

Article

Greenery as an Element of Imageability in Window Views

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Abstract: A window view affects a person's well-being and comfort. The effect of visual contact with nature on people depends on the quality of the outside scenery, which in turn depends on parameters such as the number of visible layers, the distance to visual elements and environmental information (content) in the window view. Many studies have concluded that views of nature are preferable, while in urban environments a high-quality window view should include greenery. In our study, a survey was conducted among two groups of students at the Faculty of Architecture, University of Ljubljana, to find out how the respondents perceived urban imageability in a window view. Using the example of five neighborhoods in Ljubljana (Slovenia), which have different urban planning and design concepts and greeneries, we investigated whether respondents perceived the presence of greenery as an important element of visual comfort. They ranked the quality of window views using eight indicators. The analysis of the ranking of the answers showed that the responses were similar for the two survey approaches (with single-selection and with multiple-selection techniques), except for the perception of surface texture. This indicates a common understanding of the role of greenery and an ambiguity in the perception of what is meant by the term 'texture'.

Keywords: imageability; greenery; urban density; urban development; quality of window views



Citation: Fikfak, A.;

Zbašnik-Senegačnik, M.; Drobne, S.

Greenery as an Element of Imageability in Window Views. *Land* **2022**, *11*, 2157. <https://doi.org/10.3390/land1122157>

Academic Editors: Marco Locurcio, Francesco Tajani and Debora Anelli

Received: 5 November 2022

Accepted: 27 November 2022

Published: 29 November 2022

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1. Introduction

In modern, fast-growing cities, where urban density is becoming a desirable development principle, residents lack contact with the natural environment [1]. However, studies in recent decades have shown that looking out of a window at nature has a similar effect on people as being in nature [1,2]. Research on the links between urban green spaces and the social dimensions of health has shown three main kinds of health effects: short-term recovery from stress or mental fatigue, faster physical recovery from illness, and long-term overall improvement in people's health and well-being [1,3]. Greenery in the outdoor environment triggers strong positive links to well-being [4–6] and promotes restorative behavior after stress [7,8]. A green environment also promotes physical activity and boosts the immune system [9,10]. A view of or access to a garden improves comfort, pleasure and well-being, while also contributing to lower stress levels [11].

Many studies have also highlighted the positive effects of neighborhood greenery on children. For young children, green spaces are associated with lively forms of open play, high levels of physical activity [12], better sleep, and a slimmer body [13]. Children who played in large and integrated outdoor areas with vast areas of trees, shrubs, and hilly terrain were found to have fewer attention problems [14]. Higher levels of biodiversity in residential areas are also linked to the better respiratory health of children [15]. Younger children from rural backgrounds, who were surrounded by a high proportion of greenery, were found to be significantly less stressed than urban children, who were surrounded by a low proportion of greenery [16]. Poor access to urban green spaces was also linked to hyperactivity and attention deficit disorder in 10-year-old children [17].

Kaplan [18] suggested that one outcome of mental fatigue may be an increased propensity for outbursts of anger and even violence. If so, contact with nature, which appears to

mitigate mental fatigue, may also reduce aggression and violence. Kuo and Sullivan [19,20] have used this theory to study crime rates in housing estates with and without greenery. They found that residents living in relatively barren buildings reported more aggression and violence than their counterparts in greener buildings. Moreover, levels of mental fatigue were higher in barren buildings, and aggression accompanied mental fatigue.

1.1. Window View on Greenery

Views of nature through windows have similar effects on people as experiencing nature outside [21]. Chang et al. [22] find that a close view of nature through windows from home and work correlates positively with life satisfaction. Van Esch et al. [23] have found that having access to nature via a window view will produce beneficial effects for employees who spend much of the working day inside. Consequently, a growing number of organizations are re-designing workplaces to give employees greater exposure to natural views. Although nature and green spaces have many positive impacts on people, the current trend in the construction of compact cities does not consider the ability of natural environments to contribute to improving the quality of work and living environments that could promote the health and well-being of residents [24]. Kaplan [25] also finds that taking short, repeated breaks to look out of a window at nature improves subjective well-being and reduces stress. Built environments, especially work environments, require constant focused attention, which leads to mental fatigue. On the other hand, views of nature do not require focused attention but involve fascination. Fascination triggers indirect or involuntary attention, which regenerates people. Ulrich [26] shows that patients in hospitals with a window view of a green area recovered faster than those exposed to a view of a brick wall. The importance of window views was also demonstrated during the Covid-19 pandemic, which required prolonged lockdown, as it has provided visual contact with the environment and also represented the only social contact between people [27]. Looking at greenery through windows reduced levels of anxiety, anger, fear, moodiness, boredom, irritability, and sleep disturbances [28,29]. The findings of Taylor et al. [30] suggest that for girls, green space immediately outside the home can help them lead more effective and self-disciplined lives. For boys, more distant green spaces may be equally important.

1.2. Window View on Urban Environment

A large part of the developed world's population now lives in urbanized areas, far away from native nature. Even in urban environments, however, the view out a window provokes both positive and negative reactions. In general, more distant urban elements are better received in a window view than closer ones, especially when there is greenery between the observer and the built structure, preferably clusters of trees or shrubs [31]. Greenery is certainly an element that can enhance the response of the observer in an urban view. Conversely, the sight of an untidy, neglected, unmaintained environment evokes a negative mood [32,33].

View quality is defined by parameters including the width of window view(s), the distance of view, layers in view (sky, landscape, and foreground), and environmental information (contents). The qualitative elements in the window view are the breadth and depth of the scenery—the view should encompass the foreground and the horizon [34], and it should be possible to look into the distance, as a greater distance to the subject of the view also increases visual satisfaction. Standard EN 17037 [35] defines a high-quality view as one where the distance to the content of the motif is greater than 50 meters, while a medium-quality view is one where the content is at least 20 meters away. People prefer urban features to be viewed from a distance, but the same recommendation does not apply to nature [31]. Qualitative window views are views that contain a wide variety of information—that is, when all three of the aforementioned layers are visible [35,36]. The scenery is dominated by the lower layer with pavement or grass, as well as pedestrians and vehicles, which give the scenery dynamism and thus attractiveness while providing visual information about the distance and size of objects in the middle layer. The middle

layer comprises buildings and nature or urban greenery. The upper layer shows the sky and the natural or artificial horizon and provides a distance view. In urban views, scenery containing more sky has been shown to better support psychological regeneration [37]. Giraldo Vasquez et al. [38] investigated the dependence of preferences between window views on the number of layers in the view—the lower the number of layers, the more important the view of nature; the higher the number of layers, the more acceptable are urban views. The quality of the scenery is also determined by the horizontal angle of the view, which in turn depends on the size or width of the window opening.

1.3. Residential Neighbourhoods, Building Density, and the Window View

Today's economy is driving urbanization, which is also having an impact on the quality of life in the city, especially in terms of providing sufficient built and green open spaces. Dimitrovska Andrews [39] says that urban design criteria fall into three basic categories: measurable or quantitative criteria (utilization, built form, spaciousness, density, sunniness); non-measurable or qualitative criteria (accessibility, adaptability, spatial meaning, vitality); and context or general compatibility (coherence, architectural and aesthetic aspect, principle of views, presence of the past, spatial meaning, diversity, human scale, hierarchy of urban criteria). All of these criteria are influenced by the urban design and the external layout. Therefore, increasing building density has the effect of reducing the distance between buildings, which are becoming taller for this purpose. On the other hand, increasing urban density, or densification, is an important sustainability objective and relates to the population density or morphological density of the built environment in relation to land consumption [40], population density as a geographical concept and building density as a concept used in spatial planning [41]. Higher urban densities and mixed-use urban forms lead to a better quality of life through social interaction and cultural vitality, as well as proximity to work; services; and basic social, educational and recreational activities, as the variety of activities and accessibility are key to achieving social equity [42–44]. In this research, we study the effect of urban density and the relationship between the interior space of a building with the external surfaces—the view through a window and its impact on people's well-being.

While the larger window areas made possible by technological developments in glazing ensure adequate daylight distribution in most cases, the importance and the effect of window views are overlooked. The proximity of the building opposite the window prevents distant views through the windows in most flats in multi-apartment buildings. The exceptions are dwellings on the lowest floors, where pavement, grass, and people are visible in addition to the façade, and on the highest floors, where the sky is also visible through the window.

Window views are crucial for people's sense of well-being and orientation in time and space, providing information about the time of day, weather conditions, what is happening outside, and so on, as well as the dimensions and distances of the elements in the view [45].

1.4. Urban Design and Quality Indicators

The aim of urban design is to strengthen the spatial identity, liveliness, and visibility of the parts and the whole of the settlement, its legibility and easy orientation within it [46]. The aim of defining urban design principles at the level of the settlement or its parts is to achieve a clearly structured and experientially attractive space, which many authors have recognized in their own way with the principles of reading space, such as: legibility [47], vitality, order, movement and change [48], townscape, what makes a town 'work' architecturally [49], good private garden space [50], phenomenology of the place and its genius loci [51], tastes and values of 'common' people [52], human scale and walkability [53], pattern language [54], traditional design paradigms with city building process [55], and urban design as the art of city building, which is concerned with the method and process of structuring public space in cities [56]. The challenge is to achieve a good balance of spatial perception: between vertical and horizontal relationships; of space,

form, and surface; between unity and diversity; and between composition and detail [57]. Ewing and Clemente [58] have defined 51 perceptual qualities of the built environment in the proposed metrics researching qualities in livable places, which are organized into five intangible qualities of urban design: imageability, visual enclosure, human scale, transparency, and complexity [58]. In our research, we focused on the importance of the visual impact (imageability) for well-being and quality of life, which includes the presence of greenery. A place has high imageability when specific physical elements and their arrangement capture attention, evoke feelings, and create a lasting impression [58].

1.5. Research Questions

In the context of imageability research, it is clear that the most recognized indicator of imageability is the historicity of a building and that traditional structures allow for a greater perception of imageability, as it is the façades of buildings and their expressiveness that have the greatest influence on experiencing it. However, in the context of picturesqueness, we were not only interested in the relationship between historic, modern or contemporary construction in neighborhoods but also in the perception of green spaces and green structures in general, as well as in the context of the perception of space as a window view and how urban design and the density of construction influence the ‘richness’ and the dynamics of the experience of outdoor spaces.

In this study, we tested three hypotheses:

H1: *The multi-layered nature of greenery in the city has an important impact on the scenic quality of the urban environment.*

H2: *The indicators used in the study for the perception of urban imageability lead to similar results, regardless of the survey approaches used (only one answer possible or multiple answers possible).*

H3: *In the study on the perception of urban imageability, the indicator “texture of surfaces” is more open to different interpretations than the other indicators proposed in the literature.*

2. Materials and Methods

2.1. Preliminary Research

The study of the responses to the window views of the opposite façade was carried out in two steps. In the first phase, a preliminary selection of residential neighborhoods was carried out. Neighborhoods were selected according to various spatial criteria, such as morphological design, period of development, distance from the city center, variety of buildings, variety of external open space layout, spatial fit, shape, size, street network or connectivity, climatic comfort, and so on. The city of Ljubljana is the largest urban area in Slovenia, with 293,218 inhabitants (as of 1 January 2022), with a density of 1.068 km², residing in the Municipality of Ljubljana (MOL) [59]. The city is known by its character as a city built on a human scale. In 2016, Ljubljana received the title of European Green Capital [60]. Ljubljana green facts are as follows: the city has 542 m² of public green areas per inhabitant; more than 46% of the city area is covered by native forests; 75% of the city is green area; with its 7000 trees, The Path of Remembrance and Comradeship (34 km) is the city’s longest tree-lined avenue; drinking water comes from natural sources, requiring no prior treatment; and the city is the European capital with the largest share of separately collected waste [60]. In the framework of the preliminary study, the residential neighborhoods in Ljubljana were analyzed through the following theme: imageability of urban structures based on visual principles. In the design of the morphological structure of the city, this aspect is important for understanding the harmonious floor plan, and even more so when considering how the space of the neighborhood as an ‘experiential’ space will be perceived in three spatial dimensions. Following Gestalt psychology [61,62], the observer strives for the best compositions of the whole set of things he sees, using the principles of simplicity, regularity, and symmetry in order to extract coherence or order within the image. There are four main systems by which the observer processes visual

stimuli: emergency, reification, multi-stability, and invariance. In addition to these, there are six basic rules that govern the processing of visual stimuli: the proximity rule, the similarity rule, the closure rule, the rule of favorable continuation, the symmetry rule, and the simplicity rule. For the analysis in the preliminary study, we used the following tools and included the following data:

- Literature review of city development, historical data, urban design, and architectural interventions.
- Geomorphological and real-estate data from the Surveying and Mapping Authority of the Republic of Slovenia [63]. Analyses of geomorphological features (topography, reliefs, terrain types, distances between buildings, etc.), and mapping of landscape features with spatial data using ArcGIS software (ArcMap version 10.3.1) for visual assessments and analyses.
- On-site observations and analysis. Fieldwork and photographic surveys (April 2021–April 2022).

2.2. Research of Imageability in Window Views

In the second step, for the purpose of the study, we selected 5 major residential neighborhoods in the city of Ljubljana (Novo Brdo—N1, Litostrojski bloki—N2, Mostec—N3, Štepanjsko naselje—N4, Zupančičeva jama—N5), which have certain distinctive elements of identity. The morphology of a single neighborhood and its placement in the city of Ljubljana is shown in Figure 1. The first criterion for selection was the linear design of the apartment buildings, which does not allow a distant view when looking out of a window, and the second criterion was at least partial greening of the space between the buildings. The other parameters differ: the selected apartment buildings have 3–7 stories, were built in different periods and have different urban designs, and the distance between them. All neighborhoods have greenery between the buildings, but the methods of greening vary (Figure 2). The façades also contain different architectural and construction elements and are maintained differently. This has allowed for a certain degree of variability. The façades were photographed on the same day, in the same weather conditions (cloudy day with diffuse light), with the same camera, and all images are the same size, 2592×1944 pixels (Sony camera, DSC, HX-1). All photos were taken from the location/place where the user is standing, looking out through the window at the opposite facade. To avoid photo manipulation, the photos were taken with a fixed focal length lens. The photographs deliberately do not include people, as their presence could be a distraction that could influence the responses of the respondents.

Case study areas—five major residential neighborhoods:

N1—Novo Brdo (2018–2021). The design of the neighborhood was based on the organization of built lines followed by internal pedestrian and cycling paths. The apartment blocks are presented as single dots on the grid, detached and average size (five-story villa blocks). The Housing Fund of the Republic of Slovenia has offered a higher standard of living in the new Brdo neighborhood, with a co-housing typology of different generations (young, elderly, families). The well-being of the residents in the new neighborhood will be ensured by a safe open outdoor space, which is permeated with a new green system, children's playgrounds, and links to the existing green rings in Ljubljana.

N2—Litostrojski bloki (1947–1963). The entire complex was planned as an industrial complex amidst greenery. The area was divided into three parts: residential, industrial, and cultural/educational. The residential part consists of freestanding four-story blocks, arranged in a grid of streets. Architecturally, the complex was innovative because of the use of prefabricated concrete elements, different forms of construction, and façades [64]. The concept of the layout of the residential complex is based on the idea of placing the building in a green area.

N3—Mostec (2001–2002). This housing complex is an organic composition organized as an urban structure close to the green forest space. The area is characterized by a mix of various building typologies (varying from two-story family houses to four-story blocks)

of social small-scale construction in natural surroundings. Its urban design is based on the idea of a gradual composition balancing the contact between built and green areas. This is undoubtedly a good urban composition in the sense of landscape organization and landscape protection criteria [65]. The exchange of building typologies creates an authentic atmosphere within the neighborhood [65].

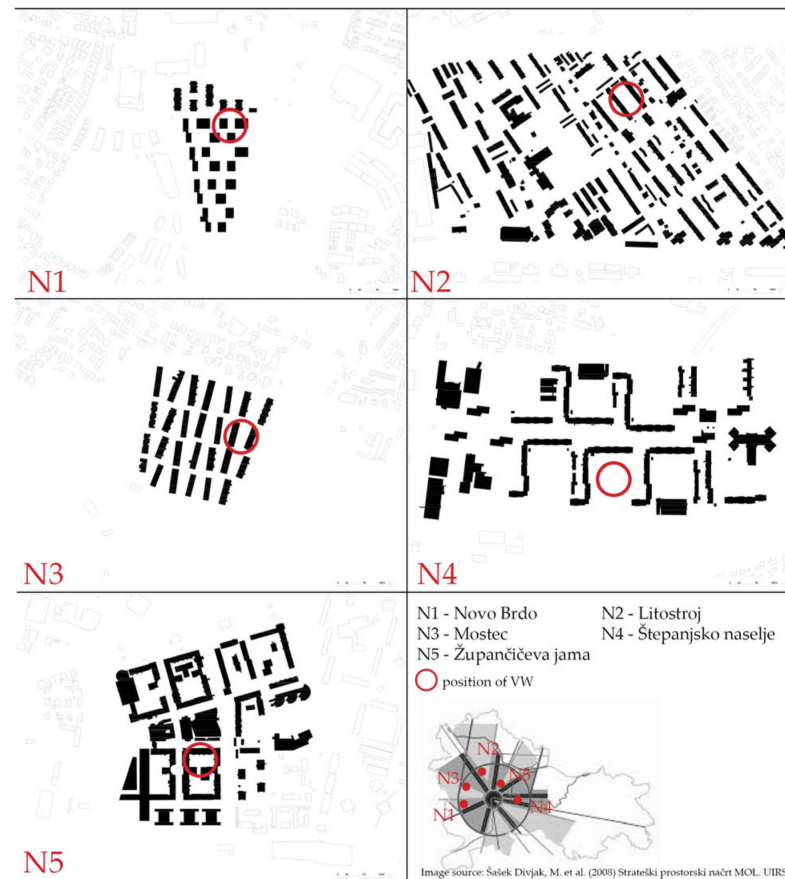


Figure 1. Five major residential neighborhoods in the city of Ljubljana and position of neighborhoods in strategic abstraction [66] of Ljubljana.

N4—Štepanjsko naselje (1972–1978). The first ‘demonstration site’ of a socially oriented campaign in Ljubljana, with a wish to build solidarity housing [67]. The urban design is based on the idea of a central spine as a wide pedestrian route with side branches into a semi-open urban block, which, despite the high density, maintains large compact green areas. Traffic is routed along the periphery, and the public program is concentrated in two nodes at each end. Residential buildings are typologically classified into four groups as five-story blocks.

N5—Župančičeva jama (1984–1993). The residential quarter is “an iconic representative of postmodern urban thought and embodies the principles of mixed use and urban public space that are still relevant today” [68]. The complex consists of four larger rectangular urban blocks. Unlike modernist ‘blocks in the green’, where urbanity is completely diluted, here the components are spatially separated into an ‘intensive’ (dense) city and an ‘intensive’ park next to it [68]. There is a dense housing area with seven-story buildings in an urban block structure.

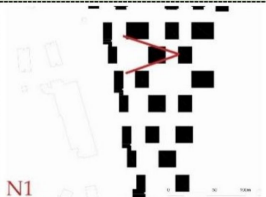

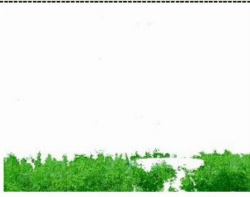
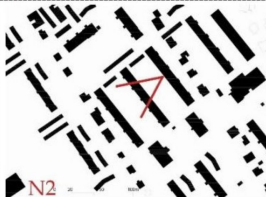


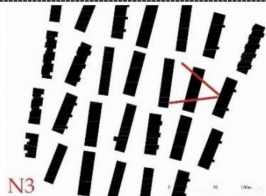

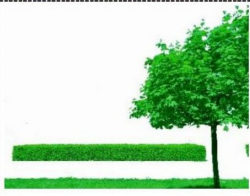
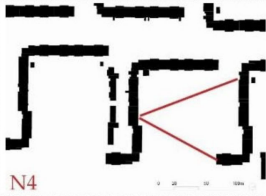


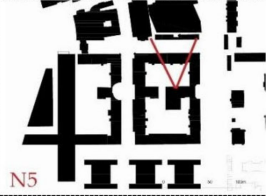
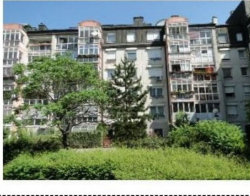
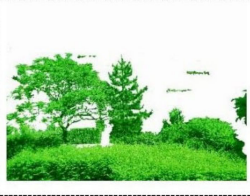
Abr.	Name	Area morphology	Building distance	Image window view (IWV)	IWV Greenery	IWV % Greenery
N1	Novo Brdo		16.60 m			23.70 %
N2	Litostrojski bloki		31.80 m			36.40 %
N3	Mostec		17.30 m			32.50%
N4	Štepanjsko naselje		117.60 m			63.20%
N5	Zupančičeva jama		28.10 m			42.70%

Figure 2. Five window views of residential neighborhoods. On the morphological scheme (area morphology) is marked the viewing angle of the window view (horizontal viewing field of the eye with 70° angle of word pattern recognition). Research on the greenery in the window view was done in parallel with the survey.

2.3. Survey and Research Framework

In the second phase of the study, we designed a survey questionnaire with 11 questions. The first six questions tested respondents' understanding of the need for a window in a room and the importance of a good quality view out of the window (i.e., window view). In the second part, respondents were asked to evaluate the window view on selected opposing façades through the prism of imageability. The meaning of imageability was introduced to them as characteristic and qualitative elements that, when seen in a specific location, attract attention, evoke pleasant feelings, and create a memorable impression. They chose from eight pre-prepared responses, respectively, indicators (I) that were selected from the literature [47–58]:

- Façade prominence and visibility (I1),
- Richness and articulation of the building (I2),
- Readability of the open space (I3),
- Multi-layered greenery (I4),
- Texture of surfaces (I5),
- Buildings with identifiers (I6),

- Vibrancy and dynamics of the ambiance (I7),
- Open views into the wider space (I8).

We invited two groups of students from two different bachelor study programs (from three years of the study program Architecture (group A) and Urbanism (group B) at the Faculty of Architecture, University of Ljubljana, to participate in the survey. This ensured independent responses between groups A and B, allowing us to test our hypothesis H2 that the indicators of the perception of urban imageability (I1–I8) would lead to similar results, regardless of the survey approaches used. In the first approach (Survey Approach 1—SA1) only one response per respondent was possible, but in the second approach (Survey Approach 2—SA2) we allowed respondents to select more than one possible answer.

The survey was completed by 88 students (50 students from group A and 38 students from group B). Participation in the survey was voluntary and anonymous. The survey was published in May 2022 in two online applications: in a Moodle learning platform in the online classroom of UL FA (<https://ucilnica2223.fa.uni-lj.si/login/index.php?lang=en>, 21 May 2022) for group A and in an online survey tool, 1KA (<https://www.1ka.si/d/en>, 21 May 2022) for group B. The survey was available for 24 hours. There was no time limit for completing the survey while it was available.






The answers were sorted into frequencies and the proportions of all answers were calculated (separately for SA1 and SA2). We then ranked the response proportions.

The three hypotheses made in the introduction were tested based on the ranking of the responses. Hypothesis H1, the hypothesis that the multi-layered nature of greenery in the city has an important impact on the scenic quality of the urban environment, was tested using the correlation test for nominal variables (χ^2 test). Hypothesis H2, the hypothesis that the urban landscape perception indicators used in the study will produce similar results regardless of the survey approaches used (only one answer possible—SA1 or multiple answers possible—SA2), was tested by testing the significance of the Pearson correlation coefficient between the ranks of answers to the survey questions according to the survey approach. Hypothesis H3, the hypothesis that the indicator “texture of surfaces” is more open to different interpretations than the other indicators proposed and used in the study, was tested by the t-test for the difference in means between the ranks for indicator I5 and for the other indicators (I1–I4 and I6–I8).

3. Results

The number of responses from respondents in relation to the perceived scenic quality of each window view according to the survey approach can be found in Table 1, and the relative form of the responses can be seen in the graphs in Figure 3. The indicators most frequently selected for each window view were as follows: for N1, façade prominence and visibility (I1); for N2, multi-layered greenery (I4) and readability of the open space (I3); for N3, multi-layered greenery (I4) and façade prominence and visibility (I1); for N4, open views into the wider space (I8), multi-layered greenery (I4) and readability of the open space (I3); and for N5, richness, and articulation of the building (I2), multi-layered greenery (I4) and vibrancy and dynamics of the ambiance (I7).

Table 1. Number of responses to perception of imageability according to the neighborhood and the survey approach.

		Novo Brdo (N1)		Litostrojski Bloki (N2)		Mostec (N3)		Štepanjsko Naselje (N4)		Zupančičeva Jama (N5)	
											
Code	Imageability indicator	SA1	SA2	SA1	SA2	SA1	SA2	SA1	SA2	SA1	SA2
I1	Façade prominence and visibility	27	25	4	7	8	16	0	3	5	17
I2	Richness and articulation of the building	4	7	0	0	5	3	2	6	15	18
I3	Readability of the open space	4	5	12	14	6	10	9	20	0	7
I4	Multi-layered greenery	0	0	19	18	15	14	10	23	13	20
I5	Texture of surfaces	1	10	1	4	2	12	0	10	5	15
I6	Buildings with identifiers	1	4	7	5	2	1	0	5	1	1
I7	Vibrancy and dynamics of the ambience	9	9	3	3	5	3	1	6	11	14
I8	Open views into the wider space	4	5	4	4	7	3	28	20	0	1
	Together	50	65	50	55	50	62	50	93	50	93

Notes: I1–I8 = codes for imageability indicator; N1–N5 = neighborhood; SA = survey approach (SA1 = only one answer allowed, SA2 = several answers allowed).

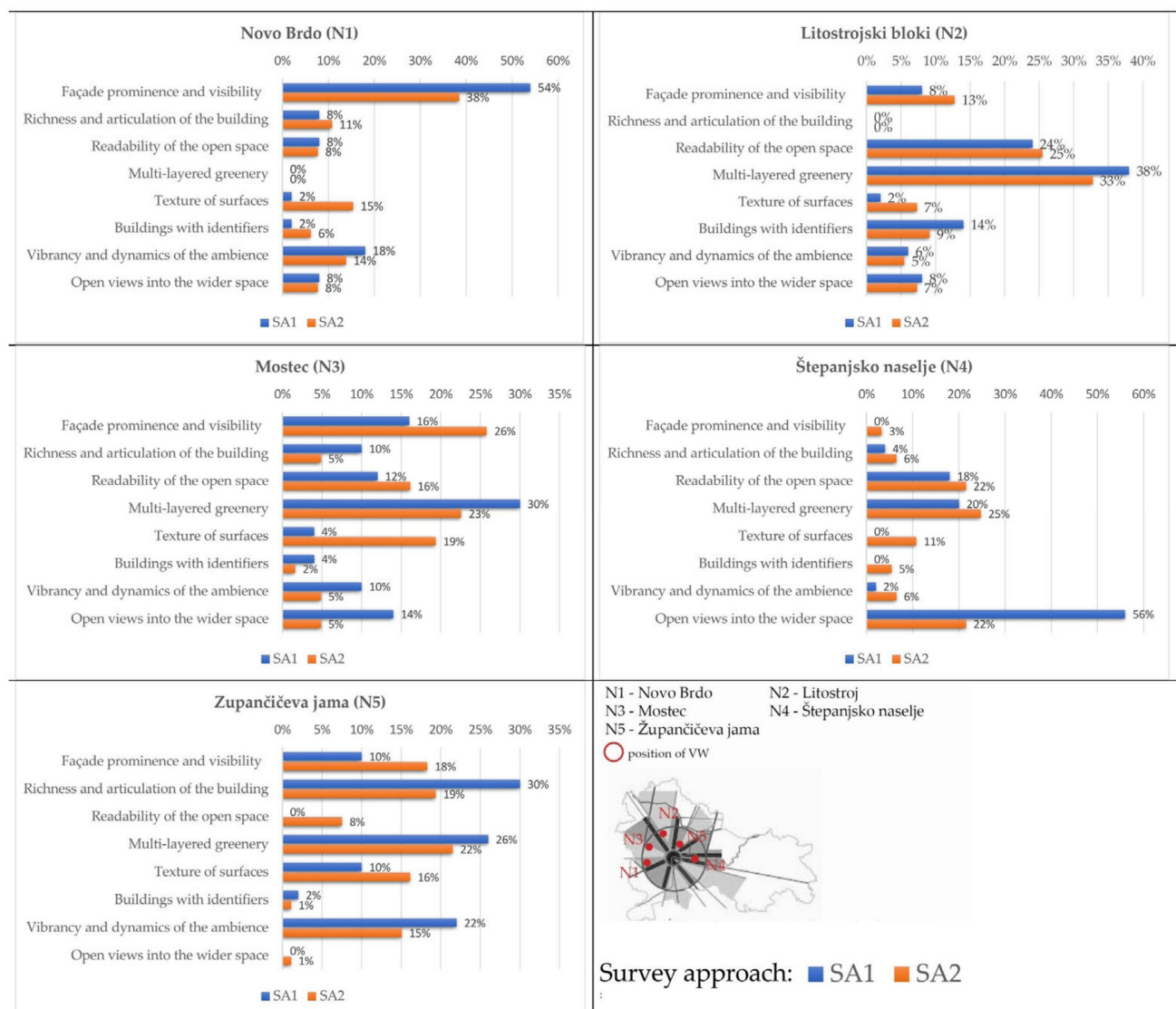


Figure 3. Relative number of responses on perception of imageability according to neighborhood and survey approach.

Table 1 also shows that in the SA1 approach, the approach where the respondent could only give one answer, all respondents answered all questions (the sum of the answers is 50 for all neighborhoods). However, in the SA2 approach, where 38 respondents could choose more than one answer, the lowest number of different scenic indicators was chosen neighborhoods N2 (55 answers), N3 (62 answers), and N1 (65 answers). However, the neighborhoods with the most different scenic indicators were described by respondents for the window view of neighborhoods N4 and N5 (with 93 responses each).

Based on the ranking of respondents' answers, we tested hypothesis H2 that the indicators of perceived urban imageability used in the study yield similar results regardless of the survey approach (SA1 and SA2). The Pearson correlation coefficient of the ranks (all ranks in Figure 4 combined) is $r = 0.786$ ($T = 7.834$, $t = 7.814$, $p = 10^{-9}$); thus, we conclude that there is no difference in ranking the answers according to the two survey approaches (SA1 and SA2). These results confirm H2.

Code	Imageability indicator	N1		N2		N3		N4		N5	
		SA1	SA2	SA1	SA2	SA1	SA2	SA1	SA2	SA1	SA2
I1	Façade prominence and visibility	1	1	4	3	2	1	6	8	4	3
I2	Richness and articulation of the building	3	4	8	8	5	5	4	5	1	2
I3	Readability of the open space	3	5	2	2	4	4	3	2	7	6
I4	Multi-layered greenery	8	8	1	1	1	2	2	1	2	1
I5	Texture of surfaces	6	2	7	5	7	3	6	4	4	4
I6	Buildings with identifiers	6	7	3	4	7	8	6	7	6	7
I7	Vibrancy and dynamics of the ambience	2	3	6	7	5	5	5	5	3	5
I8	Open views into the wider space	3	5	4	5	3	5	1	2	7	7
Pearson's correlation coefficient :		0.676		0.902		0.655		0.841		0.876	
T-statistic :		2.247		5.130		2.126		3.805		4.442	
t-value :		2.244		4.524		2.123		3.707		4.152	
p-value :		0.033		0.002		0.039		0.005		0.003	

Notes: N = residential neighborhoods (N1 = Novo Brdo, N2 = Litostrojski bloki, N3 = Mostec, N4 = Štepanjsko naselje, N5 = Zupančičeva jama), SA = survey approach (SA1 = only one answer allowed, SA2 = several answers allowed).

Figure 4. Ranks of responses on perception of imageability according to neighborhood and survey approach and results on testing the rank correlation coefficient's significance.

We also calculated rank correlation coefficients and performed significant tests separately for five neighborhoods (N1 ... N5). The results in Figure 4 show that there is no difference in the ranking of responses according to the two survey approaches, even at the neighborhood level, where all p-values are below 0.04. The p-values are quite low for neighborhoods N2, N4, and N5, while they are somewhat higher for N1 and N3. For these two window views, the p-values are higher, mainly due to the difference in ranks for the indicator 'Texture of surfaces' (I5), where the difference in ranks between the response groups in relation to the survey approach is as high as four units. Examination of the differences in ranks for the other neighborhoods also revealed a high variance in ranks, especially for indicator I5, where the differences for N2 and N4 are two units each. These findings led us to test hypothesis H3.

We tested hypothesis H3, which states that the indicator "texture of surfaces" (I5) is more open to different interpretations than the other indicators used in the study. The test was conducted using the *t*-test for the difference in means between the ranks of the two survey approaches for indicator I5 and for the other indicators (I1–I4 and I6–I8). The test showed that there is a significant difference in the understanding of the indicator "texture of surfaces" (I5) and that of the other indicators ($T = 3.941$, $t = 3.882$, $p = 4 \cdot 10^{-4}$). The understanding of the other indicators (I1–I4 and I6–I8) is more consistent than the understanding of indicator I5. This confirms H3.

A cursory examination of the responses on the perception of urban imageability in Figure 2 or the appropriate ranks in Figure 4 shows that the indicator of multi-layered greening (I4) is an important contributor to the scenic quality of the urban environment, which is in line with our hypothesis H1. In the four window views in Figure 4, indicator I4 has a rank of 1 or 2. We tested hypothesis H1 with the correlation test for nominal variables (χ^2 test) using the data in the contingency table (Table 2). The test shows a statistically significant correlation between the indicator "multi-layered greenery" (I4) and high ranks of the imageability indicators ($H = 17.055$, $\chi^2 = 15.137$, $p = 10^{-4}$), which confirms hypothesis H1.

Table 2. Contingency table between indicators and rank of importance of the indicator for imageability of the urban space.

	Rank 1–2	Rank 3–8
Multi-layered greenery (I4)	8	2
All other indicators (I1–I3 or I5–I8)	13	57

Results obtained from the parallel study of greenery proportion were tested through the preference for greenery in the window view with the parameters ‘Multi-layered greenery’ and ‘Readability of the open space’. The former comprises the proportion of greenery in the window view (Figure 2) and the type of greenery. The horizontal greenery is represented by the grassy ground, where the elements on the ground surface contribute to the determination of distances. Through the analysis of the selected neighborhoods, we were, therefore, able to observe the following occurrence of greenery in window views:

N1—Novo Brdo—only low shrubs near the observer, failing to give the impression of multi-layered greenery. The respondents did not perceive the parameter of readability of the open space in the view.

N2—Litostrojski bloki—favorable ratio of horizontal greenery with grassy ground, tall and slender trees with a sparse canopy that allows distant views, and low shrubs in the grassy area that define the distances in the space. The composition of the greenery is clear, transparent, and allows for the readability of the open space, which was also recognized by the respondents.

N3—Mostec—an example of a view of which approximately one-third comprises greenery. A small proportion of horizontal greenery with the grassy ground, a tree close to the observer, and a low hedge in front of the adjacent façade create the impression of multi-layered greenery, which was also acknowledged by respondents. The hedge obscures part of the window view of the opposite façade, which slightly reduces the readability of the open space.

N4—Štepanjsko naselje—window view on the opposite façade, which has the highest proportion of greenery among all the cases in the study (63.30%) and the highest proportion of horizontal greenery with the grassy ground. The tree nearby and other greenery in the distance did not create multi-layered greenery according to the respondents, probably due to the predominance of grassy areas. Due to the large distance between the neighboring building and the shrubbery, the respondents did not perceive the readability of the open space.

N5—Zupančičeva jama—an example of a neighborhood with a relatively high proportion of horizontal and vertical greenery, which was perceived by respondents as multi-layered greenery. The greenery covers the field of vision and the view of the opposite façade, and this reduces the readability of an open space.

4. Discussion

In this study of imageability in the urban environment, we were particularly interested in the perception of green spaces and green structures in general, as well as how urban design and building density influence the ‘richness’ and dynamics of the experience of urban outdoor spaces when looking through a window. Three hypotheses were tested in the study, one of which relates directly to the content of the study itself while the other two relate to the methodological approach to studying the imageability of the urban environment. The first hypothesis, that the multi-layered greening of the city has a significant effect on the scenic quality of the urban environment (H1), was tested and confirmed through the correlation test for nominal variables. The second hypothesis, that the indicators of perceived scenic quality of the urban environment used in our study and in the literature [47–58] lead to similar results, regardless of the survey approach (only one answer possible or multiple answers possible; H2), was tested and confirmed with the test of the significance of the Pearson correlation coefficient of the ranks. The third hypothesis, that the indicator “texture of surfaces” is more open to different interpretations than the other indicators proposed in the literature [47–58] and used in our study (H3), was tested and confirmed through testing of the difference of ranks.

We relate our findings to the results of other studies showing that people in inner-city neighborhoods use the greened courtyards between buildings as a common space, including for informal social interaction [69], and such activity affects the feeling of safety and consequently influences health and well-being [70]. A greened and landscaped neigh-

borhood creates a sense of tranquility and has an important influence on the judgment of danger [71]. The analysis of the greening proportions (survey; respondents' answers) and the results of other studies highlight interesting findings: among the neighborhoods considered, the optimal greening proportion in window views is between 30 and 40% (cases N2, N3, and N5). Window view N1 has a greening proportion of only 23.70% (consisting of shrubs and no ground layer), only one visible layer, missing ground, and significantly lacking vertical greenery (i.e., trees). N4 has the highest proportion of greenery (63.20%), which is positive from the point of view of open space, but the distance from the opposite building reduces the visual surveillance of the surroundings and thus impairs the sense of security.

The study used two survey approaches conducted with two independent groups of respondents. In survey approach 1 (SA1) we used a single-selection technique, and in survey approach 2 (SA2) we used a multiple-selection technique. In general, the multiple-selection approach is more intuitive, can be applied in a variety of ways, helps produce data that are easy to analyze, and provides mutually exclusive choices. However, the single-selection approach is more effective in determining a user's main preference from a set of choices. In this study, we show that the indicators of perceived urban scenery in window views used in several other studies [47–58] are suitable for both single-selection and multiple-selection approaches. Indeed, the two survey approaches (SA1 and SA2) produced very similar rankings of possible responses, with the difference in rankings between the two approaches generally being 1 or none (rank comparison in Table 2). However, the use of these two surveys approaches also highlighted the different perceptions of the 'Texture of surfaces' indicator, which led us to test hypothesis 3 (H3) in our study.

In the selection of two diverse test groups of students, as well as through the varied approach of the survey, we tested the interpretation of perceived urban imageability. In the survey introduction, was added a short text about 'Imageability': *When the elements of a space's design react to each other, complement each other, they attract our attention, evoke feelings and perceptions of the space, creating a memorable, lasting impression of the area. Objects that incorporate meaning, heritage presence, distinctiveness, and buildings with identifiers (dominance) into the design of the built environment contribute to the perception of a place with highly imageability characteristics.* Through this explanation, we have suggested imagining more than the image by itself. In the preparation phase of the survey, we discussed the order of the questions, including which questions to start and how to organize the questionnaire (e.g., by content or by urban level). Intentionally we mixed the content, adding the main question about greenery in the middle as 'Multi-layered greenery' and introducing it with a previous question about the 'Readability of the open space', followed by the topic of 'Texture of surfaces'. The composition of the questionnaire was intended to suggest that participants should think about textures in general, but the results of the survey indicate a lack of clarity in the perception of all textures.

4.1. Study Limitations

In the preparation of the survey material, we used photographs as a tool for the survey. Given the content, the study limitation is hidden in the perception of wholeness (neglecting the perception of 'the bigger picture'): the viewing angle, in the format of the photo cut-out, defining the visual perception as a word pattern recognition. The viewing field of the eye is closely linked to the size, position, orientation, dimension, glazing quality, and cleanliness of the glass surface, among other factors. Analysis of the results shows that respondents have a positive perception of greenery. The purpose of the study was not oriented to psychological questions about what personal feelings the window view evokes, even though it is recognized that the quality of a good view includes the experience of the space and reflection of it as a perception of 'genius loci' [51], which affects the mood of the observer, including effects on mental fatigue [72] and even ADHD [73] and stress recovery [74].

4.2. Further Research

For future research on the topic of ‘Greenery’ as a part of the urban scenery in urban ‘Imageability’, it is important to carry out the research directly on site, as doing so will afford a greater possibility of a wider perception of space. This would, however, undoubtedly lead to problems related to objectiveness. This type of research would undoubtedly have to be designed with questions about psychological perception, by observing only one category of the concept of ‘Imageability’, as it has proved to be a very complex topic to explore.

The role of ‘Imageability’ and its relation to perception and experience is an important criterion in defining limitations of urban ‘high density’. Over-density of the highest urban blocks (more than four-story buildings) can completely ignore the meaning of the ‘Imageability’ criteria of window view. This topic can be better tested in urban areas with high density, which is not the case in the city of Ljubljana.

Author Contributions: Conceptualization, A.F., M.Z.-S. and S.D.; Methodology, A.F., M.Z.-S. and S.D.; Software, S.D.; Formal analysis, A.F., M.Z.-S. and S.D.; Data collection, A.F. and M.Z.-S.; Writing—original draft preparation, A.F., M.Z.-S. and S.D.; Writing—review and editing, A.F., M.Z.-S. and S.D.; Visualization, A.F., M.Z.-S. and S.D.; Supervision, M.Z.-S. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by Slovenian Research Agency, by the Research Program “Sustainable planning for the quality living space” (P5-0068), and by the Research Program “Earth observation and geoinformatics” (P2-0406).

Data Availability Statement: Not applicable.

Conflicts of Interest: The authors declare no conflict of interest.

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