



Are Cities Decisive for Life Satisfaction? A Structural Equation Model for the European Population

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Abstract

The growth of cities is an unstoppable phenomenon that began in the last century and will undoubtedly be one of the challenges of the current century. It is not only a question of urbanization; its implications and consequences extend to the economy, society, culture and the environment. The capacity of cities as engines of change and progress cannot be questioned, and its consequences will alter the lives of their citizens, who will search, in a more liquid world, for the best places to live. Therefore, this study aims to examine the influence of perception of urban quality (PUQ) and social trust and security (STS) on the life satisfaction (LS) of European citizens to find out if these variables are essential for the population living in Europe. The data were selected from the European Urban Audit survey, which covers 40,597 people living in 80 European cities. The analysis in this study is carried out at the city level. The partial least squares structural equation modelling approach was applied to verify the hypotheses. The findings reveal a positive correlation between PUQ and STS with LS, with STS being a mediator between PUQ and LS. These results underline that improving the perception of the urban environment can significantly increase well-being, contributing more than 70% to citizens' life satisfaction. This multi-disciplinary analysis highlights the importance of considering various urban dimensions in planning and public policies to foster prosperous and satisfactory urban development.

Keywords Life satisfaction · Perceived urban quality · Social trust · Well-being · Quality of life

1 Introduction

Nowadays, technological innovations are rapidly being incorporated into cities, transforming them day by day, which can make us forget that people and social dynamics decisively influence the success or failure of a city. The true wealth of cities lies not only in their buildings and infrastructure but also in their ability to promote their inhabitants' well-being and prosperity, freedom, security, innovation, and creativity (Glaeser, 2011). Although growing global urbanization is sometimes perceived as a negative phenomenon associated with destroying ecosystems, poverty, unhealthiness or crime, the literature highlights that

cities have allowed human capabilities to expand exceptionally. Cities facilitate interaction and collaboration between highly competent individuals, contributing to the development of social and technological innovations, from democracy to printing and mass production, that benefit global society. According to Glaeser (2011), the triumph of cities lies in this.

Throughout the twentieth century and up to the present day, there has been a continuous and increasing trend towards urbanization worldwide (Larson et al., 2016; Sørensen, 2014). For years, urbanization has typically been associated with modernization and rural exodus. This has generally resulted in people moving to urban areas for better economic opportunities and, thus, a better quality of life (Sørensen, 2014). In the particular case of Europe, it has gone from being a predominantly rural continent in the last century to a predominantly urban one today. It is estimated that, of the 447 million inhabitants of the European Union, 75% live in urban areas (cities, towns and suburbs). Forecasts indicate that the proportion of the urban population in Europe will continue to grow and is likely to reach more than 80% by 2050 (United Nations, 2019). It is a reality that Europe is one of the most urbanized continents in the world.

In Europe, there is a varied mix of cities: at one end of the scale are the global metropolises of London and Paris. In contrast, approximately half of the cities have a relatively small urban centre of 50,000 and 100,000 inhabitants. A characteristic feature of European cities is their relatively smaller size. Only Paris and London, with just over 10 million populations, can be considered megacities (Margaras, 2019).

Urbanization has positive and negative aspects. Dense urban populations may have better access to services for their populations, such as health care and services that improve quality of life, as well as employment and business opportunities. However, urban areas also boast a variety of environmental problems, such as pollution or sanitation, and social problems, such as segregation and socioeconomic problems, both of which can lead to stress and health problems among the population (Larson et al., 2016). The growing relevance of cities makes it essential to know in depth how they work to improve the quality of life of their citizens. It has become a crucial element of the competition between cities to attract the best human resources (Glaeser, 2011; Zhou et al., 2021).

There has yet to be a consensus in the literature regarding the definition of quality of life. Most researchers agree that no single theory defines and explains this concept. The term quality of life refers to an evaluation of the experience that subjects have of their own life. Such an evaluation is not an act of reason but rather a feeling (Gómez Lopera, 2005). Corraliza and Rubio (1997) introduce relativity into the quality of life, stating that people's life satisfaction with a specific environment contributes to defining the quality in that territory. This contribution becomes a general measure based on quality aspects, and its indicators allow specific patterns to be identified for a specific neighbourhood or area.

That is why, currently, it is possible to find research that highlights the importance of the perception of urban quality on the life satisfaction of the citizens of a territory (Zhou et al., 2021). On the one hand, life satisfaction is an essential dimension of quality of life and the ultimate goal of urban planning (Cao, 2016; Sugiyama et al., 2009). Life satisfaction is a cognitive component of quality of life (Sørensen, 2014). Life satisfaction can be assessed generally (how satisfied the individual is with life as a whole) or in terms of different domains (such as employment, income or health) (Patiño et al., 2023). On the other hand, the perception of urban quality has been studied in different scientific fields, such as, for example, psychology, geography, economics, architecture and urban planning (Ballas, 2013; Pfeiffer & Cloutier, 2016).

For this reason, the Campbell et al. (1976) model highlights the relationship between the objective environment's characteristics and the perceived satisfaction level. The interaction

of subjective and objective factors explains the perceived urban quality. It is crucial to include measurement of people's perceptions of the quality of their urban environment when studying environmental factors. Hence, finding other urban researchers interested in the relationship between the city and behaviour is possible. The urban environment can be conceived as a source of satisfaction that contributes to the formation of individuals' sense of well-being (García et al., 1996). Following Brown and Daniel (1987), perceived urban quality encompasses numerous aspects of an individual's life, such as health, interpersonal relationships, services, places of recreation, type of construction, and housing conditions. These characteristics allow citizens to realize themselves and identify with the social values of their community, providing them with a subjective experience perceived as more or less pleasant or positive (García et al., 1996).

Therefore, managing territorial and environmental policies and public services in urban areas is essential for citizen satisfaction (Beeri et al., 2019; Ouyang et al., 2017). Improving the expectations of people looking for a place to settle can be decisive in establishing their residence (Berggren et al., 2020; Nghiêm-Phú, 2016; Sørensen, 2015). The continuous improvement of these aspects can differentiate the city in terms of citizen loyalty (Braun et al., 2013; Díaz-Díaz et al., 2017; Ochoa-Rico et al., 2022).

As urban quality of life is increasingly linked to political decisions about public services, the performance of those services has been a primary concern of public administrators, attracting considerable attention from city managers (Ma, 2017). In recent decades, social science researchers have devoted increasing efforts to evaluating the quality of good governance in the city and the services provided (Ballas, 2013; Ochoa-Rico et al., 2022). As a result, scholars, policymakers, housing developers and urban planners pay more attention to the relationship between urban environments and people's quality of life (Gao et al., 2016; Zhang & Zhang, 2015, 2017; Zhou et al., 2021).

According to Lenzi and Perucca (2016), the study of life satisfaction and the role of urbanization is a relatively neglected topic in the literature. These authors indicate the existence of some research on territories such as the USA or China, but more research is needed in other territories.

Specifically, analyzing the existing literature on Chinese cities, the research by Zhou et al. (2021) inspired us to analyze life satisfaction with both similar and additional mediating variables in territories other than China. Under this premise, the idea of this research arises. The main objective is to advance knowledge about quality of life by considering the effects of subjective perceptions of European cities' quality of life satisfaction. Applying the partial least squares-structural equation modelling (PLS-SEM) approach, this study determines whether perceived urban quality influences life satisfaction and the mediating mechanism of social trust and security in a sample of eighty European urban cities.

Knowing the relationship between these variables is essential to improving the quality of life of the European population and, with this action, attracting and retaining the best human resources in their cities. Knowing the relationship between these variables makes it possible to carry out more efficient policies to improve the life satisfaction of Europeans.

The main innovations and contributions of this study are numerous. First, unlike the existing literature on quality of life that depends mainly on socioeconomic determinants, the present study offers an "environmental-human" perspective. This research shows that objective variables are not the only determinants of citizens' life satisfaction. The perception that the population has of the city environment makes them more or less satisfied with their lives.

Secondly, this study integrates social trust and security in a research framework in which fewer works explore emotional mechanisms. This variable is essential for the quality

of life of European citizens. This work shows that social trust is conditioned by the perception of urban quality of the European population, which, in turn, conditions the life satisfaction of citizens. Therefore, having trust in society is essential for citizens to feel satisfied with their lives.

Thirdly, this work demonstrates the essential relationship between subjective variables, such as the life satisfaction of European individuals, with subjective dimensions about the urban environment, something that has not been analyzed before. Previous literature related it to objective variables of the environment, such as the number of parks, public lighting, parking spaces, lanes, etc.

Finally, this work also validates a type of analysis that allows the generalization of the results through a structural model that relates the quality of perceptions in the environment to life in the European framework. This study shows how more than 70% of the life satisfaction of European citizens is conditioned by the variables that make up the model.

The results obtained in this work are fundamental. Therefore, it is necessary to delve deeper into urban design and policies to increase citizens' life satisfaction. Moreover, by betting on public policies that promote these variables, it is possible to attract and retain the best human resources in the world, making European cities very competitive.

To achieve the proposed objectives, this research has been structured as follows. First, the existing literature on citizens' life satisfaction in urban environments is analyzed. Specifically, the relationship between the variables' perception of urban quality, social trust and security, and citizens' life satisfaction has been analyzed. This review proposes a model with four hypotheses to be tested. Secondly, the methodology applied, and the characteristics of the sample used are explained. Thirdly, the results are detailed. In the final section, the practical implications are discussed, and the main conclusions are presented.

2 Life Satisfaction in an Urban Environment

Previous literature has analyzed the life satisfaction term. In general, this concept is defined as a cognitive evaluation of the quality of life of individuals according to specific standardized measures (Kardas et al., 2019). Therefore, when analyzing citizens' life satisfaction in an urban environment, it is necessary to analyze different factors, not only the neighbourhood's physical characteristics (Ballas, 2013). Precisely, Larson et al. (2016) state that, traditionally, objective indicators, such as GDP, health, employment, literacy, or poverty, have been used to understand the population's well-being. Hence, the need to use subjective variables is increasingly highlighted in the literature (Ballas, 2013; Larson et al., 2016; Mouratidis, 2021; Mouratidis & Yiannakou, 2022; Okulicz-Kozaryn & Mazelis, 2018; Patiño et al., 2023; Sørensen, 2021; Zhou et al., 2021). However, there is research that goes further and is not limited to certain standardized factors, such as those mentioned above. More and more studies understand life satisfaction as the cognitive evaluation that people make of their quality of life according to specific standardized measures, but it can also include emotional aspects such as feeling happy with their current life and expecting it to be so in the future (Cheung & Lucas, 2014; Gandelman et al., 2012; Özer et al., 2016; Zhou et al., 2021). An example would be how factors like intergenerational relationships, economic situation, and health status influence people's life satisfaction.

Considering this definition of life satisfaction, it is not surprising that the literature highlights the importance of socioeconomic factors on people's life satisfaction, such as

intergenerational relationships, economic situation, or health status (Lin et al., 2011; Pickard et al., 2018; Koekemoer et al., 2019; Viñas-Bardolet et al., 2020; Zhou et al., 2021; Patiño et al., 2023; Abed Al Ahad, 2024).

Nevertheless, the relationship between citizen life satisfaction and residential environments is a relevant topic, not only in the academic field, in which the most influential factors in this relationship are debated. Most existing studies on this topic mainly analyze the availability and accessibility of citizens to urban physical services such as parks, play areas and greenways (Ballas, 2013). For example, various investigations show that the existence of green spaces in the residential environment, as well as good access to them by citizens, is very relevant when it comes to achieving greater life satisfaction (Fleming et al., 2016; Kothencz et al., 2017; Larson et al., 2016; Patiño et al., 2023; Tsurumi & Managi, 2019). In the case of the citizens of Uruguay, it is concluded that public goods such as electricity, running water, the garbage collection and disposal system, public lighting or sidewalks are factors considered very beneficial for the quality of life of its citizens (Gandelman et al., 2012).

There has been a significant growth in the number of investigations that, despite highlighting the importance of material factors in the residential environment, reveal the importance of subjective aspects that influence the life satisfaction of the people who live in a territory. For instance, these investigations highlight factors such as the perception of security and social relationships, showing that it is necessary to advance the knowledge of the residential environment and that, to do so, both physical factors and intangible factors must be analyzed (Ballas, 2013; Fleming et al., 2016; Kothencz et al., 2017; Larson et al., 2016; Lenzi & Perucca, 2016, 2018; Mouratidis, 2021; Mouratidis & Yiannakou, 2022; Parra et al., 2010; Patiño et al., 2023; Sørensen, 2014, 2021; Zhou et al., 2021).

Research on life satisfaction and the residential environment has been analyzed based on its use for living, studying, or working and geospatial location (Mao et al., 2015). There is a debate in the literature on urban studies, in which the most internal space, the home, has a widely discussed effect on the citizen's life satisfaction. Unlike the exterior, the private or interior space is much more complicated to evaluate and intervene. However, there is an intermediate situation that allows researchers to understand both areas. This is the case of the neighbourhood, considered a relevant factor for urban design, which can act as a bridge between the home and the city (Ibem et al., 2017). The neighbourhood is the social and physical environment around the citizens' homes of that territory (Zhou et al., 2021).

Therefore, when analyzing citizens' life satisfaction in an urban environment, different factors must be considered, not only the neighbourhood's objective characteristics. Following Zhou et al. (2021), the importance of the subjective variable perceived urban quality is highlighted, understanding it as people's evaluation of the environmental characteristics of public space around their homes. A concrete example could mention factors like the presence of green spaces, exposure to pollution, public safety, and neighbourhood cohesion that influence the perception of urban quality.

Furthermore, Parra et al. (2010) state that people's perceptions of living conditions also influence life satisfaction. These researchers conclude that neighbourhood characteristics perceived by citizens, such as the perception of traffic density, the safety of parks and street noise, are significantly related to the life satisfaction of its citizens. A similar conclusion is reached by Zhou et al. (2021) in the case of Chinese citizens.

In summary, people perceive a quality urban environment if the area close to the individual's home has factors that are considered relevant to them. Alternatively, what is the same, the person will perceive that his environment is of quality if he perceives the factors in the area in which he lives to be adequate. On the other hand, considering that

satisfaction with life occurs in individuals when they feel happy with their current life and how they expect the future, it is obvious that the quality of where the person resides firmly conditions their satisfaction with life. That is, a person will feel happier with their life if they are satisfied with the conditions of the streets, cleanliness, public transportation, green areas, public areas, health services, training institutions, sports facilities, cultural facilities, air quality or noise quality of the area where you live. In short, if a person perceives that the quality of his city is high, this will affect whether this person feels happy with his life.

Hence, the first research hypothesis is proposed:

H1 Perceived urban quality positively influences life satisfaction.

Likewise, Gao et al. (2016) and Zhou et al. (2021) show that perceived urban quality, such as perceived safety and aesthetics, is related to the well-being of individuals. On the one hand, social trust could be defined as an individual's expectations about the society around them, including the relationships between the state and civil society. A practical example could explain how social trust is strengthened when the city has good, shared governance among different public and private actors (Zhou et al., 2021). On the other hand, urban security could be defined as intangible assets indicating a high quality of life when crime prevention, crime control, and justice administration ensure the rule of law. An example could be mentioning how the perception of crime and disorder in a neighbourhood can affect the emotional well-being of its inhabitants (García Lirios et al., 2015; Grimaldo, 2010).

Van Dyck et al. (2015) and García Lirios et al. (2015) confirmed the relevance of security and social trust in the literature. The administrations and authorities are responsible for providing public goods and services in the urban environment and dictating the social norms that residents must obey and respect. Hence, its role is essential in the perception of social trust and security of its citizens (Gandelman et al., 2012). Specifically, it is indicated that urban areas with graffiti and vandalism negatively affect their citizens, causing them fear and nervousness (Bjornstrom & Ralston, 2014; Milfont & Denny, 2017). Similar conclusions are reached by Zhang et al. (2019), observing that the perception of crime and disorder in the neighbourhood causes anxiety and depression among the people who live there. Hence, some researchers find that in an urban environment where its population perceives a safe and harmonious neighbourhood, the feeling of control, calm and comfort improves (Jones-Rounds et al., 2014; Firdaus, 2017; Zhou et al., 2021).

Knowing what social trust and security are, as well as the factors mentioned above that influence it, it is logical to think that the perception of urban quality is a fundamental variable in the social trust and security of the citizens of a territory. Citizens who perceive their city to be of a quality, where its administration is fair, efficient and egalitarian, and its population trusts each other, and where citizens are not afraid in their streets or homes will feel that there is greater trust and social security in their cities.

All the arguments presented allow us to develop the following hypothesis:

H2 Perceived urban quality positively influences social trust and security.

As has been mentioned, people's life satisfaction is conditioned by variables from the environment or external to people and cognitive variables related to people's perception (Cao, 2016). The relationship between the residential environment and the life satisfaction

of the population is conditioned by different factors, such as neighbourhood satisfaction, sense of community, and physical activities (Leslie & Cerin, 2008; Zhang & Zhang, 2017).

Therefore, a citizen perceives the attributes of his residential environment as a stimulus, adjusts his emotional responses, and finally analyses whether he is satisfied with life. Zhou et al. (2021) indicate that there is a way to explain this relationship that is analyzed to a lesser extent in the literature, which is the case of social trust. In addition, García Lirios et al. (2015), Pfeiffer and Cloutier (2016), Sørensen (2021), and Mouratidis and Yiannakou (2022) also highlight the importance of security. Van Dyck et al. (2015) indicate that the perception of security and social cohesion in the neighbourhood are closely linked to the citizens' life satisfaction. For this reason, social trust and security stand out as fundamental variables to achieve citizens' life satisfaction in a residential environment (García Lirios et al., 2015; Kaunert et al., 2023; Ma & Hoard, 2020; Zhou et al., 2021).

Considering these variables, it is logical to think that both affect citizens' satisfaction with life. Thus, starting with social trust, it is said to facilitate healthy interpersonal relationships; in other words, when people trust each other, they are more likely to form and maintain relationships of support and cooperation. These relationships are essential for people's emotional and psychological well-being. Not only that, social trust also fosters a sense of belonging and social cohesion among the people of a territory. Individuals feel more connected and supported by their community, which will help increase the life satisfaction of those in that city. Also, in societies where social trust predominates, people tend to participate more in community and collaborative activities. This includes everything from volunteering to participation in community decisions, a fact related to individuals' personal satisfaction and, therefore, their life satisfaction.

Security has a direct impact on people's physical and mental well-being. The population of safe cities experiences less stress and anxiety and has less fear of crime and violence. This improves your life satisfaction levels. Likewise, in safe cities, people can move freely and participate in recreational, work, and social activities without fear. This would increase opportunities for social interaction and physical activity, two essential factors for people's life satisfaction. In addition, safe cities tend to have better infrastructure, services and maintenance, which causes property values to increase and the quality of the environment to improve. It is evident that a pleasant and well-maintained environment contributes positively to general well-being and, therefore, to people's life satisfaction. Not only this, security is also related to trust in institutions and the effectiveness of governance. When people trust that the authorities can maintain order and security, they feel safer and more satisfied.

As seen from the previous statements, social trust and security are interrelated variables that reinforce each other. In safe cities, social trust tends to be greater since the population perceives that they live in a predictable and reliable environment. At the same time, in cities with high social trust, crime levels are usually lower due to community policing and cooperation with authorities.

In summary, social trust and security are considered essential for people's life satisfaction in a city. Both create an environment in which citizens can develop meaningful relationships, feel safe, and enjoy a high quality of life. These conditions make individuals feel happier, more secure, and more connected, ultimately raising their life satisfaction.

All of the above allows us to develop the following hypothesis:

H3 Social trust and security positively influence life satisfaction.

The previous hypotheses indicate that the variable social trust and security is essential in the efficient functioning of any city. Nevertheless, in this case, a further step is taken. Specifically, what is observed in the literature is that variables play a mediating role among others (Zhou et al., 2021). In this case, it is considered that social trust and security will mediate the relationship between the perception of urban quality and the life satisfaction of the population that lives in that territory.

This fact has already been commented on in the literature. Following Zhou et al. (2021), finding a complete hypothetical mediational framework in literature is rare. Despite this, there is theoretical and empirical evidence that supports the existence of links in the chain or, in other words, preconditions for mediation. These authors stated that the perceived urban quality influences the life satisfaction of the Chinese population by strengthening social trust and security.

This is because public services, such as the quality of transportation, security, public lighting, water and sewage quality, burial services, fire extinguishing service, etc., make citizens perceive urban quality in their city (Fongar et al., 2019; García Lirios et al., 2015). A convenient, peaceful and orderly residential environment can promote the life satisfaction of those who live there (Blanco & Ruiz, 2013; Huang et al., 2016; Ochoa-Rico et al., 2022). At the same time, common areas, parks and facilities for physical activity are resources that the urban environment has in which citizens can interact, promoting social trust in the territory (Carlson et al., 2012; Larson et al., 2016; Patiño et al., 2023; Pfeiffer & Cloutier, 2016; Twyman et al., 2008). People living in urban areas with high crime rates may feel fear, which reduces their life satisfaction (Leslie & Cerin, 2008). Accordingly, an urban environment where citizens feel safe and trustful will increase their life satisfaction (Mikucka et al., 2017; Usher, 2007; Zhou et al., 2021).

The arguments show that perceived urban quality could affect life satisfaction by influencing social trust and security. This is because for people to feel satisfied with life, it is essential that cities have infrastructure and services available to citizens that are perceived as quality and that, therefore, promote social trust and urban safety.

Therefore, the following research hypothesis can be argued:

H4 Social trust and security mediate the association between perceived urban quality and life satisfaction.

Overall, it is hypothesized that perceived urban quality contributes to the life satisfaction of the European urban population (direct effect) by strengthening social trust and urban safety (indirect mediating effect). Figure 1 shows all the relationships and hypotheses proposed.

3 Methods

3.1 Analytical Methods

Structural equation modelling (SEM) is a multivariate methodology combining multiple regression and factorial analysis. Among SEM techniques, partial least squares structural equation modelling (PLS-SEM) is a variance-based statistical analysis that tests measurement and functional, predictive, and causal hypotheses. The PLS path modelling method, whose algorithm is a sequence of regressions in terms of weight vectors, was developed

by Wold (1982). PLS-SEM is an appropriate method to analyze data when the theoretical knowledge about a topic is scarce (Hair et al., 2014) and for theory-building and causal applications (Henseler et al., 2016) because it simultaneously deals with causal relationships between abstract constructs represented by latent variables. PLS-SEM is a rational and suitable selection for this research because it applies to small sample sizes, models latent constructs without distributional assumptions (Henseler et al., 2015), and estimates models with reflective and formative indicators, avoiding identification problems (Vinzi et al., 2010).

The data is analyzed using SmartPLS version 4.0.9.9 (Ringle et al., 2024). This package uses resampling methods of bootstrapping with the traditional PLS estimation algorithm to estimate the standard error of regression paths and other model parameters. The basic PLS algorithm implemented in this package follows three stages (Lohmöller, 1989): a 4-steps iterative estimation of latent variable scores until convergence has been obtained (or the maximum number of iterations has been reached), estimation of outer loading and path coefficients, and estimation of location parameters. Parametric significance tests cannot be applied to test whether these coefficients are significant because PLS-SEM does not assume a normal data distribution. Instead, it uses a nonparametric bootstrap procedure that provides parameter estimates to derive the 95% confidence intervals and the standard errors for the estimates to calculate t-values for the significance tests.

Bootstrapping is calculated to generate subsamples with replacements from the original dataset. Subsamples should be ample to guarantee the stability of results. While an initial assessment can be estimated with fewer bootstrap subsamples (e.g., 1,000), the results require many bootstrap subsamples. The bootstrap algorithm will take 5,000 iterations to achieve convergence as defined by the stop criterion (Preacher & Hayes, 2008). Bootstrapped significance is often used when the distributional properties estimates are unknown, or data cannot be assumed normal. Regarding the sample size, there are no specific requirements for resampling methods. However, the limits of the confidence intervals will be adjusted to data noise rather than to a natural distribution in small samples (Garson, 2016).

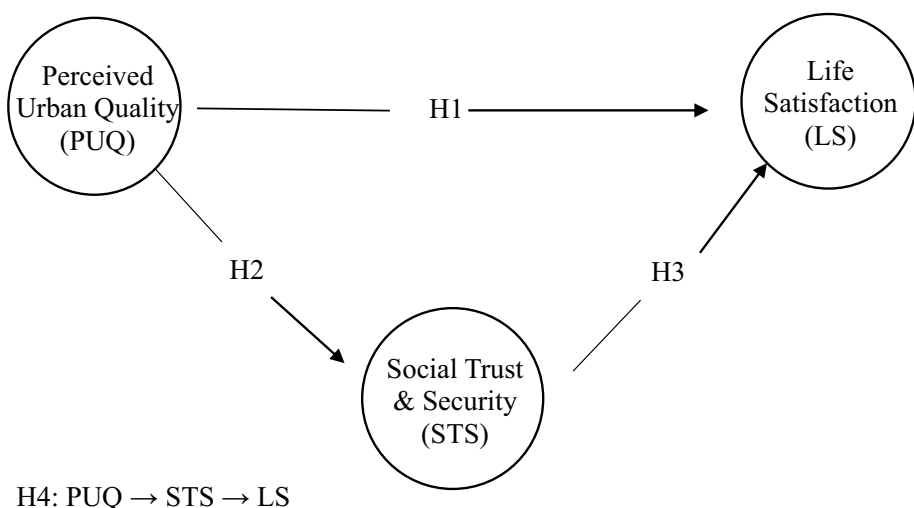


Fig. 1 Proposal for a study model of life satisfaction and urban environment. Source: Own elaboration

3.2 Data and Measures

The present study used data from the Urban Audit Survey conducted by Eurostat in 2020, specifically, of the Eurobarometer, "Quality of life in European cities". Urban Audit is a European Project that began in the nineties. Specifically, this project arose to collect statistical information that allows comparing the quality of life of people in the main European cities. This information is collected in phases or cycles, usually three years each. For this reason, the data from 2020 is used in this work, as it is the most current, published in 2021.

This Eurobarometer was commissioned by the Directorate-General for Regional and Urban Policy to capture a snapshot of people's opinions on various urban issues. Previous surveys were conducted in 2004, 2006, 2009, 2012, and 2015. This survey included all the capital cities of the involved countries (except Switzerland) and between one and six additional cities in the larger countries. In each city, around 500 citizens were interviewed. The survey was carried out by the TNS Political & Social network in the 27 Member States of the European Union and the United Kingdom, Turkey, Iceland, Norway and Switzerland. In previous years, the survey was usually carried out between May and June. However, in 2020, coinciding with the COVID pandemic, some cities extended the data collection period. Over 40,000 respondents from various social and demographic groups were interviewed via telephone (landline and mobile) in their native language on behalf of the European Commission, Directorate-General for Regional and Urban Policy. The methodology used is that of the Eurobarometer surveys conducted by the Directorate-General for Communication (DG COMM "Strategy, Corporate Communication Actions and Eurobarometer" Unit). Appendix 1 specifies the eighty European cities that are part of this research and the number of respondents in each city, which results in a total of 40,597 respondents. In addition, the appendix also details which European country each of the cities under study belongs to.

Latent variables in SEM represent abstract concepts with multidimensional constructs that can be measured through different groups of observed variables. This study proposes three latent variables: Perceived Urban Quality (PUQ), Life Satisfaction (LS), and Social Trust and Security (STS). The observed variables that measure each latent have been obtained from the answers to the items in the Urban Audit Survey questionnaire, which are enumerated in Table 1.

The latent variable PUQ comprises twelve items (PUQ1 to PUQ12) about population satisfaction through a series of quality skills in urban zones. The statements of each item of the questionnaire are detailed in Table 1, and the answers to the statements are coded on a 4-Likert scale with a higher score implying a better level: "strongly satisfied", "rather satisfied", "few satisfied", "not at all satisfied", and "do not know/not answer". The data used for each variable, whose descriptive statistics are detailed in Table 2, represents the percentage of the population satisfied with the urban quality of each one of the eighty cities. This percentage of satisfied population is calculated as the sum of the percentages of population "strongly satisfied" and "rather satisfied" in each city. Following the same method, the construct LS has been approached by four items (LS1 to LS4) about satisfaction with general life and some specific aspects.

Additionally, the latent variable STS has six items (STS1 to STS6) to proxy the population agreement with some statements about security and trust in the city (Table 1). The answers are scaled into a 4-Likert scale: "strongly agree", "rather agree", "few agree", "not at all agree", and "do not know/not answer". The data of each variable represent the percentage of the population in agreement with each statement and has been

Table 1 Questionnaire items of latent. Source: Own elaboration

Item/Variable	Definition
<i>Perceived Urban Quality (PUQ)</i>	
PUQ1	Be satisfied with the conditions of streets and building
PUQ2	Be satisfied with the conditions of cleanliness
PUQ3	Be satisfied with public transport
PUQ4	Be satisfied with green areas
PUQ5	Be satisfied with public areas
PUQ6	Be satisfied with health services, doctors and hospitals
PUQ7	Be satisfied with schools and other educational facilities
PUQ8	Be satisfied with sports facilities
PUQ9	Be satisfied with cultural facilities
PUQ10	Be satisfied with air quality
PUQ11	Be satisfied with the level of noise
PUQ12	Be satisfied with living in my city
<i>Life Satisfaction (LS)</i>	
LS1	Be satisfied with your laboral situation
LS2	Be satisfied with your financial situation
LS3	Be satisfied with your life
LS4	Be satisfied with the place where you live
<i>Social Trust¹ and Security (STS)</i>	
STS1	The presence of foreigners is good for my city
STS2	I feel safe in my city
STS3	I feel safe in my neighbourhood
STS4	Most of the people in my city are trustworthy
STS5	Most of the people in my neighbourhood are trustworthy
STS6	Public administration in my city is trustworthy

¹The term social trust may be perceived differently in other lines of research, see e.g., Sørensen (2016, p. 394)

calculated as the sum of the percentages of "strongly satisfied/agree" and "rather satisfied/agree" answers.

Table 2 shows the descriptive statistics of the 22 observed variables at the city level ($n=80$). The data for each variable represent the percentage of the population that is satisfied or in agreement with each statement in each of the 80 European cities. Appendix 2 details the correlation matrix of the 22 observed variables.

The quality skill with the highest satisfaction percentages is *living in my city* (PUQ12), with a mean and median superior to 90%. Besides, it presents the lowest standard deviation, showing that its mean is the most representative among the PUQ variables, and a kurtosis superior to 2 indicates a too-peaked distribution. However, the rest of the variables in PUQ latent follow a distribution approximately normal in terms of kurtosis and skewness. Other variables with high levels of population satisfaction are related to cultural facilities (PUQ9), green areas (PUQ4) and health services (PUQ6), which present means and medians higher than 70 and 80 per cent points, respectively. Nevertheless, the European population manifests the lowest satisfaction with conditions of cleanliness (PUQ2) and air quality (PUQ10), with means and medians lower than 64% and 69%, respectively.

Table 2 Descriptive statistics. Source: Own elaboration

Item	n	Mean	Median	Min	Max	Std. Dev	Kurtosis	Skewness
PUQ1	80	64.197	65.800	19.800	93.200	17.092	0.001	− 0.601
PUQ2	80	62.184	67.460	6.972	94.800	19.520	0.134	− 0.705
PUQ3	80	69.845	73.506	14.143	96.600	16.071	0.970	− 1.003
PUQ4	80	77.728	84.000	29.741	96.800	15.999	1.916	− 1.505
PUQ5	80	76.524	80.600	35.800	93.014	12.816	1.249	− 1.337
PUQ6	80	69.475	72.400	32.800	97.200	18.236	− 1.166	− 0.378
PUQ7	80	68.182	68.200	43.028	88.446	11.932	− 0.938	− 0.217
PUQ8	80	64.289	65.669	27.291	84.600	13.534	− 0.180	− 0.600
PUQ9	80	79.210	84.200	33.725	97.800	12.864	1.314	− 1.239
PUQ10	80	63.360	68.862	15.800	93.812	20.562	− 0.805	− 0.507
PUQ11	80	64.506	68.725	27.745	87.800	15.508	− 0.757	− 0.476
PUQ12	80	90.898	93.000	64.870	99.000	7.056	4.057	− 1.889
LS1	80	66.537	67.400	44.578	84.631	8.897	− 0.044	− 0.539
LS2	80	72.649	73.600	33.000	91.800	11.668	0.897	− 0.715
LS3	80	87.457	89.400	60.000	98.200	7.865	1.236	− 1.146
LS4	80	91.329	93.014	62.800	98.600	5.817	6.850	− 2.201
STS1	80	71.947	74.800	41.600	91.218	12.988	− 0.405	− 0.689
STS2	80	76.914	79.800	37.400	96.800	14.647	0.152	− 0.906
STS3	80	84.389	86.200	55.800	98.000	9.509	0.234	− 0.822
STS4	80	65.221	67.665	25.948	91.800	15.734	− 0.527	− 0.457
STS5	80	78.806	79.400	54.291	94.400	9.496	− 0.393	− 0.345
STS6	80	60.433	62.425	26.800	89.400	13.679	0.100	− 0.480

In the latent of life satisfaction, *satisfaction with the place where you live* (LS4) presents the highest level, with mean and median superior to 91%, the lowest standard deviation, and a too peaked and asymmetrical distribution. At the opposite end, the lowest satisfaction levels are related to the labour situation (LS1), with mean and median inferior to 68%.

All the variables in the social trust and security construct can be approximated by a normal distribution. STS3 registers the highest mean agreement percentage (84.4%), while STS6 presents the lowest (60.4%). That is, the respondent population of the cities considered in the study values the neighbourhood as their safer environment, while public administration is the least trustworthy.

4 Results

4.1 Measurement Model

The reliability of a construct measures its internal consistency, allowing to assess what items or variables measure the latent variables. Nunnally and Bernstein (1994) give the value 0.7 as a Cronbach's alpha (α) benchmark to confirm the internal consistency. Table 3

shows that the items selected in the latent variables perceived urban quality, life satisfaction, and social trust and security are highly correlated with α higher than 0.920.

The requirements for convergent validity were detailed by Hair et al. (2014): the standardized factor loadings should be higher than 0.6, the composite reliability (CR) should be greater than 0.7 in exploratory analysis, and at least 50 per cent of the variance of indicators should be accounted for the construct, that is, the average variance extraction (AVE) is more significant than 0.5. Besides, discriminant validity explains how much a latent variable differs from others and can be verified when the Heterotrait-Monotrait ratio (HTMT) values are lower than 0.9 (Gold et al., 2001).

Table 3 shows that the distribution of factor loadings ranges from 0.660 to 0.972, all above 0.6. Regarding CR, this study calculates the indexes ρ_A and ρ_C with values greater than 0.933, where high values indicate that items are well suited as variables for the same latent (Hair et al., 2016; Peng et al., 2020). As presented in Table 3, the AVE value for each construct is over 0.639. Regarding discriminant validity, the HTMT matrix comprises values lower than 0.9: 0.874 and 0.879 between perceived urban quality and life satisfaction and social trust and security, respectively, and 0.830 between life satisfaction and social trust and security. Finally, the results of the measurement analysis show good reliability and validity.

Table 3 Measurement model estimation. Source: Own elaboration

Latent variable	Item/variable	Factor loading	$CR\rho_A$	$CR\rho_C$	AVE
PUQ $\alpha=0.947$	PUQ1	0.867	0.952	0.955	0.639
	PUQ2	0.830			
	PUQ3	0.716			
	PUQ4	0.895			
	PUQ5	0.897			
	PUQ6	0.660			
	PUQ7	0.724			
	PUQ8	0.847			
	PUQ9	0.757			
	PUQ10	0.689			
	PUQ11	0.869			
	PUQ12	0.793			
LS $\alpha=0.920$	LS1	0.803	0.938	0.944	0.809
	LS2	0.916			
	LS3	0.972			
	LS4	0.898			
STS $\alpha=0.924$	STS1	0.758	0.933	0.941	0.730
	STS2	0.905			
	STS3	0.933			
	STS4	0.877			
	STS5	0.883			
	STS6	0.752			

4.2 Structural Model

The hypotheses of this study are verified using the least square method to estimate the parameters (path coefficient) of the structural model. Starting with the relevance assessment, standardized path coefficients determine the strength of each structural path and should exceed 0.2 to indicate causality (Chin, 1998). The coefficients closer to 1 indicate a strong positive impact, while coefficients closer to -1 represent a robust negative relationship. The values of the coefficients in Table 4 determine that PUQ has a more substantial effect on LS (0.565) than STS (0.313). However, the relation between PUQ and STS is the strongest in the model (0.833). In this line, the total effects evaluate the ultimate influence of the formative driver construct PUQ on the critical target variable LS via the mediating construct STS (0.261). Table 4 shows the t-statistics, p-values and confidence intervals obtained by a bootstrapping of 5,000 subsamples to facilitate and confirm the statistical significance of the coefficients. The hypotheses related to the direct effects of perceived urban quality on life satisfaction (H1), perceived urban quality on social trust and security (H2), and social trust and security on life satisfaction (H3) failed to reject with p-values lower than 0.05.

The hypothesis about the indirect effects of perceived urban quality on life satisfaction through social trust and security shows a p-value of 0.013 and it fails to reject H4. Therefore, policymakers and urban planners should focus on perceived urban quality that positively influences the population's life satisfaction both directly and through social trust and security. Specifically, they should enhance the population's satisfaction with public and green areas.

Regarding predictive accuracy, R^2 determines the portion of the variance of the dependent variable explained by the model (Hair et al., 2011). Following Serrano-Cinca et al. (2007), R^2 levels of 0.75, 0.50 and 0.25 indicate substantial, moderate and weak goodness of fit, respectively. Figure 2 represents the model's relations and provides the explained variance for each path between constructs. The R^2 values of 0.695 and 0.712 determine a moderate goodness of fit for the latent social trust security and life satisfaction. Variations of perceived urban quality explain 69.5% of the social trust and security variance, and 71.2% of the variance of life satisfaction is determined by social trust and security and perceived urban quality. The effect size is determined by f-square (Cohen, 1988), the change in R^2 when an exogenous variable is removed from the model (≥ 0.02 is small; ≥ 0.15 is medium; ≥ 0.35 is large). Statistical significance is sometimes a function of sample size alone; with a large sample, sometimes even tiny effects can be statistically significant. The f-square are 0.338, 2.275 and 0.104 in the relations between PUQ and LS, PUQ and STS, and STS and LS, respectively.

Table 4 Structural model results. Source: Own elaboration

Hypothesis	Path	Coef	t-stat	p-values	Std. dev	C.I. _{2.5%}	C.I. _{97.5%}
H1	PUQ $\rightarrow$ LS	0.565	4.950	0.000	0.114	0.357	0.807
H2	PUQ $\rightarrow$ STS	0.833	27.338	0.000	0.030	0.772	0.891
H3	STS $\rightarrow$ LS	0.313	2.519	0.012	0.124	0.053	0.537
Total indirect effects							
H4	PUQ $\rightarrow$ STS $\rightarrow$ LS	0.261	2.478	0.013	0.105	0.045	0.456

Henseler et al. (2014) introduce the standardized root mean square residual (SRMR) as a goodness of fit measure for PLS-SEM to avoid model misspecification. The SRMR assess the average of the discrepancies between observed and expected correlations because it is defined as the difference between the observed correlation and the model-implied correlation matrix. Following Henseler et al. (2016), the model fit is approximated by SRMR. A value less than 0.10 (Williams et al., 2009) or 0.08 (Hu & Bentler, 1999) reflects a good model. In this line, the model proposed in this study presents a good fit with an SRMR value of 0.093.

Appendix 3 shows the estimation results of an alternative model to contrast the robustness of the primary model proposed in this study. The alternative model removes the indicator PUQ12 to LS1 to check if the change can affect the dependent variable. This indicator was selected because it reflects the most general satisfaction in PUQ and presents a relevant factor loading in LS. Finally, it is concluded that the primary model is robust because the significance of the structural and measurement relationships is maintained. These alternative ways of theorizing the models enable comparisons by assessing them against model selection criteria. The Bayesian information criterion (BIC) was proposed by Sharma et al. (2019) to select the most appropriate model. Comparing the BIC values of both models, the most suitable model is the primary model of the study because of its lowest BIC value (-87.4 vs. -104.0).

5 Discussion and Conclusions

Nowadays, more than half of the global population lives in urban environments. Cities are complex units to analyze, and their various components make them fascinating. In cities, actors who give life to the most finished creation of modern man coincide; there are actors and bearers of interests, networks, relationships, scales, territory and dynamics. Therefore, studying it requires a systemic approach. The study of the city is not a discipline only related to architecture and urban planning but can be approached by different disciplines

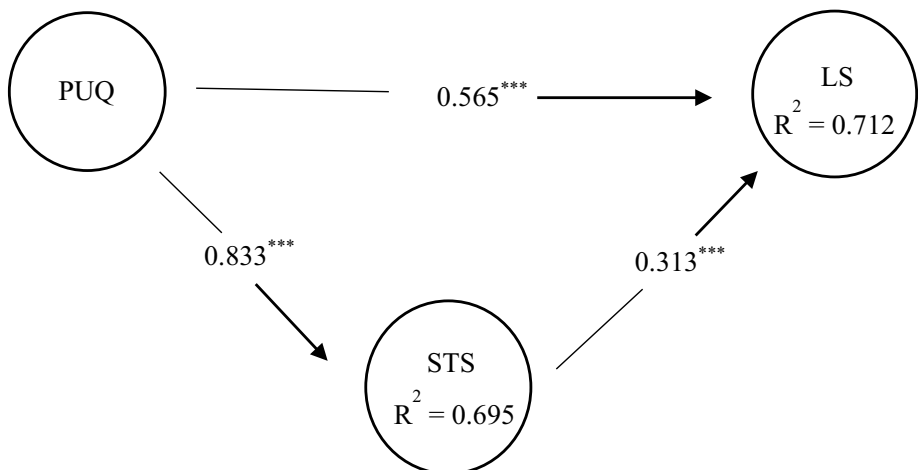


Fig. 2 Structural model. Source: Own elaboration

that could seem contradictory. Cities have components that can be analyzed, including law, economics, sociology, political science, anthropology, geography, and other disciplines (Glaeser, 2011).

When we talk about a city, we refer to the space where our daily lives take place, covering physical, social, or virtual aspects. This environment encompasses various aspects of our existence, such as the workplace, family life, leisure time, free time, enjoyment, and social participation. These environmental conditions influence our health and quality of life (Moyano & Priego, 2009; Abed Al Ahad, 2024).

For these reasons, recent literature takes great interest in this research topic. Numerous investigations about quality of life analyze the environment's physical or objective factors. However, new literature has focused on the subjective factors of people who live in a city, that is, how they perceive that city. This is because, currently, when analyzing the efficiency of cities, it has been observed that the number of services or infrastructure they have is less critical for citizens, but rather how the people who live in that city perceive it (Ballas, 2013; Fleming et al., 2016; Kothencz et al., 2017; Larson et al., 2016; Lenzi & Perucca, 2016, 2018; Mouratidis, 2021; Mouratidis & Yiannakou, 2022; Parra et al., 2010; Patiño et al., 2023; Sørensen, 2014, 2021; Zhou et al., 2021).

In this line, the present study focuses on analyzing how subjective factors such as the perception of urban quality and social trust and security affect the life satisfaction of European citizens. This is an innovative contribution because this population still needs to analyze these relationships today after such an exceptional situation as the COVID-19 pandemic. A sample of 80 European cities has been analyzed through the Partial Least Squares-Structural Equation Modelling (PLS-SEM), which can be applied to small sample sizes to estimate causal relations between abstract constructs, such as perceived quality.

The results of this paper are genuinely relevant since they demonstrate the importance of subjective variables in explaining the life satisfaction of people living in European cities. The research indicates that the variables analyzed explain more than 70% of the life satisfaction of European citizens.

Firstly, it has been proven that the perception of urban quality is a relevant variable and positively influences the life satisfaction of European citizens. This had been observed in previous research, for example, Larson et al. (2016) for the United States, but focusing on green spaces in the most populated cities; Patiño et al. (2023) for the specific case of two cities in Colombia; Lenzi and Perucca (2016) for the case of Romania; Lenzi and Perucca (2018) for the case of European cities in the period 2004–2011; Mouratidis and Yiannakou (2022) for two European cities or Zhou et al. (2021), which focuses on Chinese cities. Therefore, the results of the present work confirm what is indicated in the literature, but in the case of the European territory at present.

Likewise, social trust and security have been analyzed regarding their relationship with life satisfaction and as a mediating variable between the perception of urban quality and life satisfaction in Europe. Following Glaeser (2011), continuous contact with other people in cities produces greater social cohesion, which translates into trust, generosity, and cooperation, above and beyond relationships based on technological platforms, making citizens happier.

Furthermore, these arguments are related to what Zhang and Zhang (2017) stated, which indicates that a well-designed residential environment generates a high sense of community, identification with the neighbourhood, attachment, and trust in neighbours and

community organizations. This feeling of urban satisfaction triggers greater life satisfaction among citizens.

Mouratidis (2019), in his study of the city of Oslo (Norway), also supports these findings, stating that perceived neighbourhood safety and perceived lack of noise are positively associated with subjective well-being.

Bittmann (2022) also indicates the importance of trust in the life satisfaction of individuals, in this case, in German institutions during the first wave of the COVID-19 pandemic. Specifically, his research states that the lower the trust in institutions, the more significant the drop in satisfaction among German citizens. This is explained by the fact that people who believe in relevant institutions such as the government, the courts, or the press cannot adequately address the crisis; they could lose hope and trust more quickly, affecting their satisfaction.

Socially engaged residents can better combat threats such as crime and recover from disasters. Overcoming hazards and crises can strengthen residents' social bonds and sense of agency and thus increase their happiness (Pfeffer & Cloutier, 2016).

This point shows that, as mentioned above, European cities are not considered macro-cities, except Paris and London. The social trust and security variable may be more relevant in less extended territories, where the population tends to relate to its neighbours to a greater extent and where social cohesion is crucial for its citizens (Sørensen, 2016). However, this variable may need to be determined more extensively, as in studies of Chinese cities (Zhou et al., 2021). Therefore, social trust and security may be more decisive for the population residing in less extended cities, such as in Europe.

The results of the present study coincide with the arguments of García Lirios et al. (2015). These authors analyze people's quality of life, highlighting essential aspects such as life satisfaction, expected capabilities, relationships of trust, perception of justice, expectations of opportunity, assessment of the environment, contextual norms, and perceived resources. This paper demonstrates that, as Glaeser (2011) stated, European cities are determinant in the happiness of their population.

Therefore, advancing our knowledge is recognized by the European Union. The three pillars European ministers agreed to focus on in the Amsterdam Pact (2016) and the European Urban Agenda for formulating and implementing urban policies in the EU are better legislation, financing, and knowledge. The latter materializes in creating a knowledge base on urban policy, promoting the exchange of good practices and reuse of public sector information, and using massive, related, and open data.

Additionally, cities go through transition periods: they tend to have high growth and then decline. Hence, one of the significant challenges of cities is reinvention. It is possible due to their excellent availability of human capital and their adaptation to new times. It is necessary to know more about the factors that influence the success of cities to ensure that Europe has more prosperous, intelligent, greener, and happier citizens (Glaeser, 2011).

The results of this article, in addition to the advance in the knowledge generated, also allow the local politicians in European cities to draw lessons to improve their public policies and ensure that their citizens are more satisfied with their lives and, therefore, their city is more attractive for the best human resources. To improve the quality of life and satisfaction of citizens through the improvement of social trust and security in cities, the European Commission and European governments can implement a series of public policies focused on two axes.

The first axis would be related to the material factors and infrastructure that provide adequate public services to citizens. Urban public services play a crucial role in urban policies since, as has been described, they are essential to guarantee an adequate quality of life for all city inhabitants. These services, which include the supply of drinking water, waste management, public transportation, health, education, and security, among others, ensure cities' efficient and sustainable functioning. The adequate provision of public services contributes to social cohesion, reduces inequalities and promotes inclusion, facilitating equitable access to resources and opportunities. Furthermore, these services are essential for economic development, supporting business activities and attracting investment. In the context of urban policies, planning and continuous improvement of public services are determinant to promote sustainable and inclusive urban development. In this sense, an adequate provision in quantity and effectiveness of these services is at the basis of the perception that citizens develop of the quality of life they enjoy.

This section will prioritize aspects related to the urban environment, especially mobility, urban development, and the improvement of public space. These efforts aim to create cities with a human dimension and integrated and cohesive communities.

The urban environment is a main component of the quality of life of city dwellers. A well-managed urban environment with adequate urban planning and sufficient green spaces provides pollution-free zones vital for people's physical and mental well-being. Furthermore, adequate green infrastructure can help mitigate the effects of climate change, such as rising temperatures and urban flooding, making cities more resilient and sustainable.

In this sense, sustainable mobility is one of the most critical challenges for the urban environment. Promoting the use of sustainable transport, such as public transport and non-motorized means of transport, is essential to achieving the decarbonization objectives set in the Green Deal (2016), reducing pollution, and improving air quality. Furthermore, encouraging renewable energy and energy efficiency in homes and public buildings contributes to sustainability and environmental protection, ensuring a healthier and more balanced future for future generations.

On the other hand, urban development and the improvement of public space deserve special attention based on the conclusions of the analysis. This aspect of the urban environment not only improves the territory's physical and purely environmental conditions but also promotes interrelation between citizens. Sustainable urban design is a powerful tool to improve citizens' quality of life and safety. Implementing design principles that promote safety, such as good lighting, walkable streets and accessible green spaces, can transform cities into more liveable and safer places. Furthermore, investing in the renewal of run-down neighbourhoods not only improves the quality of life of its residents but also contributes to reducing crime and creating more cohesive and resilient communities.

The second axis of policies that can be extracted from the analysis would be those related to generating social trust and security through citizen participation and local governance. The participation of the social agents that act in the territory is increasingly necessary to be able to carry out more efficient policies, with the consequent improvements in the quality of life and the satisfaction with the lives of European citizens when carrying out the measures that citizens they want to prioritize on the political agenda. Citizen participation is required to build effective and democratic local governance. A successful

practice that serves as an example is the participatory budgeting that is being carried out in many European cities. It allows citizens to decide on community investments, ensuring that resources are allocated to the areas of greatest need and priority for the community. On the other hand, progress in institutionalizing participation, for example, with the creation of neighbourhood councils, provides a platform for residents to actively participate in local decision-making actively, fostering a sense of belonging and shared responsibility and, consequently, social trust and security.

In conclusion, improving the quality of life and satisfaction of citizens requires a multifaceted approach to providing infrastructure and services, as well as relationships and social cohesion. These interconnected measures can contribute to building a more just, equitable, and prosperous society since implementing these policies in an integrated way and with community participation can significantly improve the quality of life, social trust, and security in European cities. Collaboration between different levels of government, community organizations, and citizens is crucial for the success of these initiatives.

This study, like most research, has limitations. For example, a cross-sectional analysis was conducted, so the results are consistent with what happened this year. The COVID-19 pandemic could have influenced citizens' perceptions of their urban environment and their satisfaction with life in ways not considered in the study. Furthermore, the use of Eurostat data limits the study to the use of the information that this source collects.

For researchers, there are multiple lines for future work on how European cities influence citizens' life satisfaction. For example, it would be interesting to analyze the relationship of the variables in different periods to check how European cities are evolving concerning their citizens' life satisfaction, or it would be interesting to analyze the relationship between life satisfaction and other variables, such as environment, regulations, culture, perceived resources, and individual variables of citizens.

Finally, this study contributes to the scarce literature on how the subjective variables of European citizens affect their life satisfaction through an empirical analysis with which it is possible to generalize the results. This research is expected to promote knowledge about the importance of cities in the life satisfaction of European citizens. It is expected that this research will promote knowledge about the importance of cities in the life satisfaction of European citizens both in the scientific field, stimulating research in other territories and analyzing their relationship with other variables, and in the political field, where their leaders can carry out more efficient public policies that increase citizens' life satisfaction and make European cities more successful.

Appendix

Appendix 1. European cities in the sample

	n	City	Country		n	City	Country
1	1000	Murcia	Spain	41	500	Piatra Neamt	Romania
2	500	Madrid	Spain	42	501	Diyarbakir	Turkey
3	502	Reykjavik	Iceland	43	500	Turin	Italy

n	City	Country	n	City	Country		
4	500	Lisbon	Portugal	44	501	Irakleio	Greece
5	500	Barcelona	Spain	45	500	London	United Kingdom
6	501	Malaga	Spain	46	501	Bordeaux	France
7	509	Ljubljana	Slovenia	47	500	Oulu	Finland
8	500	Vienna	Austria	48	500	Nicosia	Cyprus
9	500	Oviedo	Spain	49	501	Brussels	Belgium
10	502	Palermo	Italy	50	504	Copenhagen	Denmark
11	500	Lille	France	51	501	Zagreb	Croatia
12	498	Miskolc	Hungary	52	503	Amsterdam	Netherlands
13	501	Luxembourg	Luxembourg	53	501	Naples	Italy
14	502	Budapest	Hungary	54	501	Aalborg	Denmark
15	505	Liège	Belgium	55	502	Verona	Italy
16	501	Berlin	Germany	56	505	Antwerp	Belgium
17	500	Oslo	Norway	57	500	Warsaw	Poland
18	500	Zurich	Switzerland	58	501	Kosice	Slovakia
19	501	Istanbul	Turkey	59	500	Belfast	Ireland
20	500	Ankara	Turkey	60	501	Paris	France
21	501	Hamburg	Germany	61	502	Manchester	United Kingdom
22	500	Rome	Italy	62	499	Burgas	Bulgaria
23	500	Marseilles	France	63	501	Riga	Latvia
24	500	Essen	Germany	64	501	Glasgow	United Kingdom
25	500	Bratislava	Slovakia	65	502	Geneva	Switzerland
26	501	Graz	Austria	66	503	Prague	Czech Republic
27	501	Antalya	Turkey	67	501	Rotterdam	Netherlands
28	502	Strasbourg	France	68	501	Cluj Napoca	Romania
29	502	Newcastle	United Kingdom	69	500	Groningen	Netherlands
30	503	Dortmund	Germany	70	500	Helsinki	Finland
31	504	Leipzig	Germany	71	500	Dublin	Ireland
32	500	Munich	Germany	72	500	Tallinn	Estonia
33	510	Valletta	Malta	73	502	Cardiff	United Kingdom
34	503	Braga	Portugal	74	503	Bialystok	Poland
35	501	Bucharest	Romania	75	503	Stockholm	Sweden
36	502	Rennes	France	76	500	Ostrava	Czech Republic
37	502	Sofia	Bulgaria	77	500	Gdansk	Poland
38	500	Athens	Greece	78	500	Malmö	Sweden
39	501	Rostock	Germany	79	500	Vilnius	Lithuania
40	501	Bologna	Italy	80	500	Krakow	Poland

Source: Own elaboration

Appendix 2. Correlation matrix

	PUQ1	PUQ2	PUQ3	PUQ4	PUQ5	PUQ6	PUQ7	PUQ8	PUQ9	PUQ10	PUQ11
PUQ1	1.000										
PUQ2	0.767	1.000									
PUQ3	0.644	0.512	1.000								
PUQ4	0.742	0.717	0.689	1.000							
PUQ5	0.759	0.695	0.655	0.874	1.000						
PUQ6	0.531	0.379	0.507	0.539	0.566	1.000					
PUQ7	0.649	0.590	0.400	0.496	0.543	0.546	1.000				
PUQ8	0.723	0.641	0.595	0.718	0.743	0.559	0.782	1.000			
PUQ9	0.603	0.480	0.652	0.756	0.755	0.448	0.489	0.647	1.000		
PUQ10	0.533	0.659	0.330	0.544	0.491	0.397	0.367	0.466	0.357	1.000	
PUQ11	0.700	0.736	0.462	0.752	0.706	0.551	0.628	0.663	0.586	0.815	1.000
PUQ12	0.621	0.684	0.499	0.689	0.738	0.396	0.503	0.599	0.509	0.569	0.656
STS1	0.475	0.485	0.454	0.507	0.557	0.154	0.293	0.409	0.472	0.472	0.430
STS2	0.634	0.765	0.402	0.586	0.630	0.299	0.447	0.503	0.426	0.660	0.655
STS3	0.748	0.714	0.496	0.661	0.677	0.465	0.522	0.596	0.581	0.702	0.709
STS4	0.498	0.594	0.285	0.470	0.522	0.465	0.447	0.493	0.319	0.623	0.669
STS5	0.626	0.551	0.380	0.518	0.578	0.651	0.517	0.571	0.431	0.662	0.691
STS6	0.717	0.677	0.582	0.618	0.618	0.643	0.586	0.644	0.467	0.554	0.660
LS1	0.530	0.463	0.405	0.564	0.532	0.482	0.454	0.477	0.556	0.277	0.435
LS2	0.639	0.565	0.477	0.694	0.589	0.663	0.429	0.540	0.576	0.524	0.654
LS3	0.659	0.599	0.521	0.744	0.681	0.626	0.560	0.650	0.674	0.501	0.700
LS4	0.686	0.639	0.524	0.761	0.768	0.505	0.576	0.666	0.622	0.508	0.672
PUQ12	STS1	STS2	STS3	STS4	STS5	STS6	LS1	LS2	LS3	LS4	
1.000											
0.726	1.000										
0.842	0.742	1.000									
0.770	0.746	0.882	1.000								
0.690	0.558	0.791	0.722	1.000							
0.626	0.497	0.675	0.788	0.840	1.000						
0.562	0.410	0.543	0.610	0.576	0.673	1.000					
0.453	0.303	0.378	0.524	0.347	0.453	0.517	1.000				
0.592	0.403	0.584	0.720	0.610	0.734	0.630	0.653	1.000			
0.715	0.497	0.659	0.782	0.667	0.736	0.561	0.732	0.894	1.000		
0.857	0.598	0.712	0.789	0.598	0.684	0.560	0.598	0.729	0.849	1.000	

Source: Own elaboration

Appendix 3. Robustness checks

The Appendix 3 shows the estimation results of an alternative model to contrast the robustness of the proposed model. Table 5 details the results of the alternative measurement model. The AVE value for each construct is over 0.645. Regarding discriminant validity, the HTMT matrix comprises values lower than 0.9: 0.887 and 0.856 between perceived urban quality and life satisfaction and social trust and security, respectively, and 0.884 between life satisfaction and social trust and security. Regarding the structural model, the significant coefficients in Table 6 fails to reject the hypothesis. The R^2 values of 0.654 and 0.766 determine moderate and substantial goodness of fit for the latent social trust and security and life satisfaction, respectively.

Table 5 Alternative measurement model estimation. Source: Own elaboration

Latent variable	Item/variable	Factor loading	CR ρ_A	CR ρ_C	AVE
PUQ $\alpha=0.943$	PUQ1	0.874	0.949	0.952	0.645
	PUQ2	0.826			
	PUQ3	0.722			
	PUQ4	0.895			
	PUQ5	0.890			
	PUQ6	0.673			
	PUQ7	0.731			
	PUQ8	0.853			
	PUQ9	0.766			
	PUQ10	0.685			
	PUQ11	0.871			
LS $\alpha=0.923$	LS1	0.843	0.936	0.943	0.769
	LS2	0.757			
	LS3	0.882			
	LS4	0.957			
	LS5	0.932			
STS $\alpha=0.924$	STS1	0.760	0.932	0.941	0.730
	STS2	0.906			
	STS3	0.933			
	STS4	0.876			
	STS5	0.881			
	STS6	0.751			

Table 6 Structural model results. Source: Own elaboration

Hypothesis	Path	Coef	t-stat	p-values	Std. dev	C.I. _{2.5%}	C.I. _{97.5%}
H1	PUQ $\rightarrow$ LS	0.464	4.376	0.000	0.106	0.262	0.677
H2	PUQ $\rightarrow$ STS	0.809	22.484	0.000	0.036	0.735	0.875
H3	STS $\rightarrow$ LS	0.456	4.333	0.000	0.105	0.238	0.652
Total indirect effects							
H4	PUQ $\rightarrow$ STS $\rightarrow$ LS	0.369	4.247	0.000	0.087	0.194	0.534

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Declarations

Conflict of interest The authors declare that they have no conflict of interest.

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