demand and protest
	Total sum Development
	Upgrade maintenance, including daily cleaning and preventative maintenance of physical facilities. Establish a community policing program.
	Are the designs of the places stimulating interactions between (diverse) people?
	Maximize biophilia connections by including views of and interactions with animals and nature (for example, ensuring birds, insects, fish and animals are visible from walkways and windows), and focusing on natural light, vegetation, living walls, natural textures, and materials.
	In the design of parks and playgrounds, create a variety of climate environments to facilitate activity in different seasons and weather conditions.
	Total sum Senses & experience
Social infrastructure	Is a place with unique characteristics that people feel about it, a version of existing social connections, attachments, stories, and history that links people together.
	Is the public space supports activities that are symbolically and culturally meaningful to individuals or groups, and supports sociability.
	Has the environment the ability to provide the goods and services in and adjacent to it by businesses and other uses that make the environment useful.
	Did the designer provide enough space for conversation and play on sidewalks?
	Total sum Social Infrastructure
Traffic	Is the planner aware that children and caregivers use transit most when it is frequent, reliable, accessible, and affordable? Are they designed to meet their needs?
	Is the public space an inclusive and accessible, is there the ability to reach the space and to enter and use it. It means proximity and connectivity to other parts of the city.
	Use on-street markings or signage to visually reinforce the separation of areas for bicyclists and motorists.
	Total sum Traffic
	Standing zone - Weighting factor:

Maintenance, Control, and Programming	Did different events in public space have programming: stage performances and art exhibitions to activities, seating, and decorations?
	Total sum Maintenance & control
Places to meet	Available physical characteristics that can contribute to comfort in public spaces include sitting space, other street furniture and physical artefacts, generous sidewalk width, trees, shade and shelter, a high degree of articulation with nooks, corners, small setbacks in adjacent walls, and landscape elements such as ledges and planters, among others.
	Does the place have details that make it possible to stop and lean against? (e.g. bus shelters, benches, facades, trees, niches, or ledges)
	Does the public space frequently offer unique amenities, such as historical sites, architecture, music, trails, outdoor recreation, shopping, dining, entertainment, and lodging that attract visitors?
	Total sum Places to meet
Security	Are there in the public space the presence of litter, graffiti, vandalism and poorly maintained buildings, these presences making places appear unsafe.
	As a result of activity and pedestrian traffic all day, every week, and all year long, streets with more regular eyes on the streets provide us with safety.
	Is the public space Safe from traffic.
	Is the lighting safe at night and aesthetically pleasing?
	Refuge means providing comforting and nurturing spaces for retreat, which might mean cozy alcoves and corners that provide comfortable spaces to safely observe others.
	Total sum Security
Senses & experience	Does the place have details that make it possible to stop and lean against? (e.g. bus shelters, benches, facades, trees, niches, or ledges)
	Are there places in public spaces with spacious awnings that trap warmth and provide shelter from the rain?
	Dose the environmental factors support outdoor activities in public spaces like, comfortable microclimatic conditions, including temperature, sunlight, shade and wind.

Standing zone - Weighting factor:

Figure 11. This figure shows a quality-control tool for analysing the strengths and weaknesses of the standing zone in a public space. The nine subcategories with relevant qualities are displayed by the tool. Ar, PI, So, AC, Tr, Se, Sen, De, Mcp. Source: the authors.



Identified qualities: 33
Weighting factor/quality: 0,030

Waiting zone

Accessibility	Does the public space provide equal access to transportation and spaces, as well as more autonomy and independence for vulnerable groups?
	Is the location available? Are there physical elements that limit the site's accessibility?
	For example, leaving a space for a wheelchair seating and ensuring people in wheelchairs can easily access any features or viewing platforms.
	Locate buildings and building entrances near public transit stops and along transit corridors.
	Provide signage at buildings, transit stops, and major intersections showing a map and the distance, time, route, and calories burned to the nearest or next transit stop.
	Total sum Accessibility
Architecture & aesthetics	Has the space a sense of enclosure, this mean it has a room-like quality that evokes the feelings of being 'inside' the space as distinct from being outside it.
	The design should incorporate local materials for paving surfaces, seating, retaining walls, plantings, fences and railings, signage and sculptures.
	Consider prospect and ensure pillars do not block a seated view of an arriving bus and integrate recesses, so rubbish skips do not block the bath of travel.
	Refuge can be enhanced for older people thoughtful bench design (arm rests and higher seats), while digital visual displays of arrival/ departure times benefits people with hearing impairments, dementia or autism sensory disorders.
	Total sum Architecture & aesthetics
Development	Did the planner realize other elements, such as public toilets, drinking fountains, and Wi-Fi, make moving through cities more comfortable and encourage kids and caregivers to spend time on urban streets?
	s the planner aware that kids and their caregivers need bus stops or stations with fun activities. Waiting for a bus or train can be highly boring for kids, but transit stops offer plenty of possibilities for their development through games, play, and art.
	Total sum Development
Maintenance, Control, and Programming	Upgrade maintenance, including daily cleaning and preventative maintenance of physical facilities. Establish a community policing program.
	Total sum Maintenance & control
Places to meet	Transform bus stops into places for collaborative digital art, creative writing and games, perhaps chess or scabble
	Furnish bus stop shelters with seating or places to lean.
	Encourage transit use by furnishing transit stops with pedestrian conveniences.
	Total sum Places to meet
Security	As a result of activity and pedestrian traffic all day, every week, and all year long, streets with more regular eyes on the streets provide us with safety.
	Does the space feel welcoming, attractive, and safe?
	Use durable and slip-resistant materials.
	Was the planner aware that urban elements like street lighting, trash cans, and wayfinding play a significant role in making public spaces safe and accessible?
	Protected overhead and from behind (refuge) and offer long-range view, so a person can watch for an approaching bus- a visually safe environment (prospect).
	Total sum Security
Senses & experience	Do the streets incorporate shade trees, plants, and green spaces that contribute to the sustainability of the environment.
	Satisfy the public space the basic physiological needs, including environmental comfort, protection from the natural elements and the provision of shelter.
	Are the designs of the places stimulating interactions between (diverse) people?
	Smart lights integrate motion sensors, automatically extend pedestrian crossing times, provide beacon navigation for blind people and blink for an arriving bus.
	Handrails in bus shelter and places to rest .as well as helping users to maintain their balance, provide a sense of personal space and safety in busy shared public walkways.
	Create bus stop shelters that protect users from sun, wind, and rain.
	Total sum Senses & experience
Social infrastructure	Has the environment the ability to satisfy basic needs for shopping, eating, entertainment, and so on.
	Triangulation refers to the practice of locating features in close proximity to one another so that they generate more activity than they would separately.
	Provide additional space for passengers to wait by adding bus bulbs
	Is there access to basic social infrastructure in the vicinity of the location? (e.g., shops, gyms, community facilities, and green spaces)
	Total sum Social Infrastructure
Traffic	Are there accessible transportation options that enable more people and vulnerable groups to participate fully in economic and social life?
	Do a variety of transportation options provide access to the place, including buses, trains, cars, and bicycles?
	Place public transit stops along well-connected streets.
	Total sum Traffic

Playing zone - Weighting factor:

Playing zone - Weighting factor:

Figure 12. This figure shows a quality-control tool for analysing the strengths and weaknesses of the waiting zone in a public space. The nine subcategories with relevant qualities are displayed by the tool. Ar, PI, So, AC, Tr, Se, Sen, De, Mcp. Source: the authors.

What does the qualitative methodology entail? Improving the quality of urban environments can foster community interaction, enhance social cohesion, and promote a sense of belonging among city dwellers.

This research presents a comprehensive framework of nine subcategories for examining the qualitative factors of public spaces.

This paper restricts its calculation of public open space to the city center's pedestrian-only streets in Karlstad. This paper focuses on all public spaces that encourage public usage and active or passive social behavior. In this paper, public spaces refer only to the open areas between buildings.

We only apply the obtained results and these quality-control tools to small cities in Sweden and the Nordic region. However, the authors acknowledge that social spaces should be developed differently for different populations and countries. Downtown social areas may need different "play zones" and "bus, taxi, tramway waiting zones" than suburban ones. Some countries have hot climates or distinct social traditions, thus they may not need "bicycle tracks and parking zones" like Nordic cities.

Nevertheless, researchers from any country may use this novel method and develop an identical approach, gaining all its advantages. However, they must take into account the cultural, climate, and social differences between Nordic countries and their territories.

The authors believe that the outstanding benefit of this research will help future urban researchers in Nordic countries adopt this methodology to determine the social area factor. Observing and evaluating pedestrian-only public places in socially aware cities like Copenhagen, Oslo, and Stockholm can easily accomplish this. The creation of the social area factor will empower municipalities to determine the appropriate amount of sociable public space, which is essential for fostering social interaction, and address any gaps in urban planning.

5. Conclusions and Recommendation

This study answered the research question and developed an evidence-based method to measure the social space ratio for Karlstad center's pedestrian-only streets, which can benefit academic research and real-world urban development projects in small Swedish or Nordic cities. These easy quality-control tools may help municipal planners in Swedish small towns assess the pros and cons of the use of public spaces and make changes. This study gives a method for creating social-area factors in future Swedish and Nordic city studies. Nordic municipalities may address planning gaps and establish how much social public space is needed to stimulate interaction by creating the social area factor. Furthermore, this research facilitates the examination of the social space ratio's applications outside Karlstad and considers how different cities or urban settings might use this strategy. Any researcher from any country may adopt this novel method and develop a similar approach with its advantages. However, social, cultural, and climatic distinctions across Nordic nations and areas must be acknowledged.

6. Future Research

Since the weighting factor values vary for each zone, it is imperative to conduct more field observations and employ appropriate methods to determine the precise weighting factor values for each activity zone. This phase is viewed as a preliminary measure before conducting research to determine the social area factor.

An effective approach to determine the social area factor is to carefully observe and assess pedestrian-only public spaces in socially conscious cities such as Copenhagen, Oslo, and Stockholm. The creation of the social area factor will enable municipalities to determine the proper quantity of sociable public space, which is necessary for social interaction, and fill an absent area in urban planning.

Author Contributions: Conceptualization, K.N.; data curation, K.N. and W.W.; formal analysis, K.N.; investigation, K.N. and W.W.; methodology, K.N.; resources, K.N.; supervision, K.N.; visualization, W.W.; writing—original draft, K.N.; writing—review and editing, W.W. and O.N. supported the whole research process, provided various insightful opinions, and oversaw all of the text that were included in the article. All authors have read and agreed to the published version of the manuscript.

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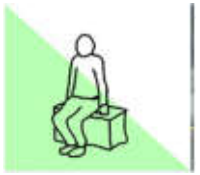
Abbreviations

Architecture and aesthetics Ar, Place to meet PI, Social infrastructure So, Accessibility AC, Traffic Tr, Security Se, Senses and Experience Sen, Development D, Maintenance, control, and programming Mcp.

Appendix A. The Qualities That Applied in Each of the Seven Zones Are Listed in Tables A1–A7; Note: In All Tables A1–A7, the White Color Corresponds to the Applied Qualities, While the Red Color Corresponds to the Missing Qualities

Table A1. This table shows the qualities that applied in sitting zones on pedestrian-only streets in the centre of Karlstad.



Sitting Zone

	Ac	Ac	Ac	Ac	Ac	Tr	Tr	Tr	So	So	So	So	Se	Se	Se	Se	Se	Pl	Pl	Pl	Sen	Sen	Sen	Sen	Sen	Sen	Ar	Ar	Ar	Ar	De	De	De	MCP	MCP
	7	9	11	23	4	7	2	3	1	2	3	4	1	2	3	4	5	1	2	3	1	2	3	4	5	6	1	2	3	4	1	8	3	1	2
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S6																																			
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S8																																			
S9																																			
S10																																			
S11																																			
S12																																			
S13																																			
S14																																			
S15																																			

Table A2. This table shows the qualities that applied in standing zones on pedestrian-only streets in the centre of Karlstad.

Standing Zones

	Ac	Ac	Ac	Ac	Tr	Tr	Tr	So	So	So	So	Se	Se	Se	Se	Se	Pl	Pl	Pl	Sen	Sen	Sen	Sen	Sen	Ar	Ar	Ar	Ar	De	De	De	MCP	MCP
	2	7	11	14	3	1	4	1	5	6	7	6	7	8	9	5	1	4	5	7	2	8	6	9	1	5	2	4	8	4	5	3	2
ST1																																	
ST2																																	
ST3																																	
ST4																																	
ST5																																	

Table A3. This table shows the qualities that applied in outdoor dining zones on pedestrian-only streets in the centre of Karlstad.

Outdoor Dining Zones

	Ac	Ac	Ac	Ac	Ac	Tr	Tr	Tr	So	So	So	So	Se	Se	Se	Se	Se	Pl	Pl	Pl	Sen	Sen	Sen	Sen	Sen	Sen	Ar	Ar	Ar	Ar	De	De	MCP
No	1	6	13	14	17	1	2	5	1	8	9	10	10	7	11	4	5	1	6	7	1	2	10	11	12	6	1	6	4	7	4	6	1
OD1				■	■						■								■	■	■					■		■		■			■
OD2				■	■														■						■	■		■		■			
OD3					■																				■								
OD4					■																				■								
OD5				■	■				■		■	■				■			■				■					■		■	■	■	
OD6				■	■														■				■					■		■			■
OD7					■																												
OD8					■												■		■										■				

Table A4. This table shows the qualities that applied in zones for moving people on feet and wheels on pedestrian-only streets in the centre of Karlstad.

Zones for Moving People on Feet and Wheels

	Ac	Ac	Ac	Ac	Ac	Tr	Tr	Tr	So	So	So	So	Se	Se	Se	Se	Se	Pl	Pl	Pl	Sen	Sen	Sen	Sen	Sen	Sen	Ar	Ar	Ar	Ar	De	De	De	MCP	MCP
	5	10	12	17	20	3	1	2	1	5	2	4	6	13	14	15	16	1	5	3	13	1	2	14	12	15	1	5	2	8	8	7	5	1	2
M1				■								■													■										■
M2				■								■													■										■
M3				■								■													■										■
M4				■								■													■										
M5				■								■													■										
M6				■								■													■										
M7				■								■													■										
M9				■						■		■							■						■										■
M10				■						■		■							■						■										■
M11												■													■										
M12												■													■										
M13												■													■										
M15				■						■		■					■			■										■					■

Table A5. This table shows the qualities that applied in playing zones on pedestrian-only streets in the centre of Karlstad.

Zone for Playing

	Ac	Ac	Ac	Ac	Ac	Tr	Tr	Tr	So	So	So	So	Se	Se	Se	Se	Se	Pl	Pl	Pl	Sen	Sen	Sen	Sen	Sen	Sen	Ar	Ar	Ar	Ar	De	De	De	MCP
	6	8	13	15	16	3	1	6	11	12	13	14	17	15	18	19	20	8	9	10	2	17	18	19	3	16	6	4	9	10	8	4	9	3
PL1																																		
PL2																																		
PL3																																		
PL4																																		
PL5																																		

Table A6. This table shows the qualities that applied in bus, taxi, and tramway waiting zones on pedestrian-only streets in the centre of Karlstad.

Bus, Taxi, and Tramway Waiting Zone

	Ac	Ac	Ac	Ac	Ac	Tr	Tr	Tr	So	So	So	So	Se	Se	Se	Se	Se	Pl	Pl	Pl	Sen	Sen	Sen	Sen	Sen	Sen	Ar	Ar	Ar	Ar	De	De	MCP
	3	7	14	21	22	7	2	8	2	15	16	10	7	21	22	23	24	11	12	13	14	12	8	20	21	22	4	11	12	13	10	9	3
W1																																	
W2																																	

Table A7. This table shows the qualities that applied in bicycle track and parking zones on pedestrian-only streets in the centre of Karlstad.

Bicycle Track & Parking Zone

	Ac	Ac	Ac	Ac	Ac	Tr	Tr	Tr	So	So	So	So	Se	Se	Se	Se	Se	Pl	Pl	Pl	Sen	Sen	Sen	Sen	Ar	Ar	Ar	Ar	De	De	MCP
	7	16	18	19	22	9	10	11	18	3	4	19	25	26	27	28	29	5	14	15	13	14	23	24	1	2	9	14	12	13	1
BT&P Tr1+P1+P2+P3+P4 +P5+P6+P7																															

Table A7. *Cont.*

Bicycle Track & Parking Zone

	Ac	Ac	Ac	Ac	Ac	Tr	Tr	Tr	So	So	So	So	Se	Se	Se	Se	Se	Pl	Pl	Pl	Sen	Sen	Sen	Sen	Ar	Ar	Ar	Ar	De	De	MCP
	7	16	18	19	22	9	10	11	18	3	4	19	25	26	27	28	29	5	14	15	13	14	23	24	1	2	9	14	12	13	1
BT&P Tr2+P8+P9																															
BT&P Tr3+ P10+P11																															
BT&P Tr4+P12+P13+P14 +P15+P16																															
BT&P Tr5+P17+P18+P19																															

Appendix B

Four corridors will be included in the case study research, as Figure A1 illustrates.

With a total size of 6477 m^2, Corridor 1 is the center square of the major bus station, made up of all seven social zones (moving, playing, waiting, standing, eating outside, and parking). It is bounded by four streets: Östra Torggatan, Tingvallagatan, Kungsgatan, and Västra Torggatan. With a total size of 3220 m^2, Corridor 2 is a pedestrian corridor made up of six social zones: sitting, standing, moving, playing, and parking. It is delimited by the street Tingvallagatan. With a total size of 4800 m^2, Corridor 3 is a pedestrian corridor that is bounded by Västra Torggatan. It is divided into six social zones, which are as follows: sitting, standing, moving, playing, and parking. With a total size of 5720 m^2, Corridor 4 is a pedestrian corridor made up of six social zones: sitting, standing, moving, playing, and parking. It is delimited by the street Drottninggatan.

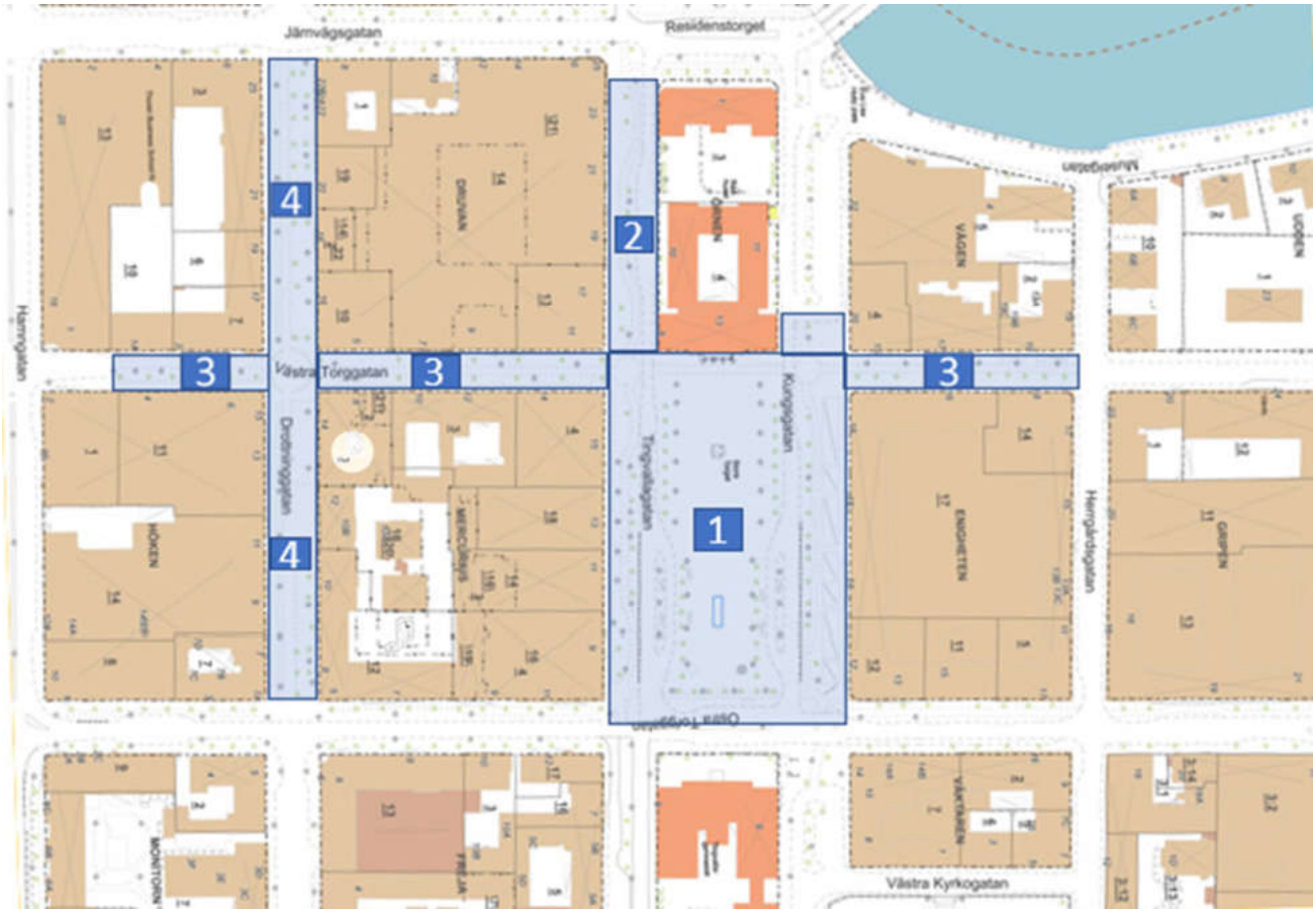

Figure A1. This figure shows four corridors which are included in the case study research. The corridors are: Number 1, Stora Torget; Number 2, Tingvallagatan; Number 3, Västra Torggatan; and Number 4, Drottninggatan. Source: Karlstad Municipality.

Figure A2. This figure shows different zones in corridors 3 and 4 which are included in the case study research. The letter S in green spots represents the sitting zones; the letters St in yellow spots represent the standing zones; the letter M in gray spots represents the moving zones; the letters OD in brown spots represent the outdoor dining zones; the letters PL in violet spots represent the playing zones; and the letter P in blue spots represents the parking zones. Source: Google maps.

Figure A3. This figure shows the different zones in corridors 1 and 2 which are included in the case study research. The letter S in green spots represents the sitting zones; the letters St in yellow spots represent the standing zones; the letter M in gray spots represents the moving zones; the letters OD in brown spots represent the outdoor dining zones; the letters PL in violet spots represent the playing zones; the letter W in light blue spots represents the moving zones; and the letter P in blue spots represents the parking zones. Source: Google maps.

Figure A4. This figure shows the aerial photos of the corridors which are included in the case study research. Source: the authors.

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