

# Exploring the Walkability of Urban Streets: A Composite Index Analysis of Five Streets in Bucharest, Romania

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## Table of contents

1. Introduction .....	pg. 3
1.1 Relevance and background.....	pg.3
1.2 Research question.....	pg.4
2. Theoretical framework.....	pg. 5
2.1 Functionality.....	pg. 5
2.2 Diversity.....	pg. 5
2.3 Comfort.....	pg. 6
2.4 Perceived safety.....	pg. 6
2.5 Walkability index.....	pg. 6
3. Methodology .....	pg. 7
3.1 Cases.....	pg. 8
3.2 Quantitative assessment.....	pg. 12
3.3 Qualitative assessment.....	pg. 17
3.4 Consent.....	pg. 17
4. Results.....	pg. 18
4.1 Functionality.....	pg.18
4.2 Diversity.....	pg.18
4.3 Comfort.....	pg. 20
4.4 Perceived safety.....	pg. 22
5. Discussion.....	pg. 23
5.1 Quantitative assessment.....	pg. 24
5.2 Qualitative assessment.....	pg. 24
6. Conclusion.....	pg. 25
7. References.....	pg. 26
8. Appendix.....	pg. 29

# 1.Introduction

## 1.1 Relevance and background

“Walking is an integral part of every trip” (Loukaitou-Sideris, 2020). It is necessary to walk to reach your destination or get to other transportation modes. The quality of the pedestrian environment plays a crucial role in determining the efficiency and effectiveness of the urban transportation system, which in turn impacts the mobility and accessibility of a city for both residents and visitors (Ewing, R. and Cervero, R., 2010). Whether in a developed or developing country, measures to facilitate walking started emerging in the planning discourse.

In any transportation system, the usage of pedestrian infrastructure, such as sidewalks, benches, and traffic control devices, is necessary. These elements not only make walking more appealing and safer, but they also have a number of positive social, economic, and environmental effects. For instance, Ewing and Cervero (2010) argue that the interactions made possible by walking can promote idea exchange, driving innovation and stimulating urban growth. Given the importance of pedestrian infrastructure, it is essential to monitor and evaluate its level of quality to identify any weaknesses or discrepancies and address them.

A walkability index is one method for assessing an area's pedestrian-friendliness. This index is a combination of quantitative and qualitative methods that quantifies an area's suitability for pedestrians. A walkability index can be used to compare different areas or to monitor changes over time. As demonstrated by the various approaches used in previous studies, there are multiple ways to create a pedestrian index (Habibian and Hosseinzadeh, 2018; Frank et al., 2010).

Walkability is a measure of how conducive an area is to walking, and it is an important factor in creating livable and sustainable communities. According to Maghelal and Capp (2011) walkability can be assessed using a number of different indices or measures that take into account factors such as the distance to destinations, the presence of sidewalks and pedestrian infrastructure, the safety of the walking environment, and the attractiveness of the area to pedestrians. Lo (2009) discusses the importance of walkability in urban planning and design, and how it can promote health, environmental sustainability, and social interaction. Lo (2009) also highlights the various ways walkability can be measured and improved, and the challenges and opportunities involved in promoting walkability in different contexts. Forsyth (2015) discusses the concept of walkability in the context of urban design, and the debates among urban designers and planners about what

constitutes a "walkable" place and how to measure and promote it. Frank et al. (2010) states that subjective experiences have shown to have a significant correlation with the overall walkability of an area and therefore require also qualitative assessment. Overall, the literature suggests that walkability is an important factor in creating livable and sustainable communities, and it can be assessed using a variety of indices and measures. Furthermore, there is evidence that suggests a relationship between the built environment and safety.(Wood et al., 2008). For the purpose of this study, the focus will be on perceived safety as perceptions have the ability to influence behavior, regardless of their accuracy. Perceived safety refers to an individual's subjective assessment of their own personal safety in a particular environment or situation. It is based on an individual's feelings, beliefs, and perceptions of the risks present, rather than on objective measures of safety. Perceived safety is a concept that has been extensively researched in a variety of fields, including psychology, urban planning, and public health. It has been shown to have a significant impact on an individual's behavior and well-being (LeGrande et al., 2017). Individuals who feel safe in their surroundings are more likely to engage in physical activity, such as walking or cycling, which can benefit their physical and mental health (Frumkin et al., 2017)). As a result, assessing and promoting perceived safety is a critical component of developing livable and healthy communities.

## 1.2 Research question

This bachelor thesis aims to develop and apply a simple to use walkability index to a specific set case study area. Therefore, the main question of the study is:

What does the walkability index score on the five streets analyzed and is there a relationship between the objective assessment of the index and perceived safety and comfort?

Sub question 1: What are the walkability index scores on the five streets analyzed and are they relevant?

Sub question 2: Is there a relationship between subjective and objective assessment of comfort in the pedestrian environment?

Sub question 3: Is there a relationship between perceived safety and the elements of the pedestrian environment?

In order to answer the question, the following sections will be presented in the following order: The theoretical framework will contain a literature review of the factors that make up the walkability index .The methodology section will present a detailed overview of the cases,

subfactors and formulas used in the quantitative measurements and the subfactors and methods employed in the analysis of the qualitative data. The results section will present the scores resulted from the quantitative assessments as well as the themes identified in the interview. The discussion section will highlight the most important findings and limitations and provide recommendations for improvement. The paper will end with a conclusion giving recommendations for future work and reflecting on the quality of the results and research design.

## 2. Theoretical Framework

Walkability is clearly hard to define and as a result it is also hard to measure. Walkability is influenced by characteristics of the built environment, people and activities. (Ewing and Handy 2009, Forsyth and Krizek 2010). The understanding of how walkable an area is, varies with individual perceptions of a place (Ewing and Handy 2009), but for the purpose of this research the focus will be to create a composite index analyzing parts of the built environment as well as subjective assessment of factors that are influenced by personal preferences. Based on existing literature, the attributes have been organized to provide the most amount of information relevant in the context, as follows: functionality, diversity, comfort and perceived safety.

### 2.1 Functionality

In their review of pedestrian indices Maghelal and Capp (2011) highlight path maintenance, path location, and traffic control devices as sub-factors of functionality. While other studies identify and measure factors such as sidewalk gradients, path surface and path width (Dandan, Wei, Jian and Yang, 2007; Abley and Turner, 2011). Subfactors pertaining to functionality are physical constructs of the built environment. According to Giles-Corti and Donovan (2002) functional factors of the physical environment have direct influences on physical activity.

### 2.2 Diversity

Diversity relates to the land use mix available to street users. It was first used by Cervero and Koleman (1997) as part of their framework to measure walkability. The framework builds upon the logic that a street with high diversity substitutes the need for external trips and therefore adds value to the street's environment (Cervero and Radisch, 1996). The sub-factors for diversity are as follows: number of facilities, number of shops and restaurants and availability of street parks, all

of which contribute to the diversity of the pedestrian environment (Radha, Mohammed-Amin and Ali, 2020).

### 2.3 Comfort

The comfort factor refers to the pleasure of walking brought by the elements of the street environment to the pedestrians( Maghelal and Capp, 2011). Several past empirical studies have correlated subfactors belonging to comfort with subfactors belonging to diversity (Radha et al., 2020). The complex definition of what makes an environment pleasant requires qualitative data. The qualitative data allows for further examination of the phenomenon's associated with environment pleasantness and the interrelations between perception of comfort and other subfactors. For the quantitative analysis, the subfactors measured for comfort are: tree shadow, location of trees, location of lighting, benches and seating areas and path design. (Radha et al., 2020)

### 2.4 Perceived safety

“Individuals' perceptions of safety involve generalized judgements about the chance of injury or loss” (Ferraro, 1995). Past cross-sectional and longitudinal studies have made associations between general safety and walking (Evenson et al, 2012, Foster et al., 2016). Safety relates to the other participants of traffic also and is also dependent on personal preference and feelings, thus the sole use of physical measurements is not suitable to explain the perception of safety. Safety is reported in open-responses and analyzed thematically(Bardutz and Bigassi, 2022).

### 2.5 Walkability index

There is disagreement among experts about the definition of walkability and the best ways to measure and promote it. The well-recognized tool to measure walkability and the one who started it in the 1990's is the urban design framework of the 3Ds: density, diversity and design, developed by Cervero & Kockelman, (1997). Several studies have since built different toolboxes with different factors. The factors used by Hong and Chen are: accessibility, aesthetic quality, street infrastructure and design and density, while Frank (2005) use design, diversity and density and Radha uses safety, security attractiveness and comfort. However, when analyzing the definitions given by each author for the factors, similarities arise. Therefore, building upon the work of the above-mentioned articles, the pedestrian index will be calculated using physical measures for the factors: comfort, diversity and functionality and perceived safety.

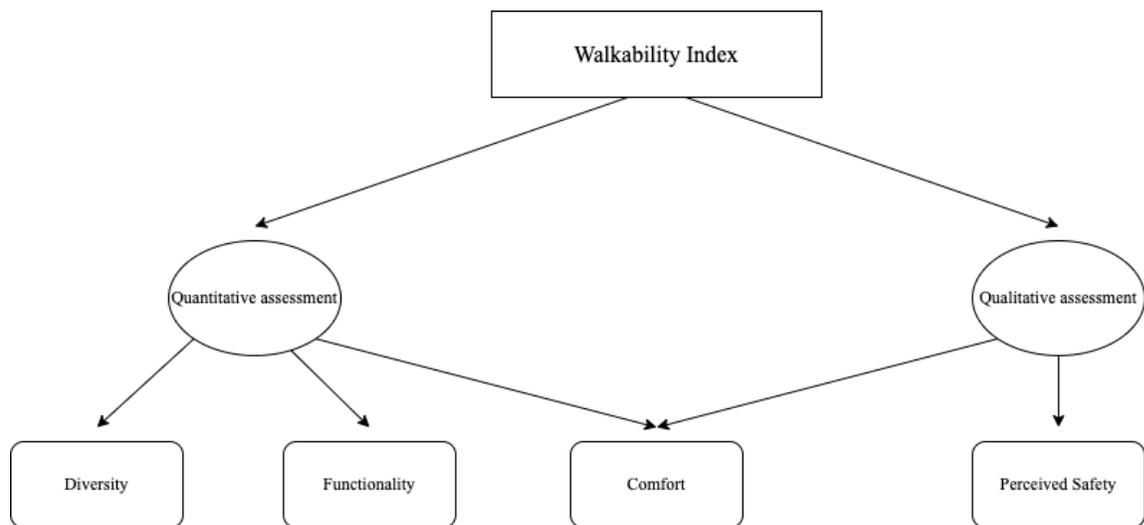


Figure 1: Conceptual framework

### 3. Methodology

Each factor is measured using a number of sub-factors. Audits, tools, scales, instruments, checklists, indices observations and interviews were used to assess the physical walking environment. Based on the results, these assessment methods can be divided into two major groups. First, the quantitative/objective assessment needed to quantify the number of built-environment features into a single number that represent the scores for each factor: functionality, diversity and comfort. Second, qualitative/subjective assessment of certain subfactors pertaining to comfort and safety

### 3.1 Cases



Figure 2: Map of Study Area: Locations of the Five Streets in Bucharest, Romania

Comparative cases studies allow the researcher to gain insights into a phenomenon across cases (Punch, 2013). The methodological approach can be described as a context specific case-based evaluation, using complementary strengths of both quantitative and qualitative data to address the complexities of the pedestrian environment across five streets in Bucharest Romania: St. Stefan cel Mare, St. Aviatorilor, St. Kiseleff, St. Calea Victorie and St. Lascar Catargiu. The streets are located in the same area which increases the accuracy of the comparison, being subject to the same economic conditions and the same local governance, using the most similar approach as the basis for choosing. The method allows for more generalization of the results as cases have external influence factors in common (Searwright and Gerring, 2008). However, differences in character, history and usage arise when further analyzing these streets.

### 3.1.1 Street Calea Victoriei



Figure 3: Map of Calea Victoriei

Is one of the historic axes of the city center. It dates back to 1692 when it was paved with wooden planks as a connection between the royal residence and the cities church (Crutzescu, 2014). Today, St. Calea Victorie, after numerous redevelopment projects, is a commercial hotspot for small businesses, a place with a multitude of cultural events and a hotspot for night life and youth. The analyzed segment is 1440 meters long and spans from Victoriei Square to the north and Museum of National Art to the south.

### 3.1.2 Street Stefan cel Mare



Figure 4: Map of Stefan cel Mare

Is an important transport axis of Bucharest today. It is part of a transport corridor that traverses the city from the north-west to the south-east. It started as a passage to one of the earliest factories in 1853 (Crutzescu, 2014). However, during the communist period it was heavily remodeled and 10 stories apartment blocks were developed either side. The segment analyzed starts at Victoriei Square and ends at St. Barbu Vacarescu with a total of 1083 meters. Today the street is

characterized by a diversity of shops and businesses at the bottom floor of the buildings, making it an important destination in the daily life of residents.

### 3.1.3 Street Kiseleff



Figure 5: Map of Kiseleff

The street is part of the same historic axes that includes Calea Victoriei. The segment under analysis starts at Victoriei Square to the south and ends at the Triumph Arch north and spans across 1400 meters. The monument and therefore the street have a big historical significance as they are linked to the first world war. The street developed a strong residential character, and presently it is one of the most expensive streets in Bucharest (Patrascu et al, Bucharest strategy for 2035). It is located around one of the biggest parks in Bucharest and has lots of trees and available green space. Due to the increasing congestion in the city, the streets suffer from a heavy traffic problem.

### 3.1.4 Street Aviatorilor

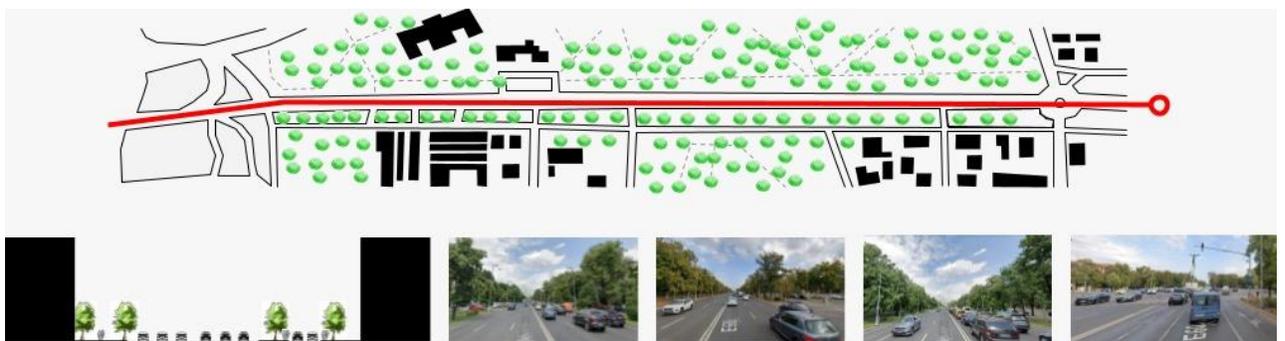


Figure 6: Map of Aviatorilor

It was built as part of a new extension plan of Bucharest in the early 1900s (Crutzescu, 2014). Today it is still a major transport corridor linking the national road heading north out of Bucharest. The analyzed segment (1300 meters) ranges from Charles de Gaulles square north and Victoriei Square south. It is a prime renting place for established business ranging from financial consulting

to law firms. It is positioned parallel to Kiseleff boulevard and therefore suffers from the same traffic problems.

### 3.1.5 Lascar Catargiu Boulevard.



Figure 7: Map of Lascar Catargiu

Constitutes a link between two important squares in Bucharest at a distance of 871 meters. Its name was changed during communism because of its association with a female freedom fighter. Today is considered a monument as it constitutes a unique urban fabric. It has architectural significance because of the preservation of older structures. The street was also a place where cultural elitists used to live, and therefore it is considered a creation hub.

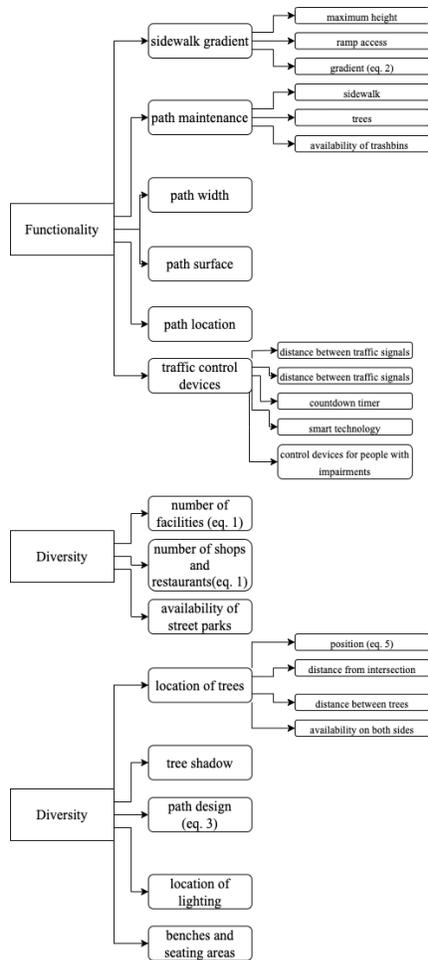


Figure 8: Quantitative variables methodology

### 3.2 Quantitative assessment

The methodology on the quantitative side consists of gradually collecting data throughout fieldwork days spanning from September 10th to October 10th. The measurements are quantified in final scores for the factors: comfort, functionality and diversity. The variables: sidewalk gradient, path design, path width, number of facilities and location of trees are calculated using statistical and mathematical formulas and variables which only require counting or observations: availability of street parks, path maintenance, path surface, tree shade, benches and seating areas, location of lighting, traffic control devices, sidewalk width, availability of shops and restaurants, sidewalk height at crossings, path location are assessed using binary methods. (Radha et al., 2020). The scores are calculated using statistical and mathematical formulas (Radha et al., 2020; Cervero and Kockelman, 1997). (Asadi-Shekari, Moeinaddini, and Shah, 2015.) The final scores

are than compared to standards from literature (Radha et al., 2020; Park, 2008; Romanian planning code).

### 3.2.1 Measurements

#### 3.2.1.1 Number of facilities

The first factor measured that contributes to the final score of diversity is the number of facilities. Facilities, in this case, are defined as different land-use types that can be found in any given area that add value to the pedestrian environment. For final score the following entropy formula was used (Cervero and Kockelman, 1997):

$$PI = \frac{\sum_k \sum_j^k p_{jk} \ln(p_{jk})}{\ln(J)} \quad (0 \leq PI \leq 1) \quad (\text{Equation 1})$$

p= proportion of land-use category j within a half-mile radius of the developed area surrounding hectare grid-cell k

j = number of land-use categories

K= number of actively developed hectares in tract.

#### 3.2.1.2 Sidewalk Gradient

The Sidewalk gradient contributes to the overall functionality score and is composed of 3 parts: maximum height, ramp access provided at every intersection and score which determines the use of access for people with impairments. The height is set at a maximum of 20 centimeters (Romania, Department of Planning. *“Normativ privind adaptarea clădirilor civile și spațiului urban la nevoile individuale ale persoanelor cu handicap, indicativ NP 051-2012 - Revizuire NP 051/2000”*, 2013). The formula for calculating the gradient score is:

$$PI = \frac{C}{N} (PI \leq 5) \quad (\text{Equation 2})$$

C= Length of the street with standard accessibility for a wheelchair, + their support length (m)

N= length of the street (m)

#### 3.2.1.3 Path design

Path design is concerned with good design of the sidewalk. It needs to adhere to guidelines in order to be comfortable to use.

$$PI = \sum_{i=1}^K DICi \times Li \quad (0,6 \leq PI \leq 1,25) \quad (\text{Equation 3})$$

$i=1,2, 3 \dots, K$  (variation in footpath width)

$$DICi = \frac{Ci}{Ni} \quad (\text{Equation 4})$$

$Ci$ = the sidewalk area with the standard slope in section  $i$  ( $m^2$ )

$Ni$ =street length in section  $I \times W$

$Li$ =street length in section  $i$

#### 3.2.1.4 Location of trees

Location of trees is part of the comfort factor and is calculated by positional comparison to standards: position, distance from intersections, distance between trees. Trees must be located on both sides with a distance of maximum 9 meters and at a distance of 7,6 meters from the intersections (Park, 2008). The formula to calculate position is:

$$P=P1+P2 \quad (\text{equation 5})$$

$$P1 = \frac{\sum_{i=1}^K Ci}{\sum_{i=1}^K Ni} \quad (\text{Equation 6})$$

$i=1,2, 3 \dots, K$  (variation in footpath width)

$D$ =distance between trees (m)

If  $D > 9$

$Ci$ = Street length with the tree in section  $i$ - considered standard limitation  $*9)/D$

If  $D \leq 9$

$C$ = Street length with the tree in section  $i$ - considered a standard limitation

$$P2 = \frac{F}{N} \quad (\text{Equation 7})$$

$F=Ci$  - Street length that does not have the first standard condition

$N$ = Street length (both sides)-total length of intersections and considered standard limitation (m)

If  $D$  varies

$$P2 = \frac{\sum_{i=1}^K C_i}{\sum_{i=1}^K N_i} \text{(Equation 8)}$$

### 3.2.1.5 Number of shops and restaurants

According to the entropy formula (eq. 1) created by Cervero and Kokelman (1997), the number of shops and restaurants can be viewed as a subfactor for diversity. By calculating the entropy various land uses, this formula determines the diversity of land uses in a given area. The entropy value increases with the level of diversity.

### 3.2.2 Counting and observations:

Binary variables are used in quantitative analysis to help calculate the walkability index by representing the presence or absence of certain amenities or characteristics that contribute to walkability. For example, binary variables could be used to represent the presence of sidewalks, crosswalks, and streetlights in a particular area, as well as the presence of destinations such as shops, restaurants, and parks. These binary variables can be combined with other measurements to create a composite walkability index. This index can then be used to compare the walkability of different areas and to identify areas that may benefit from improvements to the built environment. Variables features are either counted or compared to standards derived from the literature and given a score of 0 indicating the absence of non-compliance to standard, or 1 if the result is satisfactory (table 1). The variables which can be found in this category include: availability of street parks, path maintenance, path surface, tree shade, benches and seating areas, location of lighting, traffic control devices, path width, and path location.

Nr.	Variable name	Standard	Value
1	Availability of street parks	(Svarre and Gehl, 2014)	1-At least one street park is present 0- There are no street parks present
2	Path maintenance	(Radha et al., 2020)	1-satisfactory maintenance 0-unsatisfactory maintenance
3	Path Surface	(Park, 2008)	1-path which is in line with standards for a good surface 0-path which does not have a good enough surface
4	Tree shade	50% of the sidewalk (Park, 2008)	1-at least 50% of the sidewalk is covered by shade 0-less than 50% of the sidewalk is covered by shade
5	Benches and seating areas	(Dixon, 1996)	1-over or equal to the amount of seating areas necessary 0- under the amount of required seating areas
6	Location of lighting	25-meter distance between (Romania, Department of Planning, “PUG”, 2020)	1-The condition is satisfied 0- More than 25 meter apart
7	Path location	On both sides of the street	1-path present on both sides of the street 0-path missing from one side of the street or missing completely
8	Traffic control devices	(Patrascu et al, Bucharest strategy for 2035, 2010)	1- it is in line with requirements 0-It does not align with requirements
9	Path width	Minimum 5 meters wide for the type of street studied (Romania, Department of Planning, “PUG”, 2020)	1- The path is wider than 5 meters 0- The path is narrower than 5 meters

Table 1: Table of Binary Variables and Standards for Walkability Index

### 3.3 Qualitative assessment

The goal of this research is to develop a composite walkability index by combining qualitative and quantitative methods. The qualitative assessment will be based on the perceptions and experiences of daily users of at least one of the five selected streets. The study will use convenience sampling to select participants, with a total of seven people from various backgrounds being interviewed. Three of these participants will be locals, while the rest will be daily users of the streets.

The data collection method used will be open-ended interviews. The questions in the interview are designed to elicit detailed information about the participants' perceptions and experiences of the walking environment, including their perceptions of safety and comfort. Face-to-face interviews will be conducted, and transcripts will be analyzed thematically to identify key themes and patterns.

Word clouds will be used to visualize the main themes that emerged from the analysis in order to present the findings. This method will allow us to identify the most frequently mentioned aspects of the walking environment as well as the key issues that participants felt were important.

In this study, a mixed method approach is used to gain a more comprehensive understanding of the factors that influence the walking environment. By combining the insights and perspectives provided by the qualitative data with the objective measurements provided by the quantitative data, we will be able to identify new features and aspects of the walking environment that might have been missed by either approach alone.

### 3.4 Consent

Before the interviews, all respondents were given detailed information about the General Data Protection Regulation (GDPR). Their rights to access, correct, and delete any personal data collected during the interview process were also explained. This is significant because it ensures that respondents are aware of their GDPR rights and are able to exercise them, which is critical for protecting their personal privacy and data security (European Commission, 2018). Furthermore, it demonstrates that the research was conducted in an ethical and compliant manner by providing GDPR information (British Psychological Society, 2018).

## 4. Results

### 4.1 Functionality:

Functionality:	Standard for comparison	St. Kiseleff	St. Aviatorilor	St. Stefan cel Mare	St. Lascar Catargiu	St. Calea Victoriei
Sidewalk Gradient	Maximum height = 0,2m	0,16m	0,13m	0,45m	0,11m	0,38m
	Ramp access provided every intersection	1	0	0	0	0
	$PI \leq 0,5$ PI (eq. 2)	PI=0,12	PI=0,08	Pi=0,67	PI=0,55	PI=0,46
Path maintenance	Sidewalk	0	1	0	0	1
	Trees	1	1	0	0	1
	Availability of trash bin	1	1	1	1	1
Path location		1	1	1	1	1
Path surface		1	1	0	0	1

Table 2(part 1): Table of functionality results

Functionality:		St. Kiseleff	St. Aviatorilor	St. Stefan cel Mare	St. Lascar Catargiu	St. Calea Victorie
Path width	PI> 4,99	PI=5,75	PI=6,016	PI=4,81	PI=3,6	PI= 4,351
Traffic control devices	Pedestrian crossing signals located within 3m	1	1	1	1	1
	Distance between traffic signals	1	1	1	1	1
	Countdown timer	0	0	0	0	0
	Smart technology	0	0	0	0	0
	Friendly for impaired people	0	0	0	0	0

Table 2(part 2) Table of functionality results

Table 2 presents the results obtained after the calculations of the quantitative assessment for the functionality factor. The streets that scored highest are Kiseleff and Aviatorilor with a score of 84%, while Lascar Catargiu and Stefan cel Mare have low scores of 18% and 29% respectively. Calea Victoriei scored in the middle at 62%. The most variability in score is present in elements belonging to the sidewalk infrastructure. The level of traffic control is equal on all streets and maintenance is similar. This can be explained by the fact that all streets have access to the same resources, being part of the same area and therefore the same planning authorities.

## 4.2 Diversity

Diversity		St. Kiseleff	St. Aviatorilor	St. Stefan cel Mare	St. Lascar Catargiu	St. Calea Victoriei
Availability of street parks		1	1	1	0	1
Number of shops and restaurants	$0 \leq PI \leq 1$ (eq. 1)	PI=0,09	PI= 0,21	PI= 0,45	PI= 0,38	PI= 0,87
Number of facilities	$0 \leq PI \leq 1$ (eq. 1)	PI= 0,22	PI= 0,35	PI= 0,91	PI= 0,42	PI= 0,82

Table 3: Table of diversity results

Table 3 summarizes the score pertaining to the factor: diversity. The highest scoring streets are Calea Victoriei with 89% and Stefan cel Mare with 78%. The scores are in line with the streets' character, both being important commercial corridors for the city. The difference in score can be explained by the historical significance of Calea Victoriei which makes it more inclined to attract facilities and businesses. Aviatorilor and Kiseleff present similar scores in diversity 52% and 44%. Both streets have a low availability of shops and restaurants. Lastly, Lascar Catargiu has the lowest score (26%) in accordance with its residential character.

### 4.3 Comfort

Comfort		St. Kiseleff	St. Aviatorilor	St. Stefan cel Mare	St. Lascar Catargiu	St. Calea Victoriei
Tree shadow		1	1	0	1	0
Path Design	$0,6 \leq PI \leq 1,25$ (eq. 3)	PI= 0,71	PI= 0,58	PI= 0,17	PI= 0,25	PI= 0,58
Location of trees	Position P=0,55(eq. 5)	P=0,47	P= 0,43	P= 0,25	P= 0,41	P= 0,39
	Trees must be at least 7,6 m away from intersection	0	0	0	0	0
	Distance between trees	1	1	0	1	0
	Availability on both sides of the street	1	1	1	1	1
Location of lighting		1	1	1	1	1
Benches and seating areas		1	1	0	0	0

Table 4: Table of comfort results

The comfort factor is a composite index formed by quantitative measurements and qualitative observations of what the comfort level for each street is. The lowest scoring streets are Stefan cel Mare with 27% closely followed by Calea Victoriei with 29%. The results for Stefan cel Mare

correspond with the interview responses who attributed a lack of pedestrian infrastructure continuity (path design) as an important requisite for comfort. Calea Victoriei however, may have biased perceptions of the pedestrian environment due to its significance in Bucharest's culture. Aviatorilor with 45% and Lascar Catargiu with 53% show a medium tendency for comfort. It is in line with the interview responses which highlight the importance of green space (tree location) and path design as a requisite for comfort. Kiseleff scores high at 95%. The street is characterized by green space and pedestrian facilities like benches and street lights.

#### 4.4 Perceived safety



Figure 7: Word Cloud for perceived safety

The two images summarize respondents' associations of the feeling of safety with the physical elements of the pedestrian environment. In total the seven respondents identified traffic as the biggest problem to pedestrian safety. All the elements related to traffic control or traffic calming were also mentioned frequently. The lack of green space is also identified as a problem to safety: “health problems”. Most of the participants agreed on the need for an integrated bottom-up design approach to reduce safety and identified “concrete polls” or “high curbs” as outdated safety measures. Certain participants also touched on the maintenance of the infrastructure as a need for maintaining a high level of safety.

## 5. Discussion

## 5.1 Quantitative assessment

The results of the quantitative assessment of walkability presents a set of diverse results, as presented in the model by (Radha et al., 2020). The purpose of this research was to create a system for evaluating walkability that does not require highly specialized knowledge, expensive or specialized software, or data that is difficult to obtain. Planners should be able to use the methodology as well. The research has succeeded in doing this based on my experience applying the methodology. The data needed was easy to collect, simple to use, and provided a reasonable understanding of the level of walkability in the case-areas. Without using GIS analysis or any other specialized tools, walkability might be researched and graded using a relatively small sample of cases and investigations at the street level. Based on the results, it is believed that the criteria set when developing the walkability index was successfully met.

It is also acknowledged that challenges were encountered during the process. The equipment used to collect the data does not provide the highest degree of accuracy. Another shortcoming of the model could be the weight of each variable per factor. Depending on personal preferences, people could perceive a functional street in different ways and therefore, path maintenance could be more important than path width for a certain group of the population. It would be interesting to add to the assessment a count of the number of people walking or staying in the public space (Svarre and Gehl, 2013; Gehl, 2014). One last shortcoming would be the effect of binary variables. They provide a good basis to calculate a final score however they lack the ability to explain the nuances of the collected data.

Developing and testing an approach to measure walkability using statistical and mathematical formulas provided a deeper understanding of what is required to encompass the whole pedestrian environment, and this allows for changes to be made in the future to better adapt the framework. The approach was used to measure walkability at the street level. On a neighborhood, city or regional level the quantitative data would require automated collection. Using this approach would be too time consuming and complex to be applied on bigger case areas. GIS would be an adequate solution, using data already available from governmental agencies, ONG's. For the analyzed case studies data in GIS is available however incomplete and outdated.

In the experience, fieldwork was identified as another important aspect of the study. Some of the data collected through fieldwork would not have been available from other sources such as maps or data sets. It is believed that the task is doable at street and maybe neighborhood level, however,

for bigger scales, a strengthening of the fieldwork process would be required. It is suggested that the addition of another researcher to the data collection process would be a valuable addition to the approach.

## 5.2 Qualitative assessment

The purpose of the qualitative assessment was to make the framework more susceptible to influences of the perceptions of users on the elements that make the pedestrian environment. Another addition is the ability to understand the processes that affect the walkable environment. By doing so it was easier to identify new variables that could be used to measure safety quantitatively, for example: traffic. The use of interviews has also highlighted the relationships between different variables of different factors and also the relationships between factors, for example: the interviews showed a correlation between diversity and comfort as many factors used in the quantitative measurements of diversity were found in interview responses describing feelings of comfort. Safety and functionality form another pair which showed a slight correlation when comparing interview responses with variables used in the quantitative measurements.

The data presents a low level of generalizability because of the low number of respondents. Therefore, the above-mentioned correlations are not particularly applicable on other case studies. As a suggestion of improvement, the data derived from the interview responses could be used to create a questionnaire and tested against a larger proportion of the population. The unstructured interviews have their own limitations such as the subjectivity of the researcher when asking follow up questions, interpreting the data, and difficulties in comparing among participants. (Bihu and Ghafoor, 2020). The convenience sampling method also contains generalizability problems to the population at large and is problematic in terms of external validity (Findley, Kikuta and Denly, 2020).

## 6. Conclusion

In conclusion, the findings are consistent with the sub-questions investigated in this study. The walkability index produced a wide range of results, which can be attributed to the different uses and characteristics of the streets under consideration. St. Kiseleff and St. Aviatorilor were the most functional, with near-perfect scores for sidewalk infrastructure. However, Stefan cel Mare Street received the lowest score in this category, owing to heavy traffic volumes and their negative impact on infrastructure maintenance and quality's. Calea Victoriei, as expected, scored the

highest in terms of diversity, with a diverse array of facilities and restaurants. This street's historical significance acts as an incentive for businesses, attracting pedestrian traffic and increasing diversity. Stefan cel Mare Street ranked second in terms of diversity, likely due to the high volume of traffic and associated exposure to potential customers. Kiseleff, Aviatorilor, and Lascar Catargiu streets exhibit historic functions that remain relevant today, yet their scores are hindered by the lack of new developments aimed at preserving their historic character. Kiseleff Street also received the highest rating for comfort, thanks to its French-style boulevard building with wide sidewalks and landscaping. The interview results show a link between the factors identified by respondents as essential for comfort and those included in the objective assessment. Benches and seating areas, for example, were identified as a subfactor for comfort in both assessments. Calea Victoriei and Stefan cel Mare streets scored low in terms of comfort, most likely due to their high diversity scores, which imply a certain level of traffic which could overcrowd the available infrastructure. In terms of comfort, St. Lascar Catargiu and St. Aviatorilor were comparable. Perceptions of safety were primarily associated with traffic and efforts to reduce negative traffic impacts. Respondents acknowledged safety as a factor that increases walkability; however, due to the small number of participants, the significance of this relationship remains inconclusive.

The limitations of this study include the potential for improved data quality, the limitations of the instruments used in data collection, and the varying importance of subfactors in calculating the walkability index. The small number of participants and the unstructured nature of the interviews also cast doubt on the validity of the findings. However, the walkability index's sound research design, supported by relevant academic literature, compensates for these limitations. To improve the index in the future, it may be beneficial to include a variable measuring traffic volume and to apply the index on a larger scale, potentially utilizing automation for data collection and analysis. Overall, the index can be considered to have met its goal of being a composite index which is easy to apply and use by a wide range of individuals

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## 8. Appendix

## 8.1 Coding tree

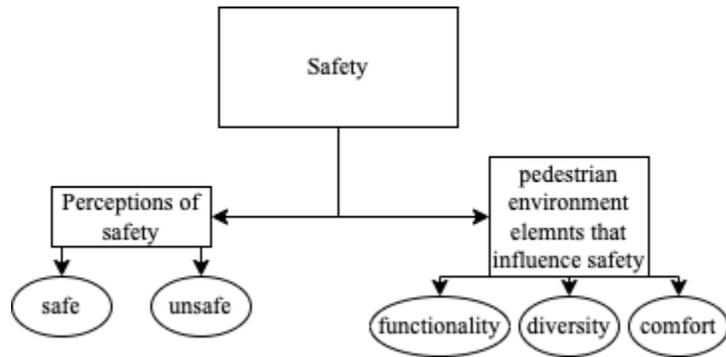


Figure 8: Coding tree for perceived safety.

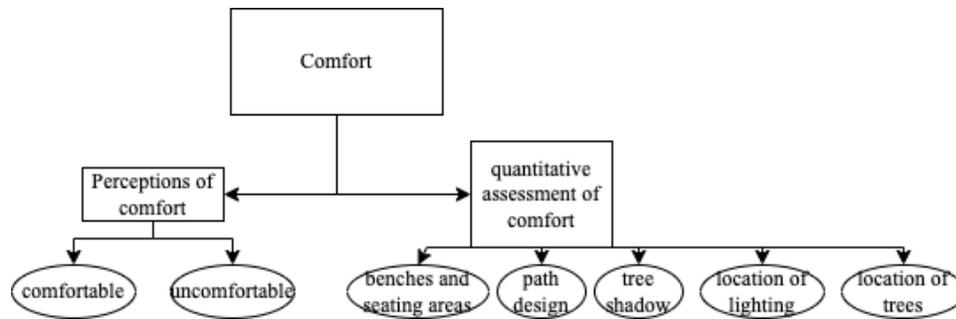


Figure 9: Coding tree for comfort

## 8.2 Measurements table (Table 5)

Measurements	St. Kiseleff	St.Aviatorilor	St. Stefan cel Mare	St. Lascar Catargiu	St. Calea Victoriei
Max length	1400m	1300 m	1083 m	871 m	1440
Street width	13 m	22 m	29 m	29 m	9 m
Sidewalk width	5,75 m	7,8 m; 6m; 4,8m	Between 3,2 m and 8 m	3,6 m	0,9 m; 2,1 m; 9 m
Sidewalk height	0,16m	0,04m; 0,13m	Between 0,1m and 0,29 m	0,11m	0,05m; 0,38m
Lighting distance	25m	25m	25m	25m	25m
Pedestrian crossings	4	3	4	2	9

## 8.3 Interview transcripts

Participant 1(P1) and participant 2(P2) joint interview:

Researcher: What streets do you use out of the 5 streets, how often do you use them and what do you use them for?

Participant1: I usually use 3 of the mentioned streets. Stefan cel Mare usually use it to shop and I observe issues every day. I come from an architectural background and I usually observe these things. For Calea Victoriei I go to pubs. There is a multitude of pubs and it is well recognized In Bucharest for the nightlife. And Kiseleff I use to walk my dog, well it's not actually my dog, it's my girlfriend's dog and I do not have it all the time, so I wouldn't t say I walk the street daily.

Researcher: How often would you say you use the other streets?

P1: I am a resident of Stefan cel Mare, so I would say pretty much every day, even though most of the time when the weather allows me, I like to use my electric scooter. Coming back to

Kiseleff, I would say I prefer it to walk the dog because of the green spaces. Also, sometimes I use Lascar Catargiu as it links two important squares in Bucharest.

Researcher: What is your opinion of the streets regarding the pedestrian environment?

P1: Kiseleff has a lot of observable green space. It is usually a nice street to walk on. Calea Victoriei, is well made.

Researcher: What exactly do you mean by well made?

P2: Bicycle lanes, the pavement, all of these things are usually better (compared to what you expect to find in Bucharest)

P1: You do not get bored because not everything is uniform

P2: I think he means you do not get bored because of the bars

P1: There are a lot of houses, I do not like a street to be straight. Also, Kiseleff is especially pleasant during the summer because it's shaded compared to other streets and I'm not hot. Also, the sidewalk is very wide which makes walking more comfortable.

Researcher: What about Stefan cel Mare, you said you use it quite regularly?

P1: It's a complete disaster!

Researcher: Why?

P2: It is very dangerous to cross the street when coming closer to the western part because of the heavy traffic and bad traffic infrastructure, also there are a lot of parked cars on the sidewalk.

P1: The street and I mean: the lanes which are dangerous, the speed of the cars, the horns which you hear constantly, the curbs which are insanely high, the potholes which are everywhere.

Researcher: Do you find any safety concerns in relation to the pedestrian infrastructure which you just referred to as a disaster?

P1: If you are used to the type of infrastructure provided in Romania, you would not describe it as particularly dangerous however you would not describe it as an enjoyable environment in which to walk. However, in terms of the physical infrastructure: the colors and aesthetics are bad, the trees have fences around them which makes no sense. There are however trash bins, however there is a lot of littering. Also, there is a big problem with the children's hospital

entrance which is right on the streets. The parents' que on the sidewalk to wait for the patient which can cause all sorts of problems. There is a big problem with the cars parking on the sidewalk. They usually make pedestrians move out of their way so they could park.

P2: Also, a big problem with all of the streets in question except Calea Victoriei is the presence of a cycling lane drawn on the sidewalk which proves to be unsafe.

What about the other streets, do you have any opinions concerning the walking environment?

P1: Calea Victoriei is a really nice place to walk. It is used by a lot of people which is nice. On the other hand, the cars do not adhere to the speed limit and go quite fast which is not exactly desirable when you sit on the cafes and pubs which have tables close to the street. The tables block the sidewalks however is not quite that inconvenient, unless they block the sidewalk completely. The bike lane is also a nice addition. There are trees which are a nice separation from the street traffic. The high curbs give you a somewhat sense of safety.

P2: Also, to add to that, compared to the other streets, like Kiseleff and Aviatorilor, Calea Victoriei has a lot of crosswalks. I think there is a big problem on the above-mentioned one's going from one side to the other. There is a high concentration of traffic and it can be quite dangerous.

P1: This is also an issue with Lascar Catargiu. It has 3 crosswalks in total one at each end and one in the middle. The problem is one at one end is underground and it closes during the night because it's connected to the subway. During the night you have to walk half of the street to be able to cross.

Participant 3(P3):

Researcher: Out of the 5 streets I presented to you which do you feel you are most accustomed to and use the most.

P3: Calea Victoriei, is a street dear to my heart because I both lived on it and used it as a case study for my bachelor thesis. It is street constructed by Constatin Brancoveanu to connect the royal palace with the church which also was the second home of the royal family. It has a rich history and changed a lot over time. It has an important historical significance as it was connected to the only "real" square in Bucharest (a square used for its intended purpose, as a

meeting place for people). This adds value to the street as it has an important public space. There are several associations in Bucharest that are trying to pedestrianize Calea victoriei and revive the palace square (mentioned above), after a trial, noise complaints from residents have been an issue.

Researcher: What about the street's infrastructure, how do you regard it?

P3: The buildings surrounding the street are a mix of classical old architecture and communistic modern design. The building adjacent to the square we talked about is one of the most impressive examples of modernist architecture, with living standards better than in the west. At that moment in time the average size of the apartments was bigger than in western Europe, the apartments were cleaner and more efficient. There was a mix of styles and trend in architecture and that is what gives almost all the streets in question a diverse character. That is except Stefan cel Mare.

Researcher: What do you usually do when you walk on the street, what is the purpose?

P3: To be honest, now that I do not live here anymore, I usually come for the events. There is a concentration of cultural, economic, social events. You can say that you come here and find what you want. The area is overly saturated with activities however, people cannot get enough. You can always find something new. Especially museums. They get lost in the urban tissue and the crowdedness of the street.

Researcher: In terms of walkability what do you think of the street?

P3: There are a lot green spaces in theory, which adds to the desire of using the street, however in reality they are not there, or they are poorly maintained and as a repercussion, most of the time not usable as they were intended which in turn can attract an unwanted part of the population. It also comes down to mentality. People mistreat new places and I think it all comes down to education. Also, another big problem in terms of the walkable infrastructure is the lack of continuity and lack of maintenance.

Researcher: What do you mean about continuity?

What I mean is that the sidewalk needs to be inclusive. It shouldn't be harder for people with disabilities or old people to use them. For example, The AMAIS association in Bucharest, educate people about the difficulties encountered by people with disabilities, however there is

little interest from public authorities. Also, I think it requires more thought-out connections to the rest of the pedestrian network around the city. And also, by continuity I mean consistency.

We as a culture tend to be overprotective and I think that can be seen in the planning culture. We tend to create absurd safety regulations which when compared are opposing. We tend to put safety features like fences and concrete poles, which in my opinion are more dangerous for pedestrians and bikes in case accidents happen as you can hit your head.

Participant 4(P4):

Researcher: Out of the 5 streets I presented to you which do you feel you are most accustomed to and use the most?

P4: Calea victoriei is one, mostly because I use it every day on my work commute. I like walking whenever the weather allows. Also, Stefan cel Mare is where my office is. I usually use just a small portion as the office is located on one end of the street. Kiseleff is also a street I am accustomed to mostly due to my work.

Researcher: What do you think of the street's environment and infrastructure?

P4: I will start with Calea Victoriei and Kiseleff because they constitute a transport axis and also because there is a large degree of experiments done at the street level for those 2 streets. I consider CV an attractor not just for the surrounding area but for the entire city and maybe country. In recent times there was an adaptive reuse masterplan for CV. It successfully attracted a lot of economic actors, cultural actors and many more which contributed to the overall attractiveness of the street. What is the main problem in my opinion: traffic. Calea Victoriei benefits from alternative routes which were especially built in order to pedestrianize the beforementioned axis (Calea Victoriei-Kiseleff). The axis has all the qualities of being an “urban living room” like, for example Friedrichstraße. However, when we speaking about this axis, we need to keep in mind that this is at the moment an island. It has no connections to the rest of the cities network. We always have to think about people's choices. I want to walk! I made this choice; I do not want to use the car or ride the bike. However, when you chose to walk you are vulnerable and you need a sense of safety that needs to be regulated by policy but also by signs/science. Policy change is harder because it requires a behavioral change. But you need to think about how you can design the public space and now we have a design that is nor car

friendly y, scooter friendly, nor bike friendly or pedestrian friendly. It has an old design. A lot of poles which in my opinion are an outdated safety measure. They are more dangerous for everybody. It needs to have an open design with a focus on pedestrian mobility and there is the possibility to make it. On the other hand, there are streets like Stefan cel Mare and Aviatorilor where car traffic cannot be completely excluded. There are solutions to protect pedestrians there. Following the example of western countries, you can implement traffic calming measures. A design helped by technology (traffic control devices) that enforces lower speed limits. It's risky, risky, risky.

P4: For Lascar Catargiu for example we need to think about a street design where cars pedestrians, bikes and scooters can coexist. Recently, they introduced electric scooters in Bucharest, they are really dangerous and so are bikes. They pass you at high speeds and being electric you can't hear them, not suitable for sidewalks. Therefore, for added safety you need a design concept which is integrated but at the same time allows for separation. Who is the most vulnerable? The pedestrian, he needs to have a safe environment. You need to have access to technology (wi-fi, electric car chargers) but you also need nature-based solutions (green tower, etc.) in order to feel safe and be inclined to use the space. But the most important thing is to have integrated plan.

P4: For example, Calea Victoriei has a big space which is currently a parking lot which hinders the pedestrian environment. Why can't that parking be underground? We need to bring back also the architectural space and bring back the elements pertaining to the environment which adds value. Also, when you walk you need to be able to continue your walk wherever you go. When you get to Victoriei Square the chaos starts, the congestion. That is a space where I do not feel safe as a pedestrian. You need to have separate pedestrian ways. You cannot make a person walk on a street that has 6 lanes right next to car traffic. We can look out the window now and see a lot of dangerous situations. People that arrive in this pedestrian environments need to already have a low speed. There also needs to be a mentality shift for the people living in the city. They need to understand that you have other alternatives, not just the car. But of course, this implies that the public transport, the infrastructure needs to have an increase in quality. I just came back from Vienna a couple days ago; there I used the tram. Here I cannot use the tram. It's dirty and smells really bad. I am disappointed because I want to use it. This is not democratic because I want to use it but it does not live up to the standards. The same is for the pedestrian environment.

Participant 5(P5):

Researcher: Out of the 5 mentioned streets which one do you use, it can be one or more?

P5: Stefan Cel Mare and Lascar Catargiu

Researcher: How often would you say you use them?

P5: Almost daily, if not every other day for sure. I usually walk.

Researcher: That was my next question, do you usually walk?

P5: Yes, almost always, Lascar Catargiu is on my way to work and I live on Stefan cel Mare.

Researcher: What is your perception of safety regarding the pedestrian environment of the streets?

P5: Only safety or comfort in general?

Researcher: Whatever you feel is important to the pedestrian experience, feel free to mention

P5: The pavement, on Stefan cel Mare is bad compared to Lascar Catargiu.

Researcher: Maybe you can elaborate on that. What specifically do you find bad? Also, are there any other elements that maybe impact you journey as a pedestrian?

P5: On LC the sidewalk is fairly qualitative compared to Stefan cel Mare, you do not have to take care and look where you are going. You also have some places with benches, if you get tired or just want to talk to somebody. On the other hand, on Stefan cel Mare the pavement on sidewalks is bumpy and, regarding urban furniture, it's basically nonexistent. Actually, there is a bit of space which contains urban furniture, however it's occupied by homeless people most of the time making it unusable. There is also a big lack of green space compared to maybe Kiseleff, where somewhere in the middle you have a small square where you can sit down and talk to someone. Stefan cel Mare has some trees, however I find it insufficient, I mean compared to the amount of traffic that goes by every day, it threatening for your health.

P5: I don't know if this is relevant...!

Researcher: Please, go ahead!

P5: Something which is extremely annoying is the loud noise you constantly hear from the heavy traffic, including in my house. If you walk on the street and talking on the phone, there are big chance you are not going to hear anything.

Researcher: Can you elaborate maybe on what you think about the impact of cars and driving on your experience as a pedestrian?

P5: If you remember, there is a lot of cars parked on the sidewalk. The problem is with the legislative system. Someone must have decided that Stefan cel Mare should allow this amount of traffic. If you ask me this street shouldn't be allowed to have so many cars because it threatens the quality of life. In a very serious manner. I think certain cars should be excluded from the street. If you want to know, just to get understand. My balcony (which is on Stefan cel Mare) gets dusty twice a day. This would help both type of pollution: phonic and atmospheric which once again affect the quality of life, also considering you have 2 hospitals in the middle of all this traffic who suffer from this.

P5: Also, another weird thing is concerning almost all streets is the lack of consistency in infrastructure. Some of them are better off because of some businesses that have done something to add to the street environment. You basically visualize on how you cross the street: on one side you are in a European country and on the other in a communistic ruin. There are not a lot of trash cans on Stefan cel Mare and when you can find one there is usually also trash on the ground, again very unhealthy. I think some green space would benefit also in terms of aesthetics, bring a little bit more color between all the grey buildings. Also, on Stefan cel Mare Kiseleff Aviatorilor and Lascar Catargiu, there is one more thing, I do not know exactly what the laws says on this, but on the sidewalk markings from a former bike lane still remain. If I understood correctly last time, I asked someone, they told me the bike lane was disbanded. However, the people who use bikes, still use it and if you are in their way, they get aggressive. I do not think it's their fault, nor the pedestrian's fault, but I think it would be safer if there would be a clear separation in the legislation. It happens that they use their horn, and get aggressive and it affects your mood. There are also quite a lot of baggers and also not very well light. I sometimes do not feel safe to walk and have to go around certain areas to get home.

Also coming back to the green spaces and adding color to the city. I think maybe some graffiti art would also be a good idea to reinvent maybe a dangerous place.

Participant 6(P6):

Researcher: Which out of the 5 streets are you most familiar with?

P6: Stefan cel Mare yes, Calea Victoriei occasionally, Lacara Catargiu don't think so, and Kiseleff mostly when I go to the park( Kiseleff park).

Researcher: How often would you say you use them?

P6: Stefan cel Mare is a special case because that is where I live. I use it as a pedestrian daily in functional intentions. The street is quite long, even the segment you told me about. I do not think I ever walked the entire thing at once. Just small segments.

Researcher: Would you perceive the street environment as being safe, and by environment, I mean urban furniture, traffic signals?

P6: On Stefan cel Mare, and If I think about it on almost all mentioned streets, excluding Calea Victoriei, this segment has a very big problem, it has the bicycle lane drawn on the sidewalk which has part that are not wider than 2 meters and also include a small fenced green space. The lane is not accounted for by pedestrians. It happened to me while I was walking, that a bike passed at a very high speed, the road being quite long and straight and so is the sidewalk, it allows for high speeds which can be dangerous. Plus, it sometimes gets blocked also by parked cars. It is unsafe that we do not have a clear delimitation and accidents can happen between pedestrians and bicycles.

Researcher: How about other types of traffic, do they influence your experience as a pedestrian?

P6: Car Traffic is also a problem. There are always parked car on the pavement. Especially on Stefan cel Mare but not restricted. Also, on Stefan cel Mare here are always cars parked adjacent to the sidewalk, which is possible due to the low maintenance of the infrastructure necessary to block their entrance on the sidewalk. The signaling is not consistent, it differs from meter to meter, certain well-off stores have signs with strong lighting and then you go to an out of business store with its lights closed, which can impact both pedestrian and traffic users' and comfort. The street lights are dim on Stefan cel Mare. On streets like Stefan cel Mare the terraces are a thing to look forward to an otherwise boring journey. Regarding Calea Victoriei, Kiseleff and Aviatorilor I would say that I can only have a subjective opinion because I saw them change from worse to better since the early 2000's.

Participant 7(P7):

Researcher: Which out of the 5 streets do you most often use?

P7: I mostly use a bike on Stefan cel Mare, on my way to work. But you know there are certain conflict zones where the bicycle and pedestrian are supposed to use the same space and also zones where the sidewalk is split between pedestrians and cyclists just by paint. I would consider this a danger for pedestrians.

P7: For example, in some areas, larger sidewalks which create some sort of plazas, like Kiseleff, could be a solution. There should however be a clear separation, for example, there is a new development somewhere on Aviatorilor where they have sidewalk, slow moving zone for cars, green space, sidewalk again and then the main street. This is a clear improvement for pedestrian safety and comfort. I can talk about it all day; you can ask me some questions maybe?

Researcher: How about any of the other streets, do you have any thoughts?

P7: Kiseleff, in my opinion, is one of the most aesthetically pleasing streets in Bucharest and because of that is a special case. It has the best pedestrian environment in my opinion for walking because of the green space, aesthetics, the most pleasing overall. Except when you have heavy traffic. Then the noise is a nuisance. The problem is that you do not have the street functions necessary to attract you to the space, even though the space is of such good quality. Just to name a few: the sidewalk, the vegetation which separates you from the street, with a good street profile and also the park. But it's just a transit zone. Because of that is not really busy and that can make you feel insecure, also because of how big the street actually is, more than 6 lanes. However, when you get near the southern end where you have a bunch of museums, there is a cluster of functions which attracts people. I think that is interesting, because the functions change how you use the street. For example, Stefan cel Mare is the ugliest street but has the most functions and therefore is always circulated.

Researcher: Out of these physical elements that you mentioned are important for the pedestrian environment, or maybe new ones, which ones would you consider also impacting your safety?

P7: First of all, the size. The size needs to be scaled for pedestrian safety. And the problem here is how can you make the calibrations. For example, if you have a sidewalk 3 meters wide but you

have small buildings and two car lanes with limited traffic, you feel safe compared to when you have the same width sidewalk but a street with 6 lanes and heavy traffic and buildings that are 12 stories high. So, the comfort is dependent to integration of all the parts that constitute the environment.

P7: Secondly, trees. There is one thing to have a tree on a street which is oriented towards the north, that way it provides shade and is another thing to have the same tree on the street facing south where it provides no shade and therefore can produce health risks in the summer.

P7: What else? Oh, urban furniture, but I think this is quite subjective. For example, I do not understand the usage of tall curbs, you can trip, the bicycle has problems going over them, parents with strollers have issues. I honestly, I do not understand why we need to have tall curbs. I do not feel that safe. I would have felt safer if we had lower curbs but the road would be separated by a green space from the sidewalk. That way cars would also not be able park; it would be a win. Maybe bollards would also help with safety, but only if done correctly. For example, in Bucharest, we have some thin black metal poles which get easily bent. It happened to me numerous times to hurt my leg, hitting one. But, coming back, I think the best course of action would be smart design. Those bollards are just temporary measures because you had no other quick alternatives.

Researcher: Out of the streets you use would you consider one to be safer than the other?

P7: Kiseleff and Aviatorilor compared to Stefan cel Mare and Lascar Catargiu feel safer. They are design resiliently from the beginning, they have working traffic lights, proper crosswalk, the curbs are lowered and in part have a certain degree of separation, helped out by the fact that the sidewalk is wide.

P7: Also, I live on Stefan cel Mare, and every other week I see a crash between car and pedestrian, car and car, every possibility. Especially in certain hotspots. The sidewalk does not have consistent width and surface. I need to preplan my route in order to find the safest and best alternatives.

P7: Also, Lascar Catargiu, has a certain sidewalk which is particularly bad. You have to wait a lot as a pedestrian even though it's equipped with a button, that does not really work. Also, aviatorilor has the same problem. A few crosswalks, and it's basically untraversable.

#### 8.4 Consent form

Title of your project: Exploring the Walkability of Urban Streets: A Composite Index Analysis of Five Streets in Bucharest, Romania

Thank you for answering the interviews! We appreciate your participation! It will take max 15 minute to answer it. With this interview I study the walkability on five streets in Bucharest, Romania.

The interviews are about your perceptions. There are no right or wrong answers.

Your participation is voluntary. You can stop the interview at any time while answering the question. You do not have to give a reason for this.

#### Privacy

Answering the interviews is anonymous; the data you provide cannot be traced back to you. Your personal information will remain confidential and will not be shared with third parties. The data will be analyzed as part of my thesis in the Faculty of Spatial Sciences, University of Groningen.

I have read and understood the above information. I agree to participate in this research and to the use of the data collected.

Date:

Name and Signature:

