ARTICLE

How socio-spatial aspects of urban space influence social sustainability: a case study

Seyda Akcali[1] · **Arzu Ispalar Cahantimur[2]**

Abstract

Today's society is increasingly concerned with the social impacts of sustainability. Social and economic difficulties necessitated a reconsideration of urban space, with socio-spatial issues at the center of discussions. Urban space is a facilitator for accomplishing social and environmental equity and fostering the sustainability of community. This study aims to discover the relationship between the socio-spatial characteristics of urban space and social sustainability. It highlights socio-spatial dimensions such as social equity (accessibility, social facilities, daily operations), environmental equity (open spaces), and sustainability of community (attachment, sense of community, sense of safety, participation). Applied to two study areas in Izmir, Turkey, the research method consists of detailed spatial analyses, a questionnaire survey, and statistical analyses. The findings show that the study areas had considerably differing social sustainability scores in the indicators of accessibility, daily operations, open spaces, attachment, social relations, sense of safety, and participation whereas they showed similar results in social facilities and sense of neighborliness. Furthermore, there are many promising relationships between social sustainability measures with varying strengths. Most particularly, residents who stated that their neighborhood was more accessible and that daily operations were more pleasant showed higher results in attachment and participation. Residents who evaluated their open spaces higher showed greater social relationships and a higher sense of safety. So, the study shows that the sustainability of community is highly influenced by social and environmental equity, which should be thoroughly considered in planning and developing the urban space. The study summarizes the relationship between socio-spatial aspects, followed by a discussion.

Keywords Socio-spatial aspects · Social sustainability · Urban space · Turkey

✉ Seyda Akcali
seyda.akcali@gmail.com

Arzu Ispalar Cahantimur
arzucahan@uludag.edu.tr

[1] Freelance Researcher, Izmir, Turkey

[2] Department of Architecture, Bursa Uludag University, Bursa 16059, Turkey

1 Introduction

In recent years, social sustainability has received great significance within the framework of sustainable development, and scholars have widely acknowledged it as one of the main pillars of sustainability. However, social sustainability, like many other theories in sustainability discourse, displays a lack of consensus on a theoretical and methodological formulation. The contextual analysis of the chronological progress of the concepts shows that traditional themes such as equity, inclusion, justice, and poverty are replaced with more intangible issues, such as social cohesion, sense of place, social interaction, and community. This movement from 'hard' to 'soft' themes, as described by Colantonio (2010), highlights the importance of the urban environment in achieving 'soft' objectives.

Urban space as a built environment is a multilateral issue with social, economic, and cultural roles for urban citizens. In recent years, social concerns regarding communities and societies pressured a re-thinking of urban settings, ushering in a time of phenomenal change with space-related social problems at the top of the agenda. Considering the fact that social issues are influenced by a wide range of factors, we must reframe socio-spatial aspects by theorizing how the built environment facilitates the community to function in prosperity. Urban space, with its socio-spatial contributions to society, has immense potential for attaining social objectives by supporting the development of sustainable cities and communities. We may evaluate social sustainability through analyses of urban space as both an input and output. So, the major challenge is to determine what aspects of the built environment prosper or hinder social sustainability in the urban context.

The socio-spatial perspective recognizes the importance of careful planning and design in urban space by focusing primarily on the social functions and consequences of urban spaces. In most cases, these social concerns are strongly related to the socio-physical aspects of the space (Neal, 2010). Urban space serves as a basis for providing social and environmental equity while promoting interaction and cohesion among its residents, resulting in the sustainability of community. Of this growing knowledge, there are various debates on the planning and design issues in social sustainability, including housing, vulnerable and/or disadvantaged groups, community, social capital, participation, governance, history, and policy (Davidson et al., 2012; Landorf, 2011; Sachs, 1999; Weingaertner & Moberg, 2014; Woodcraft, 2012). As a result of a detailed literature review, we noticed that many scholars extensively present the relationship between urban space and social sustainability in terms of specific qualities such as density, location, and some other urban form concerns, with contradictory findings (Abed, 2017; Ali et al., 2019; Alipour & Galal Ahmed, 2021; Bramley et al., 2006; Bramley & Power, 2009; Dempsey et al., 2012; Hemani et al., 2017; Jabareen, 2006; Kyttä et al., 2016; Shirazi et al., 2022; Soltani et al., 2022). Searching for an ideal urban form and the comparison of different physical aspects of urban space for better outcomes is inconclusive yet. So we should particularly determine the socio-spatial aspects of urban space contributing to social sustainability despite their densities, housing types or locations may differ. Although many studies approach urban space by searching for an efficient cause (antecedent -consequent relations between variables) in social sustainability, we should focus on the principles and identify patterns and form of relations, not as independent variables aimed toward an ideal state, but as addressing urban social sustainability as a holistic unit rather than a combination of individual entities.

This study aims to investigate how socio-spatial aspects of urban space affect social sustainability. Since all cities and communities have distinct levels of development, socio-cultural and socio-economic features, we should determine the socio-spatial features to meet basic, psychological, social, and self-fulfillment needs (Abed, 2017; Maslow, 1954; McLeod, 2007; Mehan, 2017) for individuals and communities to thrive and prosper. Thus, the purpose of this study is to present a comprehensive overview of socio-spatial indicators to understand the dynamics of social sustainability in the urban context. So, we addressed the following research questions: (1) What are socio-spatial elements of social sustainability, especially considering residential areas? (2) What roles do the urban-related aspects play in ensuring social sustainability? Is there a relationship between socio-spatial aspects and the sustainability of communities? (3) What is the relationship between the socio-spatial features of social sustainability? By addressing these questions, this research determines the impact of socio-spatial characteristics of urban space on social sustainability, through a case study in Izmir, Turkey, as a representative of other cities, especially in developing countries.

The rest of the paper's structure is as follows: The second section outlines the conceptual framework of the research and reviews the social sustainability issues. The third section describes the research method used in the case study in Izmir. It introduces two study areas by providing spatial analyses of each. Combining spatial analysis and questionnaire survey data, the fourth section presents the results on the social sustainability of two communities, followed by a discussion. Finally, the conclusion describes the findings and the relationship between urban-attributed difficulties and social sustainability. We present some recommendations for establishing more socially sustainable urban environments.

2 Conceptual framework: social sustainability and its socio-spatial aspects

Social sustainability is a multidimensional concept addressed as an approach, a paradigm, and a tool in several disciplines. It occurs at the intersection of academics, politics, and practice. Social sustainability has no unified definition. Identifying its theoretical and methodological framework is characterized by discipline-based studies that definitions, indicators, and measurement criteria are context-dependent (Dempsey et al., 2011; Weingaertner & Moberg, 2014; Woodcraft, 2012). Social sustainability, according to Sachs (1999), must be based on the fundamental ideas of equity, democracy, and social justice, which include social homogeneity, equitable income distribution, employment, and equitable access to resources and social services. Yiftachel and Hedgcock (1993) define a city's long-term viability as a setting for human interaction, communication, and cultural growth. Polese and Stren (2000) describe it as development and/or growth that is compatible with civil society's harmonious evolution, fostering an environment conducive to the compatible cohabitation of culturally and socially diverse groups while encouraging social integration and improving the quality of life for all segments of the population.

Rather than pursuing an agreed definition, some researchers identify significant themes, aspects, or criteria relating to the social dimension of sustainability (Weingaertner & Moberg, 2014). Social sustainability, according to Bramley et al. (2009), comprises two key dimensions: Social equity and sustainability of communities. Affordable housing and access to services and opportunities are elements of social equity. The sustainability of com-

munities is related to social interaction, social cohesion, social capital, attachment, sense of safety, satisfaction, and participation. Dempsey et al. (2011) also agree with the two-dimensional approach, however slightly differ in terms of the sustainability of community as social interaction/social networks in the community; participation in collective groups and networks in the community; community stability; pride/sense of place; safety and security. Dempsey et al. (2012) introduced a new tennent to this framework: Environmental equity, which involves the opportunity to access open spaces and green areas. Although the terms in different studies appear to be consistent, their content and meaning may not be identical (Weingaertner & Moberg, 2014). For instance, Landorf (2011) agrees that social equity is one of the three pillars of social sustainability. However, he describes social equity as the quantity and diversity of housing infrastructure and access to services, amenities, and opportunities.

Recently, there has been an increasing trend to evaluate social sustainability from the perspective of urban planning and design and to recognize relevant elements that support the idea of social sustainability (Ghahramanpouri et al., 2015). Some scholars focus on different urban units and scales, such as urban neighborhoods (Larimian et al., 2020; Shirazi et al., 2022) or compact neighborhoods (M. R. Shirazi & Keivani, 2021), open spaces (Moulay et al., 2017), urban streets (Lotfata & Ataöv, 2020), housing developments (Abed, 2017), mass housing project (Karji et al., 2019), building assessment (Stender & Walter, 2019), or common space (Abed & Al-Jokhadar, 2022). An alternative approach to discussing social sustainability with urban space is particularly related to urban form characteristics (Ali et al., 2019; Alipour & Galal Ahmed, 2021; Hemani et al., 2017; Kyttä et al., 2016; Shirazi et al., 2022; Soltani et al., 2022), especially with a great emphasis on density and mixed land use. Urban form is a polysemic term that broadly describes several characteristics of space's organization in urban areas. However, there are multifarious terminological inconsistencies with its use and agents, and the lack of a systematic and comprehensive framework to classify urban form characters (Fleischmann et al., 2021). An empirical research that evaluates all aspects of urban form is an incredibly challenging task. So, the controversial findings of these studies that typically focus on density and mixed-use, cause interpretations such as '*urban form beyond density does matter*' (Arundel & Ronald, 2017:47) and "*viable threshold*" (Jabareen, 2006) and reflect that some other aspects of urban form are missing in social sustainability (Larimian et al., 2020). It appears that the relationship between urban form characteristics and social sustainability is non-linear and remarkably moderated by context, or other factors that strongly shape its kind of influence (Kyttä et al., 2016). An ideal or desired urban form is not applicable since each has its advantages and drawbacks. So, the "context" in urban form is the primary factor, and it encompasses a wide variety of issues in a specific urban area (Mouratidis, 2018). As a consequence, rather than comparing urban form qualities, we argue that stressing the socio-spatial aspects of urban space that contribute to social sustainability might provide better practical benefits for cities and communities.

By acknowledging that urban form affects urban design and planning, it is not the key determinant for comparing social sustainability issues, especially while the majority of studies focus on density. Unquestionably, density may define a city's intrinsic potential for shared services and amenities, public transportation, and open spaces (Jabareen, 2006). However, as this study aims to discover, the socio-spatial characteristics of urban areas may be relevant to the social concerns regarding density's impact rather than the design of

the urban form. Researchers showed that density is a relative concept what is regarded as high density in one setting may be considered as medium density in another (Cheng, 2009; Jenks & Dempsey, 2005; Shirazi & Falahat, 2012). Furthermore, there are methodological discussions in the literature concerning these criteria, such as density (Alexander, 1993; Dave, 2011) or connectivity (also accessibility in certain instances) (Lättman et al., 2018; Pot et al., 2021), since the quantitative (*objective assessment*) and the perceived (*subjective assessment*) evaluation may be two sides of the coin. For example, while most perceived density characteristics showed significant relationships with social sustainability, physical density had no significant relation at all (Dave, 2011). Although we excluded urban form issues, the study addresses some of the related aspects, such as daily operations and accessibility (walkability, transport options, connectivity) since they represent socio-spatial characteristics and provide more practical benefits to the lives of individuals and communities. We prefer a more place-centric approach rather than applying urban form terminologies.

After a thorough analysis of various approaches, we developed a conceptual model for social sustainability that emphasizes socio-spatial features of urban space (Abed, 2017; Ali et al., 2019; Alipour & Galal Ahmed, 2021; Ancell & Thompson-Fawcett, 2008; Bacon et al., 2012; Bramley et al., 2009; Chan & Lee, 2008; Chiu, 2003; Dempsey et al., 2011, 2012; Hemani et al., 2017; Karuppannan & Sivam, 2011; Kyttä et al., 2016; Landorf, 2011; Porta & Renne, 2005; Shirazi & Keivani, 2021; Soltani et al., 2022) In this study, we suggest that social equity, environmental equity, and sustainability of community are the dimensions of social sustainability. Although different scholars may use these concepts to complement or substitute another, or even to refer to different content, we refer to these dimensions as umbrella themes by considering them as the key principles. While indicators of social and environmental equity are directly related to urban space socio-spatially, we characterize the indicators of the sustainability of community as a social response in which socio-spatial aspects play a significant role in its functioning. Figure 1 shows the study's conceptual framework in which the socio-spatial aspects of urban space are considered both a contributor and an indicator of evaluating social sustainability. The sub-themes of indicators were determined by reviewing empirical studies about social sustainability while considering urban-attributed issues as a focus of attention (Table 1).

Furthermore, due to its strong relationships with other pillars of sustainability, it is crucial to acknowledge that social sustainability is not limited to these factors. Social sustainability is a complex system with high involvement in many disciplines that also belong to the sustainable development pillar. So, social issues such as health, education, employment, equitable income, social homogeneity, and inclusion are more related to economic, institutional, political, and cultural preconditions which are now assumed as "traditional themes" of social sustainability rather than reflecting primary concerns of the socio-spatial aspects of urban space. Another point, the studies based on the socio-spatial schema in urban contexts use either social or spatial elements separately or define them as integrated elements as socio-spatial. For instance, in some cases, scholars recognize social elements as education level, working conditions, and income (He & Wu, 2007) which may refer to socio-demographic variables. In some cases, social elements include issues relating the neighboring activities, social bonding, and social solidarity (Eranıl Demirli et al., 2015; Gür & Enön, 1990; Ye et al., 2021), relating to social relations or sense of community. Various studies discuss the themes that may be attributed to social, cultural, and political aspects of society, such as migration, traditional values, or housing tenure (Eranıl Demirli et al., 2015; He &
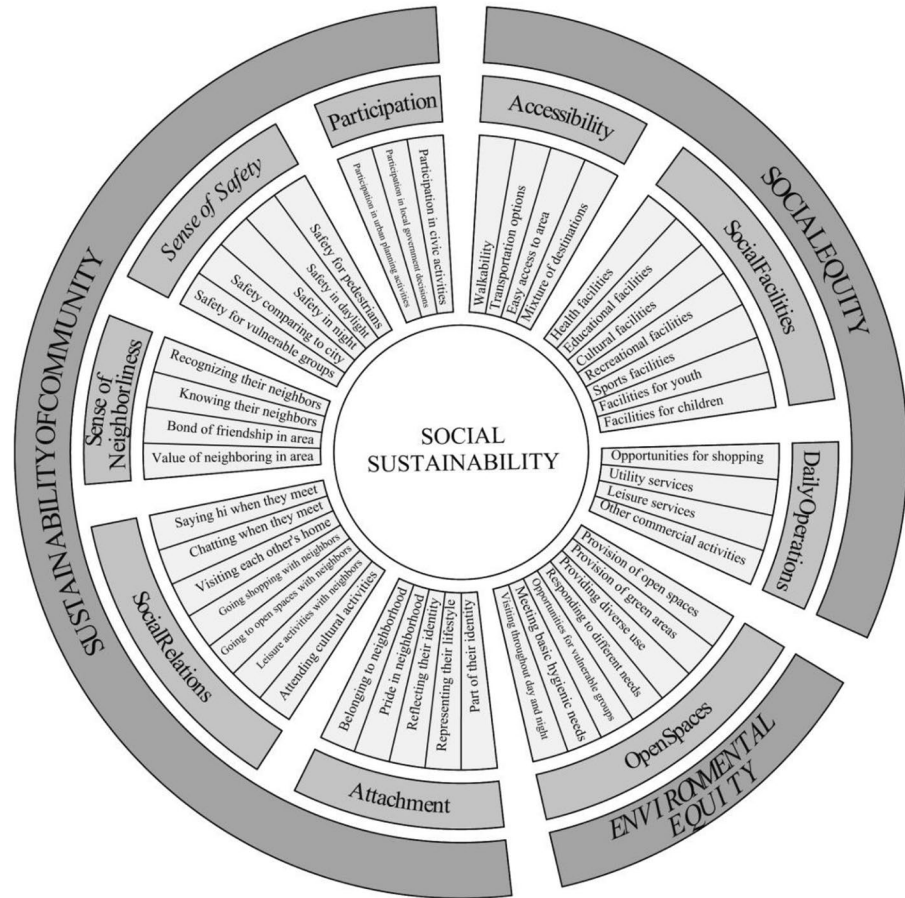
Fig. 1 Socio-spatial indicators of social sustainability in residential areas

Wu, 2007; Ye et al., 2021). In another distinctive approach, the socio-spatial elements are used as a combination and have a wide spectrum of issues relating to urban function, housing, common spaces, open space, street, layout, and so. In this study, although the tenets are defined as socio-spatial elements, some social variables, such as age, education level, income, birthplace, and length of residence have been addressed as socio-demographic variables, considering their impact on social sustainability (Akcali & Cahantimur, 2022).

2.1 Social equity

Social equity is concerned with access to services, facilities, and opportunities as a fundamental part of social sustainability. Social equity is referred to as being able to access resources relevant to engage in community life while also having the opportunity for personal development and enhancement (Colantonio & Dixon, 2011). Social equity assures individuals' full participation in society socially, economically, and politically (Pierson,

Table 1 Socio-spatial issues in residential areas for social sustainability (scholars in chronological order)

Aspect	Indicators	Scholars
Social equity	Accessibility	Porta and Renne, 2005; Ancell and Thompson-Fawcett, 2008; Chan and Lee, 2008; Karuppannan and Sivam, 2011; Bacon et al., 2012; Ali et al., 2019; Alipour and Galal Ahmed, 2021
	Social infrastructure	Porta and Renne, 2005; Ancell and Thompson-Fawcett, 2008; Bramley et al., 2009; Chan and Lee, 2008; Karuppannan and Sivam, 2011; Landorf, 2011; Bacon et al., 2012; Dempsey et al., 2012; Hemani et al., 2017; Shirazi and Keivani, 2021; Abed and Al-Jokhadar, 2022
	Daily operations	Bramley et al., 2006; Chan and Lee, 2008
Environmental equity	Open spaces (and green areas)	Chan and Lee, 2008; Karuppannan and Sivam, 2011; Bacon et al., 2012; Dempsey et al., 2012; Ali et al., 2019
Sustainability of community	Attachment	Bramley et al., 2009; Karuppannan and Sivam, 2011; Dempsey et al., 2012; Hemani et al., 2017; Shirazi and Keivani, 2021; Abed and Al-Jokhadar, 2022; Soltani et al., 2022
	Sense of community	Ancell and Thompson-Fawcett, 2008; Bramley et al., 2009; Karuppannan and Sivam, 2011; Landorf, 2011; Dempsey et al., 2012; Bacon et al., 2013; Hemani et al., 2017; Ali et al., 2019; Shirazi and Keivani, 2021; Abed and Al-Jokhadar, 2022; Soltani et al., 2022
	Sense of safety	Porta and Renne, 2005; Bramley et al., 2009; Karuppannan and Sivam, 2011; Landorf, 2011; Bacon et al., 2012; Dempsey et al., 2012; Hemani et al., 2017; Ali et al., 2019; Alipour and Galal Ahmed, 2021; Shirazi and Keivani, 2021; Abed and Al-Jokhadar, 2022; Soltani et al., 2022
	Participation	Chan and Lee, 2008; Bramley et al., 2009; Landorf, 2011; Bacon et al., 2012; Soltani et al., 2022; Hemani et al., 2017

2002). As a result, accessibility, social facilities, and daily operations are the indicators of social equity in the built environment.

The first indicator, accessibility is the ease with that a person can travel from one location to another using a particular mode of transportation, such as walking, cycling, or public transportation. Everyone should have easy access to certain locations in their daily lives, particularly without being obligated to travel far (Koenig, 1980). Accessibility, as the freedom and ease of geographical movement, is considered a basic human right that must be secured (Chan & Lee, 2008). Secondly, the characteristic of social infrastructure as a public good is crucial for residential areas since it provides basic education, health care, cultural entertainment, and so on (Lan et al., 2020). It helps to improve quality of life, as well as address a variety of needs. It is vital in the development of social networks and relationships, belonging and attachment, which are powerful strategies for improving social well-being (Bramley et al., 2009; Chan & Lee, 2008). Thirdly, the indicator daily operations involves the places where everyday basic needs are provided, including third places. Third places include cafes, bars, restaurants, gyms, shopping malls, barbershops, and other commercial businesses regularly visited between work and home (Low & Smart, 2020). Bramley et al. (2006) classify daily operations in two parts; first as 'utility' services including chemists, corner shops, supermarkets, and banks, and second 'leisure' services including restaurants, cafes, bars, and public facilities for children and young people. While supporting day-to-day operations, the places for daily operations serve as a platform for the building of communities of interest among local inhabitants and the establishment of social ties via shared experiences (Adams et al., 2012; Low & Smart, 2020). Providing spaces for daily activities may be seen as a result of urban planning's mixed land use approach. It offers several advantages,

including the enhancement of integration, vitality, and variety, and improved access to utilities and services (Schwanke, 2003).

2.2 Environmental equity

Environmental and social equity are intensely connected. It refers to the level of availability of services and facilities in a certain place with a special focus on nature. The distinction between "social" and "environmental" is that in one, the service given here is used, while in the other, the space is used as an environmental source with restorative and recreational purposes. Inequities in accessing natural resources and green areas became more commonly acknowledged. As an important element of urban space, open space provides corridors and opportunities for social interactions. It enables the formation of social networks that foster a sense of belonging. (Bridge, 2002; Chan & Lee, 2008). It promotes informal and spontaneous interaction by creating supportive conditions for sustainability of community (Jabareen, 2006). It helps for a better sense of security and reduces local crime rates (Karuppannan & Sivam, 2011).

2.3 Sustainability of community

The sustainability of community is referred to the ability of society to maintain and reproduce itself at an acceptable level of functioning in terms of social structure (Coleman, 1985) and integrate individual social behavior into a larger social environment (Dempsey et al., 2012). Community behaviors include social interaction, social networks, participation in collective groups, levels of trust throughout the community, sense of place, attachment, and safety (Bramley et al., 2009; Dempsey et al., 2012). Even though this study research attempts to discuss some of these concepts individually, it acknowledges that they are intertwined in the development of the sustainable community. We focus on the four fundamental concepts: attachment, sense of community, sense of safety, and participation.

First, for attachment, several concepts may address emotional bonds to physical places, such as belonging, attachment, and a sense of place (Stokols & Shumaker, 1981). Place attachment is linked to enhanced community participation and social involvement (Mesch & Manor, 1998). It supports the creation of social networks, improves social interactions, increases the well-being of the community (Dinnie et al., 2013), and lowers the fear of crime (McMillan & Chavis, 1986).

The community may be defined in a variety of ways. Although the community is not only dependent on a specific space, as a result of the contribution of place in developing a community it could be considered as a place-centric process (Meegan & Mitchell, 2001). It is frequently formed via daily face-to-face contact, which is an important component in sustaining livability, security, participation, and identity (Goffman, 1963). The sense of community promotes social cohesion, interaction, and integration (Stott et al., 2009). Although the sense of community can be portrayed in several ways, in this study, we prefer to evaluate it through social relations and sense of neighborliness regarding the residential areas.

Sense of safety is an essential element for sustainability of community. One of the most complicated challenges in terms of sense of safety is the lack of understanding of what safety means to different people. The safety is not determined solely by objective factors. Individuals perceive risk or threat protection through several lenses which are constructed

by combinations of beliefs, attitudes, perceptions, and experiences (James et al., 2020). The sense of safety is a social structure that emerges as a result of numerous variables and situations, therefore it is an important factor in built environment for individuals affecting their behaviors and perceptions in a variety of ways. Individuals who feel safe interact more (Dempsey et al., 2012). It strengthens attachment, resulting in a greater sense of community (Shaftoe, 2000).

In recent years, participation in interactive governance, especially public involvement in urban planning, is an essential part of sustainable development policies. Participation should be emphasized as a democratic right to participate in public policy and decision-making processes. Residents who are involved in the urban planning of their communities are more likely to have their needs and expectations met (Colantonio, 2007; Rydin & Pennington, 2000). Simultaneously, inhabitants may feel more connected to the community, so enhancing their sense of belonging when they participate (Ng et al., 2001).

3 Methods and data

This research aims to identify the link between the socio-spatial characteristics of the urban space and social sustainability in residential areas. The methodology of the research includes spatial analysis, a questionnaire survey, and statistical analyses. Izmir was selected for the study because it can represent both Turkey and a contemporary metropolis, particularly in developing country. The research locations were selected from settlements in the Karsiyaka district, Izmir, developed during the second half of the 20th century. Both settlements are located in the central city of Izmir, which exhibits the characteristics of a contemporary urban area. The questionnaire was designed using prior discussions as a basis, and includes two sections. The first section comprises questions regarding the demographic features of the participants. The second section contains questions about socio-spatial indicators of social sustainability, as seen in Fig. 1. Participants rated each indicator-related statement on a 5-point Likert-type scale. As a pilot test, fifty volunteers of varied ages, levels of education, and housing backgrounds were given the questionnaire. After revisions, the final questionnaire was administered in person to 500 participants, 250 from each study area. Spatially stratified random sampling was applied to select participants for enabling having representatives from different parts of the neighborhoods as well from diverse building types and floors. There was a total of 234 valid questionnaires examined, yielding a rate of 93.6%. Based on valid samples, the margin of error is 6.36% for the study with 95% confidence and a percentage of 50 (Hamburg, 1985).

3.1 Study areas

Izmir, the third largest city in Turkey, is located in the country's western region and has a population of more than 4 million residents (Fig. 2). As one of the oldest settlements in Anatolia, the natural port, which is unique to its topography, serves as the foundation for Izmir's urban development. Along with the rapid growth of coastal usage as a commercial district, Izmir, which was a small coastal town in the 17th century, has become a major population center in following years (Martal, 1999). During both the pre-industrial and post-industrial periods, its geographic attributes and location had a considerable impact on its
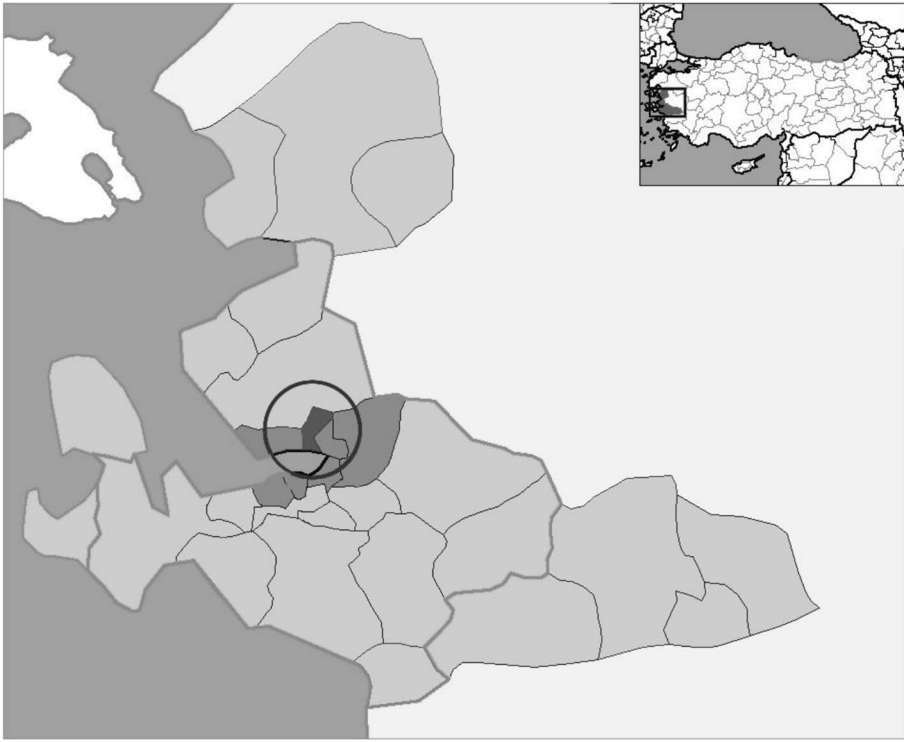
Fig. 2 The location of Izmir and central districts of the city (study areas, Karsiyaka, in the circle)

urban development. Karsiyaka, one of the city's central districts located around the gulf, is in the northern area of the metropolis. Despite the regional and economic prosperity of Izmir, Karsiyaka did not experience significant urban growth until the middle of the 19th century (Gündüz & Kiray, 2006). Karsiyaka was selected as a study area because its urban development reflects the urbanization trends of the twentieth century as a representative of a developing country's city.

As a result of their histories or geographies, developing countries have several characteristics, notably in the transition of their social, cultural, and economic processes influencing their urban space. It is noteworthy that Turkey has a complex social structure due to its strategic intersection of many cultures along the Eastern edge. Even before the establishment of the republic, the diverse social structure of Izmir was formed by the east-west crossing of different ethnicities and religions, influencing its social and cultural life as well as its urban environment. Furthermore, in Turkish culture, the concept of "neighborhood" (mahalle) refers to a distinct sociocultural phenomenon. Turkish neighborhood was an administrative, economic, social, and cultural center of society since the 14th century (Çadırcı, 1996). Since the earliest Turkish cities, the neighborhood has been a settlement with its own dynamic of social and cultural life beyond its psychical description in urban space (Aru, 1998; Karaarslan & Karaarslan, 2013). The neighborhood unit, which defines a certain size with its population, area, and boundaries, is vitally significant in defining social life and perception of urban space as much as physical space in the development (Erkan & Akın, 2011). Within

the contribution of its socio-physical characteristics, it presents a unique social structure that people know each other, defend one another's rights, solve their problems within themselves, are responsible for each other's behavior, and are in social solidarity, refers to a community socio-spatially (Ergenç, 1984; Karaarslan & Karaarslan, 2013). However, the effects of modernization in cities and societies caused the roles and the symbolic meaning of the neighborhood to diminish and dissimulate after the 20th century.

The scale of the study is narrowed to the neighborhood unit due to the administrative and social-physical elements of the neighborhood in Turkish culture. We compared the neighborhoods in the Karsiyaka district based on various factors, including planned urban development, the provision of social infrastructure in varying typologies, open spaces, and the provision of daily operations. Although five neighborhoods were legible for the study, the Atakent Neighborhood was chosen as one of the sampling areas because of the highest green area per capita among the neighborhoods in Karsiyaka. The residential development of Atakent developed after 1990, is distinct with its proximity to the city center and having various social facilities. Other neighborhoods meeting the criteria were compared in terms of perceptible administrative boundaries and street patterns. We chose Bahriye Ucok Neighborhood, because it is connected to the main arteries of the district, and has different public space typologies, as well as having high accessibility opportunities (Fig. 3). The urban development of Bahriye Ucok Neighborhood started in the 1970s and reconstructed as multi-family housing buildings after the widening of Girne Boulevard and the construction of Bahriye Ucok Boulevard after 1980. Both study areas have a diversity of building types and a perception of a neighborhood perimeter that is largely enclosed by proper boundaries. While Bahriye Ucok is distinguished by its characteristics such as mixed land use and better access to daily activities, Atakent is characterized by its abundance of open spaces and green space. In addition, the current market prices of all streets and avenues in the district were compared for determining the socioeconomic structure of the neighborhoods. According to the analysis, whereas Atakent is ranked second among 27 districts, Bahriye Ucok is ranked 11th and is higher than the district average. The socioeconomic difference between the two neighborhoods was not regarded as an impediment to comparison, because the buildings in the Atakent neighborhood are still originated in the period of its first development, and there are not any gated communities. So that, discussions about socioeconomic segregation and the reflections of neoliberal policies on urban space are not effectual for current samples.

We analyzed several spatial characteristics of residential neighborhoods. First, the land use was analyzed to determine the provision of daily operations (Fig. 4). The ratio for residential buildings is 47.6% in Bahriye Ucok and 65.6% in Atakent. 48.8% of buildings in Bahriye Ucok were mixed-used, resulting in 0.54 commercial floor area ratios, while 19.2% of buildings in Atakent were mixed-used, resulting in 0.23 commercial floor area ratios. Next, the social facilities and open spaces were determined in spatial maps for social and environmental equity (Fig. 5). In terms of social facilities, both areas have primary schools, primary health care facilities, and sports facilities. While Bahriye Ucok provides both recreational and cultural facilities, Atakent has only recreational facilities. In terms of open spaces and green areas, although both areas provide several open spaces and green areas in different scales, as well as in different regions of areas, there is a huge difference in comparing their green areas per capita, which Bahriye Ucok is 0.58 sqm/person and Atakent is 15.02 sqm/person.
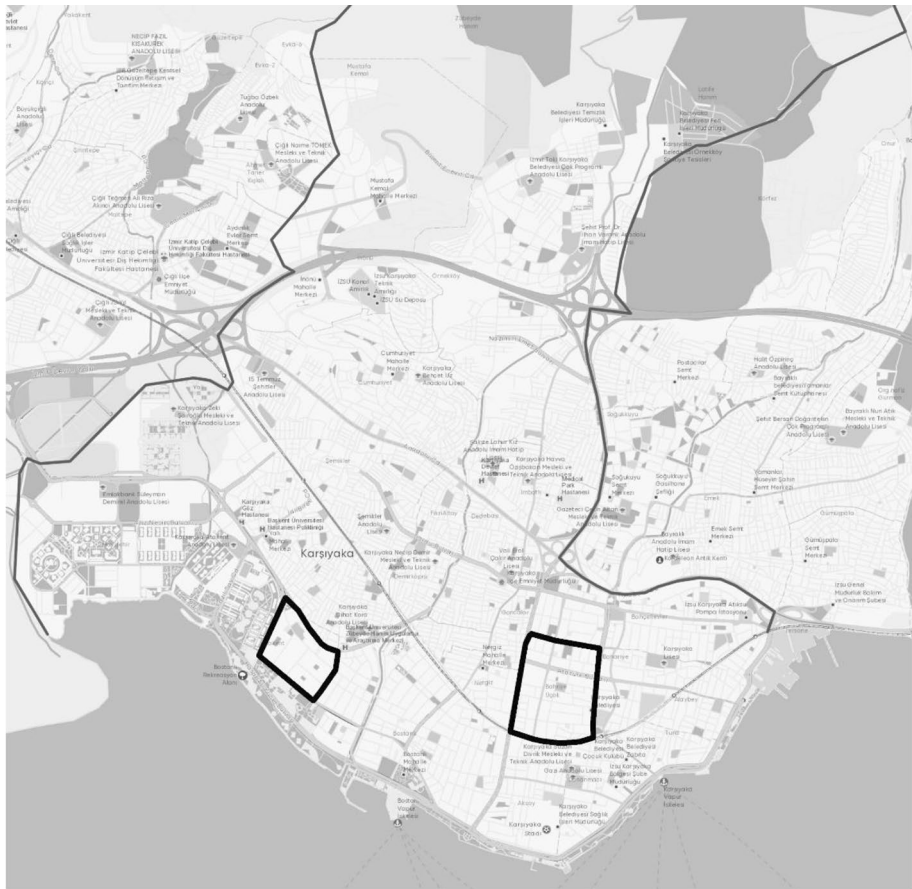
Fig. 3 Karsiyaka district and study areas, Izmir

Accessibility, as an indicator of social equity, was explored through walkability, the mixture of destinations, and transportation options. To construct a walkability index, the elements of the built environment were identified as floor area ratio (FAR), commercial floor area ratio (CFAR), and sidewalk coverage as correlates of the walking activity (Lam et al., 2022). After FAR, CFAR, and sidewalk coverage (sidewalk length/area) was calculated for each block, the measures were standardized by making their values equivalent to between 0 and 1 and then recomputed by averaging three components, referring lower to higher from 0 to 1 (Fig. 6). The average walkability index for Bahriye Ucok is 0.49 by evaluating 49 blocks in the area, while Atakent's average score is 0.19 by considering 23 blocks. The mixture of destinations, distinctively to the walkability index, is considered measuring street connectivity and whether it provides alternative routes within the areas. In this context, the street density (street length/area) and intersection density (number of intersections/street length) of each street in the research areas were calculated. The measures were computed by standardizing their values equivalent to between 0 and 1 and averaging at the end that the score "0" is the lowest, and "1" is the highest, similarly to the walkability index (Fig. 7).

Fig. 4 Land use analysis for determining daily operations

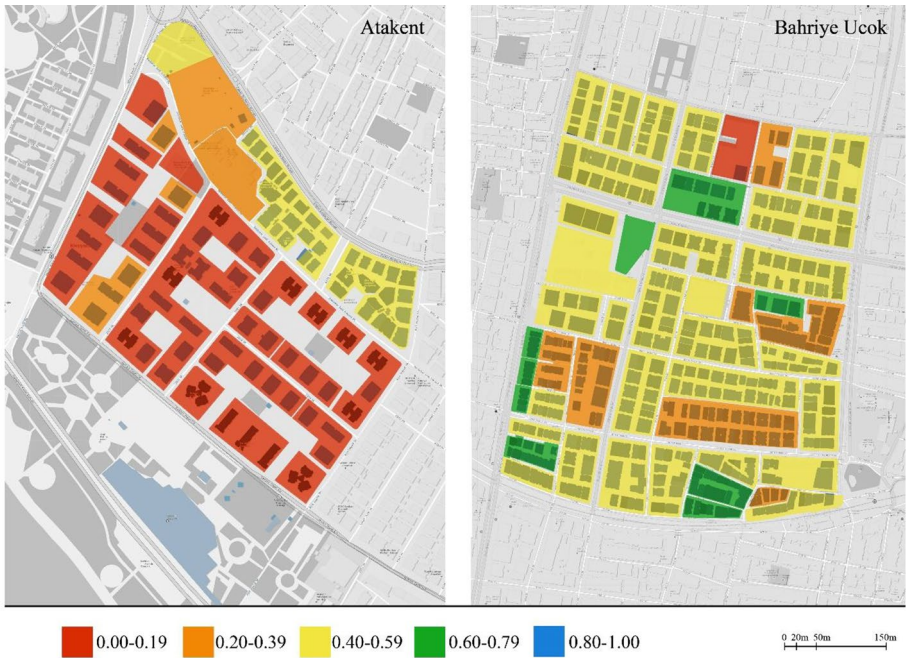**Fig. 5** Social facilities and open spaces within the areas
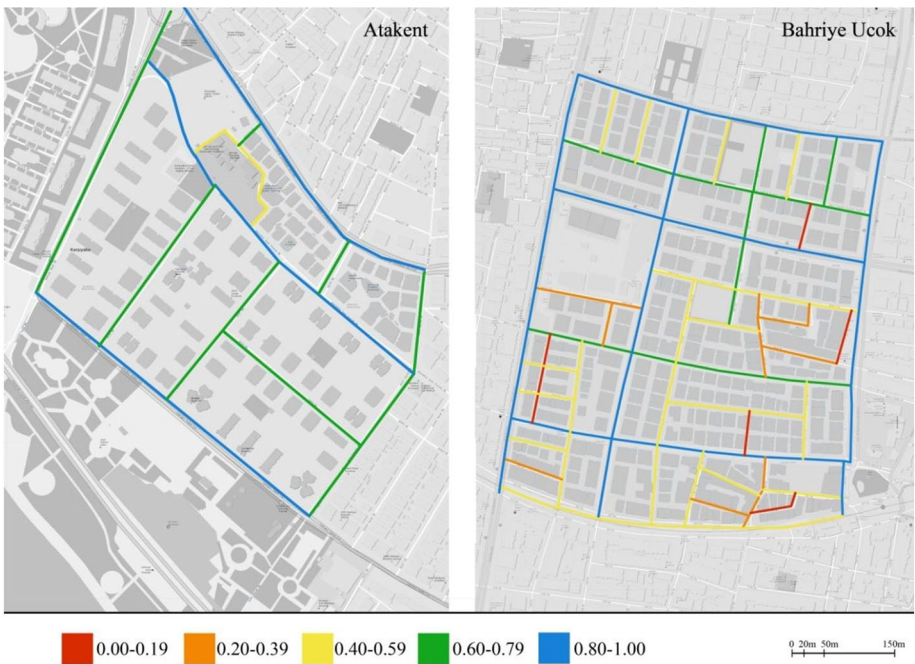
Fig. 6 Walkability index for each study area

Fig. 7 The score of the mixture of destinations for each study area

The average of the mixture of destinations for Bahriye Ucok is 0.48 by evaluating 40 streets in the area, while Atakent's average score is 0.21 by considering 11 streets. For transportation options, the routes of buses passing through the areas were determined, and a transit network was demonstrated in Fig. 8. The railway and sea transportation, which are both adjacent to the regions, were illustrated within the context of the areas' access to the larger region.

3.2 Data analysis

The questionnaire data was analyzed using version 24 of the Statistical Package for the Social Sciences (SPSS). Q-Q plots indicated that the responses to Likert-type scale questions were distributed normally. The results for Skewness and Kurtosis were within the acceptable ranges for normal distributions (George & Mallery, 2016). Various statistical techniques were used to analyze the survey data, such as reliability analysis, Independent T-test, correlation analysis, and Chi-square analysis. The reliability analyses were conducted to assess whether the overall scale and each indicator had internal consistency (Table 2). Cronbach's alpha (α) value was 0.932, which was acceptable for the present sample (Nunnally & Bernstein, 1994).
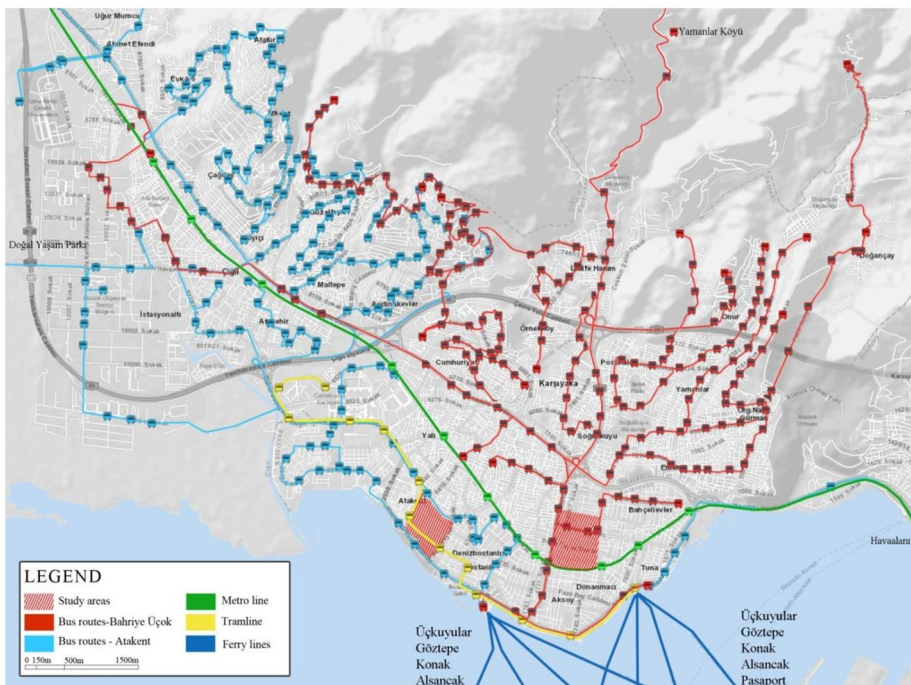
Fig. 8 Transport options in and adjacent to the study areas

Table 2 Reliability test results for each indicator

	Number of cases	Number of items	Mean	Std. Dev.	Cronbach's Alpha
Accessibility	234	9	4.06	0.65	0.687
Social Facilities	185	7	3.58	0.72	0.829
Daily Operations	230	4	4.53	0.48	0.761
Open Spaces	226	7	3.68	0.78	0.868
Attachment	214	5	3.82	0.77	0.824
Sense of Neighborliness	216	4	3.04	0.90	0.841
Social Relations	234	7	3.54	0.90	0.876
Sense of Safety	231	5	3.79	0.75	0.790
Participation	162	3	3.60	0.90	0.855
Overall					0.932

4 Research findings and discussions

First, Chi-square test was conducted to investigate whether the resident profiles of the two research areas differed, based on socio-demographic variables (significance level 0.95; p<0.05). There are significant differences in the variables, such as educational level (p=0.000) and household income (p=0.000). However, there is not any significant difference between the two groups in the distribution of gender (p=0.380), age (p=0.444), marital status (p=0.225), number of children (p=0.554), and birthplace (p=0.086). In addition, the characteristics of homeownership (p=0.214), residence time in the house (p=0.406) and in Izmir (p=0.194) did not show any significant difference. Considering the number of private cars, there was a statistically significant difference between the two areas (p=0.000). Comparing the frequency of driving among participants with at least one private car in the household also showed a significant difference (p=0.013). Participants in Atakent use their private cars frequently, but participants in Bahriye Ucok use their automobiles just when they consider it necessary, as compared to often (Table 3). The comparison of socio-demographic variables shows that study areas have slightly different socio-economic structure since the higher income groups of Atakent are larger than the participants of Bahriye Ucok.

A Pearson correlation test was conducted to see whether there was a significant association between the indicators and, if so, how strong that association was. The r values are recommended as 0.00-0.19 for "very weak", 0.20–0.39 for "weak", 0.40–0.59 for "moderate", 0.60–0.79 for "strong" and 0.80-1.0 for "very strong" relationships (Evans, 1996). Many indicators exhibit statistically significant and positive associations, as shown in Table 4. This research attempts to explore each concept individually despite their intertwined relationships through their dimension. So, we prefer to discuss the relationships between the indicators in distinct dimensions, while there are several positive relationships in varying degrees. There is a weak association between accessibility and open space, attachment, sense of safety, and participation. Social facilities have a strong correlation with open spaces, a moderate correlation with sense of safety, and a weak correlation with attachment and sense of community. The daily operations indicator shows weak correlations with attachment and participation. Open spaces have a significant relationship with social facilities, but a moderate relationship with attachment and sense of safety. Open spaces also correlate weakly

Table 3 Socio-demographic characteristics of study areas			Bahriye Ucok		Atakent	
			n	%	n	%
Gender		Male	68	55.7	56	50.0
		Female	54	44.3	56	50.0
Age		Above 60	27	22.1	27	24.1
		Between 50–59	25	20.5	13	11.6
		Between 40–49	27	22.1	25	22.3
		Between 30–39	26	21.3	30	26.8
		Between 18–29	17	13.9	17	15.2
Marital status		Single	31	25.4	26	23.2
		Married	74	60.7	68	60.7
		Divorced	3	2.5	9	8.0
		Widow	14	11.5	9	8.0
Number of children		None	38	31.1	32	28.6
		1	37	30.3	34	30.4
		2	37	30.3	41	36.6
		3 and above	10	8.2	5	4.5
Educational level		Literate	2	1.6	0	0.0
		Primary school	8	6.6	2	1.8
		Secondary school	8	6.6	2	1.8
		High school	40	32.8	27	24.1
		Bachelor	62	50.8	64	57.1
		Postgraduate	2	1.6	17	15.2
Household income* (monthly**)		200–500 $	67	54.9	19	17.0
		500–1000 $	47	38.5	61	54.5
		1000–2000 $	7	5.7	26	23.2
		2000 $ and above	1	0.8	6	5.4
Homeownership		Owner	70	57.4	64	57.1
		Tenant	42	34.4	36	32.1
		Belong to a family member	9	7.4	6	5.4
Length of residence		5 years and below	38	31.1	46	41.1
		6 to 10 years	38	31.1	32	28.6
		11 to 15 years	19	15.6	16	14.3
		Above 16 years	27	22.1	18	16.1
Car ownership*		None	58	47.5	19	17.0
		1	60	49.2	66	58.9
		2	4	3.3	27	24.1
Frequency of car travel*		Everyday	37	57.8	50	53.8
		A couple of times a week	12	18.8	35	37.6
		Weekends	2	3.1	2	2.2
		Only if necessary	13	20.3	6	6.5

*p<0.05

**At the time of the survey, the average net minimum wage was $336

with accessibility, the sense of neighborliness, social relations, and participation. Figure 9 illustrates strong, medium, and weak correlations between the indicators.

The research areas were compared by using Independent t-tests. Since some of the variables in the conceptual framework could not be measured directly, the submeasures were

Table 4 Results for correlation analysis between the indicators

|	Accessibility	Social Facilities	Daily Operations	Open Spaces	Attachment	Social Relations	Sense of Neighborliness	Sense of Safety
Social Facilities	0.405**							
Daily Operations	0.395**	0.310**						
Open Spaces	0.375**	0.616**	0.104					
Attachment	0.265**	0.438**	0.335**	0.401**				
Social Relations	0.166*	0.199**	0.114	0.281**	0.425**			
Sense of Neighborliness	0.186**	0.264**	0.196**	0.283**	0.636**	0.590**		
Sense of Safety	0.304**	0.401**	0.168**	0.527**	0.241**	0.154*	0.137*	
Participation	0.361**	0.199**	0.347**	0.374**	0.441**	0.093	0.373**	0.210**

** Correlation is significant at the 0.01 level (2-tailed). * Correlation is significant at the 0.05 level (2-tailed). n=234

assigned to construct the main indicators as manifest variables. So, to minimize the bias of the statistical model of the study, further independent t-tests were used to assess if the manifest variables measures preserved the same statistical difference as the constructed indicators. The majority of the measures, with few exceptions, followed the same statistical tendency of their main indicator. As shown in Table 5, the majority of indicators were significantly different. The participants in Bahriye Ucok evaluated accessibility, daily operations, attachment, and participation as higher, whereas the participants in Atakent evaluated open spaces, social relations, and sense of safety as higher (Fig. 10). However, social facilities, except for sub-measure "*health facilities*", and sense of neighborliness except for the sub-measure "*bond of friendship in the area*", showed no significant statistical differences in overall means. Besides, for the attachment, although the only significantly differentiated manifest variable is "*belonging to the neighborhood*", the overall construct, the attachment, shows also a significant difference. The minor quantitative difference of other variables may cause statistical differences while averaging their total score. For more detail, Table 5 shows the means and standard deviations of both the main indicators and the submeasures for the related indicator.

The results of spatial analysis and different statistical analyses of the questionnaire survey are discussed together to draw a general picture in terms of both the indicators and study areas. The discussions about the indicators for the two study areas are as follows:

Accessibility, as an indicator of social equity, was explored through walkability, the mixture of destinations, and transportation options via both spatial analysis and questionnaire. In spatial analysis, the walkability and mixture of destinations were determined as higher in Bahriye Ucok compared to Atakent, which was supported by the participants in the questionnaire survey. Although both areas have several transport opportunities, the participants in Bahriye Ucok evaluated it better since the area is more advantageous by its close proximity to railway stations, which connects it to the wider district. Despite the participants of Bahriye Ucok evaluated overall accessibility as higher, easy access to the area as a submeasure showed no significant difference statistically between the areas. There is an inherent relationship between the measures of the accessibility itself. For example, as the street networks are well-connected, walkability and accessibility improve (Southworth, 2005), also seen in this study.

According to correlation analysis, accessibility is positively associated with social facilities, daily operations, open spaces, attachment, the sense of safety, and participation. The positive relationship between accessibility and attachment, as seen in both indicators higher in Bahriye Ucok, supports the previous study that pedestrian-oriented environments with accessible routes and efficient public transport enhance people's attachment to their environment (Larimian et al., 2020). In addition, the commercial floor area ratio is higher in Bahriye Ucok, which also contributes to an increase in its walkability index as a measure of accessibility, and also shows higher scores in daily operations. The results show consistency between spatial analysis, correlation analysis, and the comparison of the two study areas in terms of daily operations and accessibility. Besides, accessibility and mixed land use encourage a more walkable community and promote natural surveillance at the street level, resulting in an increased sense of safety (Jacobs, 2006; Schwanke, 2003). Although the correlation results show that sense of safety has a positive relation with accessibility, it does not have any noticeable relation to daily operations. As a matter of fact, Bahriye Ucok was
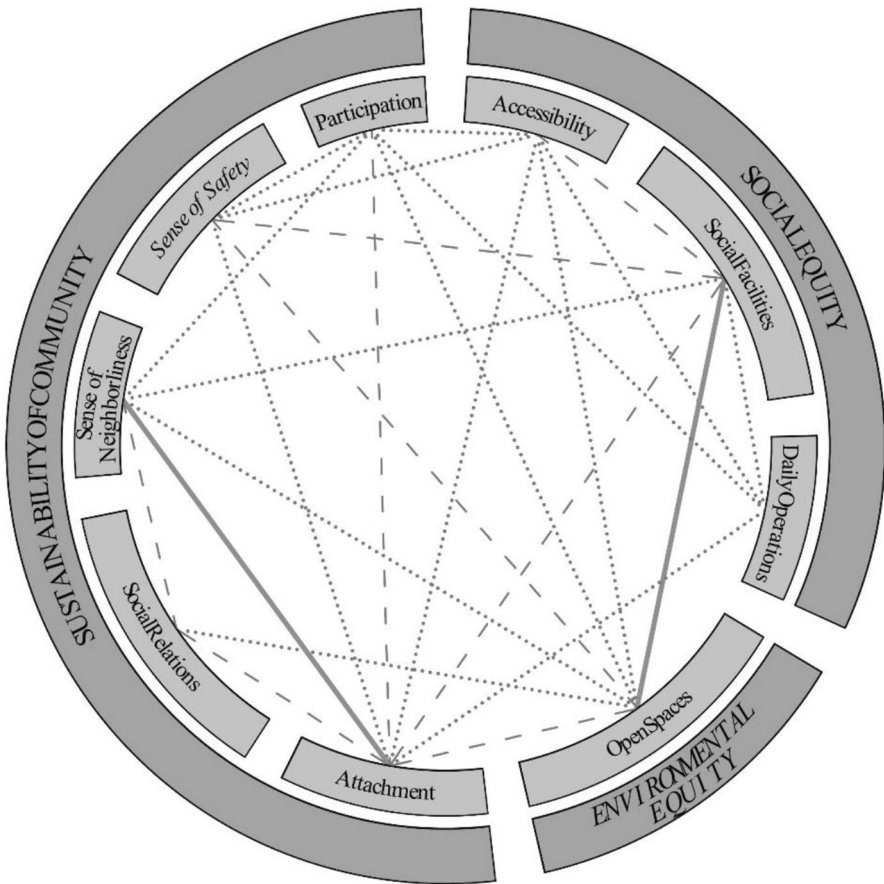
Fig. 9 Correlation network: positive relations between indicators (strong: straight, moderate: dashed, weak: dotted)

expected to show higher results in sense of safety, since its better accessibility and providing daily operations, however the result is the contrary in this sample.

The contrary results on accessibility, mixed land use and safety resonates with the studies suggesting that the increased commercial density and beyond a certain threshold of walkability may cause the presence of higher traffic, congestion, and strangers in the neighborhood, resulting in a decrease in social interaction, the creation of a sense of community, and sense of safety (Appleyard, 1981; Hart, 2008; Wood et al. 2008; Wood et al., 2010). It is also consistent with the finding Bahriye Ucok has a lower score than Atakent for social relations and sense of safety. Although a positive association is found between social interaction and increased opportunities for movement and walkability in previous studies (Brookfield, 2017; Talen & Koschinsky, 2014; Wood et al., 2010; Yin, 2013; Zuniga-Teran et al., 2019), this particular result is more in accordance that greater pedestrian flow provides more opportunities for encounters, but it does not necessarily increase social interaction (Ferguson, 2007). So, our results contradict studies that walkability and mixed land use

Table 5 The comparison of the two study areas through social sustainability indicators

Indicators and Measures	Bahriye Ucok	Atakent	t	p
Accessibility	4.13 (0.67)	3.97 (0.60)	1.978	**0.049***
Walkability	*4.39 (0.77)*	*4.07 (0.65)*	*3.358*	***0.001****
Transportation options	*4.50 (0.67)*	*4.14 (0.73)*	*3.890*	***0.000****
Mixture of destinations	*4.44 (0.76)*	*4.04 (0.70)*	*4.145*	***0.000****
Easy access to the area	*3.48 (1.17)*	*3.73 (1.01)*	*-1.791*	*0.075*
Social Facilities	3.55 (0.79)	3.60 (0.63)	−0.598	0.551
Health facilities	*4.06 (0.99)*	*3.52 (1.14)*	*3.863*	***0.000****
Educational facilities	*3.93 (0.89)*	*3.85 (0.89)*	*0.595*	*0.552*
Cultural facilities	*3.38 (1.04)*	*3.60 (0.98)*	*-1.657*	*0.099*
Recreational facilities	*3.15 (1.15)*	*2.96 (1.07)*	*1.242*	*0.216*
Sports facilities	*3.47 (1.12)*	*3.69 (0.90)*	*-1.613*	*0.108*
Facilities for youth	*3.56 (1.10)*	*3.77 (0.87)*	*-1.623*	*0.106*
Facilities for children	*3.51 (1.11)*	*3.64 (0.98)*	*−0.901*	*0.368*
Daily Operations	4.65 (0.43)	4.39 (0.48)	4.159	**0.000***
Opportunities for shopping	*4.65 (0.56)*	*4.34 (0.58)*	*4.158*	***0.000****
Utility services	*4.78 (0.42)*	*4.53 (0.58)*	*3.819*	***0.000****
Leisure services	*4.58 (0.62)*	*4.46 (0.68)*	*1.342*	*0.181*
Other commercial activities	*4.60 (0.59)*	*4.27 (0.82)*	*3.535*	***0.000****
Open Spaces	3.46 (0.86)	3.91 (0.60)	-4.627	**0.000***
Provision of open spaces	*3.60 (1.10)*	*4.13 (0.72)*	*-4.242*	***0.000****
Provision of green areas	*3.38 (1.16)*	*4.03 (0.78)*	*-4.991*	***0.000***
Providing diverse use	*3.40 (1.14)*	*3.96 (0.97)*	*-3.957*	***0.000***
Responding to different needs	*3.82 (1.04)*	*4.04 (0.81)*	*-1.839*	*0.067*
Opportunities for vulnerable groups	*3.33 (1.20)*	*3.57 (1.02)*	*-1.603*	*0.110*
Meeting basic hygienic needs	*2.70 (1.31)*	*3.63 (0.90)*	*-6.226*	***0.000****
Visiting throughout the day and night	*3.98 (0.99)*	*4.07 (0.79)*	*−0.747*	*0.456*
Attachment	3.91 (0.85)	3.71 (0.65)	2.025	**0.044***
Belonging to neighborhood	*3.61 (1.06)*	*3.10 (1.06)*	*3.577*	***0.000****
Pride in neighborhood	*4.22 (0.79)*	*4.13 (0.62)*	*0.888*	*0.375*
Reflecting their identity	*4.08 (0.91)*	*3.89 (0.89)*	*1.611*	*0.109*
Representing their lifestyle	*3.93 (0.99)*	*3.79 (0.83)*	*1.229*	*0.220*
Part of their identity	*3.94 (0.99)*	*3.71 (1.00)*	*1.781*	*0.076*
Sense of Neighborliness	3.59 (0.91)	3.47 (0.87)	1.054	0.293
Recognizing their neighbors	*3.56 (1.15)*	*3.46 (1.07)*	*0.700*	*0.485*
Knowing their neighbors	*3.60 (1.08)*	*3.48 (1.05)*	*0.834*	*0.405*
Bond of friendship in the area	*3.61 (1.06)*	*3.10 (1.06)*	*3.577*	***0.000****
Value of neighboring in the area	*3.46 (1.06)*	*3.65 (0.81)*	*-1.551*	*0.122*
Social Relations	2.84 (0.84)	3.24 (0.92)	-3.519	**0.001***
Saying hi when they meet	*4.32 (0.95)*	*4.32 (0.57)*	*−0.017*	*0.986*
Chatting when they meet	*3.84 (1.07)*	*4.09 (0.77)*	*-2.001*	***0.047****
Visiting each other's home	*2.64 (1.32)*	*3.07 (1.24)*	*-2.575*	***0.011****
Going shopping with neighbors	*2.61 (1.33)*	*2.73 (1.26)*	*−0.739*	*0.461*
Going to open spaces with neighbors	*2.63 (1.31)*	*2.97 (1.31)*	*-2.002*	***0.046****
Leisure activities with neighbors	*2.14 (1.21)*	*3.10 (1.35)*	*-5.736*	***0.000****
Attending cultural activities	*1.72 (1.01)*	*2.46 (1.31)*	*-4.819*	***0.000****
Sense of Safety	3.62 (0.84)	3.97 (0.58)	-3.636	**0.000***
Safety for pedestrians	*2.98 (1.33)*	*3.79 (0.90)*	*-5.429*	***0.000****

Table 5 (continued)

Indicators and Measures	Bahriye Ucok	Atakent	t	p
Safety in daylight	4.30 (0.83)	4.27 (0.63)	0.281	0.779
Safety in night	3.95 (1.10)	4.07 (0.89)	−0.919	0.359
Safety compared to the city	4.40 (0.79)	4.09 (0.74)	3.113	**0.002***
Safety for vulnerable groups	2.93 (1.28)	3.61 (0.95)	-4.584	**0.000***
Participation	3.88 (0.79)	3.29 (0.92)	5.184	**0.000***
Participation in civic activities	4.11 (0.85)	3.16 (1.12)	6.811	**0.000***
Participation in municipality decisions	4.01 (1.04)	3.49 (1.03)	3.606	**0.000***
Participation in urban planning	3.49 (1.17)	3.46 (1.08)	0.167	0.867
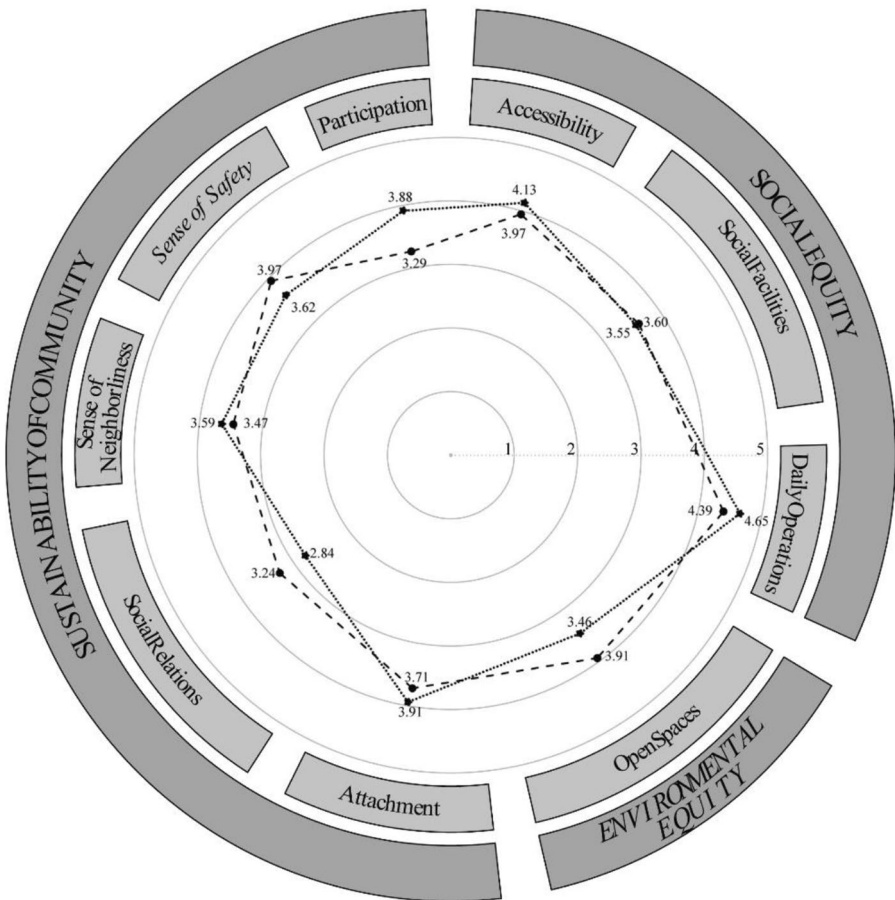
Fig. 10 The scores of indicators in study areas (dotted: Bahriye Ucok; dashed: Atakent)

positively affect the subjects relating to social capital and sense of community such as social integration, social relation, and network (Ali et al., 2019; Dempsey, 2008; Kamruzzaman et al., 2014; Kaźmierczak, 2013; Larimian et al., 2020; Park & Park, 2012; Silburn et al., 1999; Yoo & Lee, 2016). So it seems that the mixed land use, as believed, causes both positive and negative outcomes (Shirazi & Keivani, 2019).

Social facilities, another indicator for social equity, are positively associated with many other indicators such as accessibility, daily operations, open space, attachment, sense of neighborliness, and sense of safety ranging in strength from weak to strong. The results resonate with the studies that social infrastructure increases feelings of belonging, attachment, and sense of community (Bramley et al., 2009; Chan & Lee, 2008; Karuppannan & Sivam, 2011). However, there is a lack of evidence in this sample for social relations that social infrastructure has an important role in the growth of social networks and interaction (Karuppannan & Sivam, 2011). In addition, although the two areas are statistically different in terms of the associated factors of social facilities such as accessibility, daily operations, open space, attachment, and sense of safety (except the sense of neighborliness) there was no statistical difference for social facilities in this sample.

For environmental equity, there is consistency between the survey results and spatial analysis in terms of open space and green areas. According to the correlation analysis, when open spaces increase, attachment, sense of neighborliness, social relations, sense of safety, and participation also increase. These findings are consistent with previous studies in terms of social relations, sense of safety, and participation with results of Atakent compared to Bahriye Ucok. The provision of open space and green areas promotes spontaneous interaction by fostering circumstances in allowing people to form social networks (Anderson et al., 2017; Chan & Lee, 2008; Jabareen, 2006). Furthermore, open spaces and green areas in residential areas increase individuals' sense of safety (Anderson et al., 2017; Dave, 2011; Karuppannan & Sivam, 2011; Kuo et al., 1998; Maas et al., 2009). However, the attachment score in Atakent was expected to be higher as a result of the moderate association to open spaces, and also comparing the previous studies in literature (Bridge, 2002; Chan & Lee, 2008). On the contrary, the attachment score was higher in Bahriye Ucok. We might conclude that the correlation of attachment with accessibility and daily operations, which are rated higher in Bahriye Ucok, may be more influential cumulatively, despite its relationship with open areas.

The sustainability of community was evaluated through the indicators of sense of neighborliness, social relations, attachment, sense of safety, and participation. Since we discussed the relations between the indicators of different dimensions and the sustainability of community above, the relationships of indicators to one another in the sustainability of community will be mentioned. According to correlation analysis, attachment has a positive relation with sense of neighborliness, sense of safety, and participation. These results contradict some studies that social networks can play important roles in attachment (Dekker, 2007; Lewicka, 2011; Livingston et al., 2010); since Atakent has better social relations, while Bahriye Ucok has a higher attachment. It also contradicts the study evaluating three social factors, which are social relation, community participation, and place attachment, a greater sense of place was related to decreased community engagement (Zhang et al., 2018) considering correlation analysis and the higher results in terms of both attachment and participation in Bahriye Ucok. In addition, sense of neighborliness has a positive correlation with social relations and participation. Consistently, residents may feel more attached to

the community as they become more participating (Ng et al., 2001). However, the results show a lack of evidence in the comparison of the two study areas in terms effects of sense of neighborliness. Although some studies show that sense of safety increases the sense of community and attachment (Lund, 2002, 2003; Nash & Christie, 2003; Shaftoe, 2000), the results contradict that Atakent has a higher sense of safety and Bahriye Ucok has a higher attachment and no significant difference in sense of neighborliness at all. Compared to social relations, the results are in accordance with the studies that people who feel safer interact more (Bridge, 2002; Dempsey et al., 2012). There is a statistically significant difference in social relations. Even though social relations are more intense in Atakent, the lack of a statistically significant difference in sense of neighborliness suggests that people's subjective perceptions of neighborliness may be compatible with the neighborliness pattern in each area. Lastly, the sense of safety is positively associated with participation. However, Bahriye Ucok has a lower sense of safety while participation is higher. The nature of these indicators' relations is indeed bidirectional, however, on some occasions, it may not have an effect as an antecedent-subsequent process as seen in correlation analysis and comparing the study areas. The combined effect of several factors on the overall results may not be observed in the same way depending on the nature of their certain relationships.

Personal variables are another group of variables that are believed to impact people's perceptions of indicators relating to sustainability of community. Studies found that sociodemographic characteristics such as age (Fernández-Carro et al., 2015), income (Bramley et al., 2009; Dave, 2011; Dempsey et al., 2011; Hagerty et al., 2002; Hemani et al., 2017), homeownership (Dave, 2011; Evans, 2009; Hemani et al., 2017), and length of residence (Dave, 2011; Grillo et al., 2010; Hemani et al., 2017; Lewicka, 2010) may influence different indicators such as social relations, sense of place, sense of safety, and social participation, with some contradictory findings. For example, some studies discovered that higher income level is negatively associated to social relations since higher-income residents are more likely to feel autonomous and separate themselves from other inhabitants (Bramley et al., 2009; Dempsey et al., 2011; Larimian et al., 2020); while lower income residents also have fewer social relations since they are discouraged from participating in activities that promote social integration because they believe they are different, do not fit in, and are not respected (Dave, 2011; Hagerty et al., 2002). The comparison of socio-demographic variables between two areas shows that only the socio-economic variables are significantly different. The participants of Atakent presented a higher income profile while they have higher social relations, which contradicts previous studies. In addition, although previous studies found that lower socioeconomic groups have a weaker attachment to their environment (Dave, 2011), Bahriye Ucok with lower socio-economic profile shows contradiction with higher attachment results. Income also have a positive effect on sense of safety that higher socio-economic residents may show higher results (Hemani et al., 2017), as reported by Atakent. Future research in this field should explore the factors involved in modeling these complicated interactions.

5 Conclusions

Building cities that are not just ecologically and economically sustainable, but also socially sustainable, has become one of the most crucial objectives on the global agenda. Solutions for future cities and communities can be developed by determining which aspects influence social sustainability. In this sense, our study concentrated on the socio-spatial aspects of urban space, which have a great impact on social sustainability. The analyses revealed a range of favorable relationships between social sustainability indicators in varying degrees, as detailed above. The study also revealed that the social sustainability criteria of two residential areas with distinct spatial features provide remarkably different results. According to research results, for indicators of social equity, when accessibility increases, satisfaction with the open spaces, attachment, and sense of safety also increases following it. When social facilities are enhanced, open spaces, sense of security, attachment, and neighborliness also improve. Moreover, there is a positive relationship between daily operations and attachment. Another urban-related dimension of social sustainability is environmental equity, which includes open spaces and green areas. We can confirm that the greater the open spaces, the greater sustainability of community, which includes attachment, sense of neighborliness, social relations, sense of safety, and participation. Besides, most of these findings are also validated by comparing two study areas, which provide more details and valuable insights. Residents who rated their neighborhood as considerably more accessible and daily operations much more positively reported higher attachment and participation. Residents who evaluated their open spaces higher have reported higher social relations and sense of safety. Although social equity and environmental equity is closely related, one of the study areas has better results for social equity, the other one was more successful in providing environmental equity. Yet, they generated different results for indicators of the sustainability of community.

The problems in urban space, especially rapid urbanization in developing countries, have outpaced the capacity of most cities to provide sufficient services to its residents, resulting in inadequate accessibility, a lack of social infrastructure and places for everyday operations, and insufficiency of open spaces and green areas. To effectively address urban challenges, governments must build effective urban road map strategies that concentrate all the underlying difficulties in urban areas as quickly and efficiently as possible. We believe that the findings of this study will inspire future urban areas for achieving more socially sustainable cities, not just in developing cities like Izmir, but also in developed ones. However, especially considering the fact that cities are all faced with nearly similar situations and challenges, the solutions to one city's problems may be distinctive from those found in another. It may be incredibly difficult to envision a broad generalization that could apply to all. Because of the variety of economic, social, political, and cultural elements, strategies must be tailored to each country's, even cities', specific characteristics.

We would highlight the participation within the context of this research in particular. Global dialogues on sustainable development emphasize new governance mechanisms and consider participation as the primary criterion for effective decision-making. Public participation may contribute in avoiding several prevailing problems and the detached realities of the urban experience in daily lives. The socio-spatial aspects of urban spaces serve as the foundation for social sustainability since it is where individuals get personal development and enhancement opportunities, feel secure and attached, interact with each other, and par-

ticipate in community decisions. More general recommendations, despite its shallowness, include ensuring better accessibility, the provision of social facilities, and daily operations to contribute to social equity. Open and green spaces must be appropriately provided for environmental equity. When social and environmental equity is secured, the sustainability of community may be enriched simultaneously through its socio-spatial contributions. It is critical for future urban spaces that social equity and environmental equity should be assured simultaneously. None of these components must be compromised or given more priority than any other. On the contrary, they should all be provided concurrently since they influence different indicators of the sustainability of community, and also function as a complement to one another.

As a starting point, the following points should be addressed while promoting social sustainability.

- Accessibility, as freedom of geographic mobility, should include alternative modes of transportation, such as walking, cycling, and public transportation.
- Transportation should be accessible and affordable to all city inhabitants.
- For social facilities, local governments should have a great effort to improve basic infrastructure and supply crucial services.
- Social facilities are fundamental in promoting the use of basic human rights such as education and health, as well as including amenities that support social and cultural development.
- The places for daily operations should accommodate the basic needs of inhabitants by providing a variety of goods and services. Mixed land use is a good way to promote daily operations in residential areas. Opportunities for mixed land use in existing developments should be evaluated to use current infrastructure and buildings to offer horizontal or vertical mixed-use zones and minimize the need for new facilities.
- The planning guidelines for open spaces and green space, which have traditionally emphasized pro-rata provision (square meters per person) need to be reassessed. Open spaces must be improved beyond the pro rata requirements. Well-used open spaces are always accessible to all groups of the community. Every community has its own characteristics and set of demands, thus spaces that are respectively diverse will meet a broad range of those interests. The open space serves as a vital meeting and encountering place for both existing and future relationships.

This study, like so many others, has some limitations that introduce potential for further research.

[1] The household survey data gathering was limited to two neighborhoods in Izmir, Turkey might limit the generalizability of the model to other nations with comparable urban contexts. Replicating this research across different countries is necessary to verify the generalizability of the results because cultural, social, economic, and environmental factors all influence urban social sustainability. As a consequence, it may lead to more satisfactory results and comparative analysis.

[2] There are certain methodological limitations in this study. The survey conducted in two neighborhoods examined the research questions concerning the different socio-spatial aspects of urban space. The questionnaire explored what levels of different indicators affect social sustainability, however; it failed to explore the reasoning behind some issues. This

methodological limitation restricted a thorough investigation of the potential roles of other elements may play in influencing the sustainability of community. To explore the role of these latent factors, a more thorough questionnaire would be useful, as combined with more qualitative techniques like in-depth interviews and focus group discussions.

[3] This study is limited to socio-spatial aspects of urban space to develop and evaluate a scale for measuring urban social sustainability. We aimed to construct a comprehensive scale that combines and integrates the most often used aspects in the literature, however we cannot claim to have fully addressed all aspects of social sustainability. We recommend researchers to conduct interviews or focus group discussions to identify additional potentially significant characteristics that are excluded from this study. In addition, we should also avoid the assumptions that only those socio-spatial elements have an impact on overall social sustainability, especially on sustainability of community. Although deterministic approaches believe that built (physical) environment influence daily lives and human behaviors (Lang, 1987), or cause systematic effects on human behavior (Hillier & Hanson, 1984), it might be difficult to distinguish how and to what extent human behavior is determined by its surrounding, socio-economic or social structures. Physical measures may not always have the expected social consequences, and receiving positive response from people may also depend on the social structure of the community (Miles & Song, 2009; Shirazi et al., 2022).

The findings of this research first provide valuable information to governments, policymakers, urban researchers, planners, and architects to help them design and implement programs to improve social sustainability. This study presents a context-sensitive understanding of the influence of socio-spatial aspects of urban space on social sustainability. We recommend further research to see how other aspects of urban space may affect the outcome to have a more comprehensive understanding of the subject. For instance, urban form characteristics with their thresholds are one of the more fascinating variables of social sustainability that should be investigated further with this framework in future studies. To achieve social sustainability, we advise more social-goal-oriented planning. The ultimate aim of integrating planning inputs into social outcomes is a critical one to accomplish for all cities and communities around the world.

Declarations

References

Abed, A. R. (2017). Assessment of social sustainability: A comparative analysis. *Proceedings of the Institution of Civil Engineers - Urban Design and Planning*, *170*(2), 72–82. https://doi.org/10.1680/jurdp.16.00020

Abed, A., & Al-Jokhadar, A. (2022). Common space as a tool for social sustainability. *Journal of Housing and the Built Environment*, *37*(1), 399–421. https://doi.org/10.1007/s10901-021-09843-y

Adams, M., Holding, E., & Kimball, M. (2012). *Social sustainability: Process, place, people*. JTP Press.

Akcali, S., & Cahantimur, A. (2022). The Pentagon model of Urban social sustainability: An assessment of sociospatial aspects, comparing two neighborhoods. *Sustainability*, *14*(9), 4990. https://doi.org/10.3390/su14094990

Alexander, E. R. (1993). Density measures: A review and analysis. *Journal of Architectural and Planning Research*, *10*(3), 181–202.

Ali, H. H., Al-Betawi, Y. N., & Al-Qudah, H. S. (2019). Effects of urban form on social sustainability – a case study of Irbid, Jordan. *International Journal of Urban Sustainable Development*, *11*(2), 203–222. https://doi.org/10.1080/19463138.2019.1590367

Alipour, S. M. H., & Galal Ahmed, K. (2021). Assessing the effect of urban form on social sustainability: A proposed 'Integrated Measuring Tools Method' for urban neighborhoods in Dubai. *City Territory and Architecture*, *8*(1), 1. https://doi.org/10.1186/s40410-020-00129-4

Ancell, S., & Thompson-Fawcett, M. (2008). The Social sustainability of medium density housing: A conceptual model and Christchurch Case Study. *Housing Studies*, *23*(3), 423–442. https://doi.org/10.1080/02673030802029990

Anderson, J., Ruggeri, K., Steemers, K., & Huppert, F. (2017). Lively Social Space, Well-Being activity, and Urban Design: Findings from a low-cost community-led Public Space intervention. *Environment and Behavior*, *49*(6), 685–716. https://doi.org/10.1177/0013916516659108

Appleyard, D. (1981). *Livable streets*. University of California Press.

Aru, K. A. (1998). *Türk kenti*. Yapı Endüstri Merkezi.

Arundel, R., & Ronald, R. (2017). The role of urban form in sustainability of community: The case of Amsterdam. *Environment and Planning B: Urban Analytics and City Science*, *44*(1), 33–53. https://doi.org/10.1177/0265813515608640

Bacon, N. D. D., Cochrane, S., Woodcraft, J., & Brown, C. (2012). *Creating strong communities: How to measure the social sustainability of new housing developments*. http://www.social-life.co/media/files/Creating_Strong_Communities.pdf

Bramley, G., & Power, S. (2009). Urban form and social sustainability: The role of density and housing type. *Environment and Planning B: Planning and Design*, *36*(1), 30–48. https://doi.org/10.1068/b33129

Bramley, G., Dempsey, N., Power, S., & Brown, C. (2006). What is 'Social Sustainability', and How Do Our Existing Urban Forms Perform in Nurturing It? *Planning Research Conference*, *April*, 1–40. http://www.city-form.org/uk/pdfs/Pubs_Bramleyetal06.pdf%5CnAvailable from: http://www.city-form.org/uk/pdfs/Pubs_Bramleyetal06.pdf.

Bramley, G., Dempsey, N., Power, S., Brown, C., & Watkins, D. (2009). Social Sustainability and Urban Form: Evidence from five british cities. *Environment and Planning A: Economy and Space*, *41*(9), 2125–2142. https://doi.org/10.1068/a4184

Bridge, G. (2002). The Neighbourhood and Social Networks. *Paper- ESRC Centre for Neighbourhood Research*, *April*, 16–18.

Brookfield, K. (2017). Residents' preferences for walkable neighbourhoods. *Journal of Urban Design*, *22*(1), 44–58. https://doi.org/10.1080/13574809.2016.1234335

Çadırcı, M. (1996). Anadolu kentlerinde mahalle (Osmanlı dönemi). In Y. Sey (Ed.), *Tarihten günümüze Anadolu'da konut ve yerleşme* (pp. 257–263). Habitat, Türkiye Ekonomik, Toplumsal ve Tarih Vakıf Yayın&#305.

Chan, E., & Lee, G. K. L. (2008). Critical factors for improving social sustainability of urban renewal projects. *Social Indicators Research*, *85*(2), 243–256. https://doi.org/10.1007/s11205-007-9089-3

Cheng, V. (2009). Understanding density and high density. In E. Ng (Ed.), *Designing high-density cities for Social and Environmental sustainability* (pp. 3–17). Earthscan.

Chiu, R. L. H. (2003). Social sustainability, sustainable development and housing development: The experience of Hong Kong. *Housing and Social Change: East-West Perspectives*, 221–239. https://doi.org/10.4324/9780203402634

Colantonio, A. (2007). Measuring Social sustainability: Best practice from Urban Renewal in the EU. *EIBURS Working Paper Series*, *1*(July 2007), 37.

Colantonio, A. (2010). Urban social sustainability themes and assessment methods. *Proceedings of the Institution of Civil Engineers - Urban Design and Planning*, *163*(2), 79–88. https://doi.org/10.1680/udap.2010.163.2.79

Colantonio, A., & Dixon, T. (2011). Social sustainability and sustainable Communities: Towards a conceptual Framework. *Urban Regeneration & Social Sustainability* (pp. 18–36). Wiley-Blackwell. https://doi.org/10.1002/9781444329445.ch2

Coleman, A. (1985). *Utopia on trial: Vision and reality in planned housing*. Hilary Shipman.

Dave, S. (2011). Neighbourhood density and social sustainability in cities of developing countries. *Sustainable Development*, *19*(3), 189–205. https://doi.org/10.1002/sd.433

Davidson, K. M., Kellett, J., Wilson, L., & Pullen, S. (2012). Assessing urban sustainability from a social democratic perspective: A thematic approach. *Local Environment*, *17*(1), 57–73. https://doi.org/10.1080/13549839.2011.631990

Dekker, K. (2007). Social Capital, Neighbourhood attachment and participation in Distressed Urban Areas. A case study in the Hague and Utrecht, the Netherlands. *Housing Studies*, *22*(3), 355–379. https://doi.org/10.1080/02673030701254103

Dempsey, N. (2008). Does quality of the built environment affect social cohesion? *Proceedings of the Institution of Civil Engineers - Urban Design and Planning*, *161*(3), 105–114. https://doi.org/10.1680/udap.2008.161.3.105

Dempsey, N., Bramley, G., Power, S., & Brown, C. (2011). The social dimension of sustainable development: Defining urban social sustainability. *Sustainable Development*, *19*(5), 289–300. https://doi.org/10.1002/sd.417

Dempsey, N., Brown, C., & Bramley, G. (2012). The key to sustainable urban development in UK cities? The influence of density on social sustainability. *Progress in Planning*, *77*(3), 89–141. https://doi.org/10.1016/j.progress.2012.01.001

Dinnie, E., Brown, K. M., & Morris, S. (2013). Community, cooperation and conflict: Negotiating the social well-being benefits of urban greenspace experiences. *Landscape and Urban Planning*, *112*, 1–9. https://doi.org/10.1016/j.landurbplan.2012.12.012

Eranıl Demirli, M., Tuna Ultav, Z., & Demirtaş-Milz, N. (2015). A socio-spatial analysis of urban transformation at a neighborhood scale: The case of the relocation of Kadifekale inhabitants to TOKİ Uzundere in İzmir. *Cities*, *48*, 140–159. https://doi.org/10.1016/j.cities.2015.06.013

Ergenç, Ö. (1984). Osmanlı Şehrindeki "mahalle"nin İşlev ve Nitelikleri Üzerine. In H. İnalcık, N. Göyünç, & H. W. Lowry (Eds.), *Osmanlı Araştırmaları IV* (4 vol., pp. 69–78). Enderun Kitabevi. 4.

Erkan, N., & Akın, O. (2011). Konut alanı tasarım sürecinde unutulan bir kavram; mahalle. *Çevre ve Tasarım Kongresi Bildiri Kitabı*, 437–448.

Evans, J. D. (1996). *Straightforward statistics for the behavioral sciences*. Brooks/Cole Publishing.

Evans, G. (2009). Accessibility, Urban Design and the whole Journey Environment. *Built Environment*, *35*(3), 366–385. https://doi.org/10.2148/benv.35.3.366

Ferguson, P. (2007). The streets of innovation: An exploratory analysis of knowledge transfer in the public realm. *6th International Space Syntax Symposium*. http://spacesyntaxistanbul.itu.edu.tr/papers/longpapers/019 - Ferguson.pdf.

Fernández-Carro, C., Módenes, J. A., & Spijker, J. (2015). Living conditions as predictor of elderly residential satisfaction. A cross-european view by poverty status. *European Journal of Ageing*, *12*(3), 187–202. https://doi.org/10.1007/s10433-015-0338-z

Fleischmann, M., Romice, O., & Porta, S. (2021). Measuring urban form: Overcoming terminological inconsistencies for a quantitative and comprehensive morphologic analysis of cities. *Environment and Planning B: Urban Analytics and City Science*, *48*(8), 2133–2150. https://doi.org/10.1177/2399808320910444

George, D., & Mallery, P. (2016). *IBM SPSS Statistics 23 step by step*. Routledge. https://doi.org/10.4324/9781315545899

Ghahramanpouri, A., Abdullah, A. S., Sedaghatnia, S., & Lamit, H. (2015). Urban Social Sustainability contributing factors in Kuala Lumpur Streets. *Procedia - Social and Behavioral Sciences*, *201*, 368–376. https://doi.org/10.1016/j.sbspro.2015.08.188

Goffman, E. (1963). *Behavior in Public Places; notes on the Social Organization of gathering*. Free Press of Glencoe.

Grillo, M. C., Teixeira, M. A., & Wilson, D. C. (2010). Residential satisfaction and Civic Engagement: Understanding the Causes of Community Participation. *Social Indicators Research*, *97*(3), 451–466. https://doi.org/10.1007/s11205-009-9511-0

Gündüz, O., & Kiray, M. T. (2006). 20. yüzyılda Karsiyaka'da kentsel ve mimari dönüşümler. In *Karsiyaka Kültür ve Çevre Sempozyumu* (pp. 82–93). Şanal Matbacılık.

Gür, S., & Enön, Z. (1990). Changing socio-spatial aspects of neighborhood: Design implications. *Ekistics*, *57*(342/343), 138–145.

Hagerty, B. M., Williams, R. A., & Oe, H. (2002). Childhood antecedents of adult sense of belonging. *Journal of Clinical Psychology*, *58*(7), 793–801. https://doi.org/10.1002/jclp.2007

Hamburg, M. (1985). *Basic Statistics: A Modern Approach*. Harcourt Brace Jovanovich.

Hart, J. (2008). *Driven to excess: impacts of motor vehicle traffic on residential quality of life in Bristol, UK* [University of the West of England]. https://www.streetparty.org.uk/wp-content/uploads/downloads/DrivenToExcess-Report.pdf

He, S., & Wu, F. (2007). Neighborhood changes and residential differentiation in Shanghai. In F. Wu (Ed.), *China's Emerging Cities*. Routledge. https://doi.org/10.4324/9780203937808

Hemani, S., Das, A. K., & Chowdhury, A. (2017). Influence of urban forms on social sustainability: A case of Guwahati, Assam. *URBAN DESIGN International*, *22*(2), 168–194. https://doi.org/10.1057/s41289-016-0012-x

Hillier, B., & Hanson, J. (1984). *The Social Logic of Space*. Cambridge University Press. https://doi.org/10.1017/CBO9780511597237

Jabareen, Y. R. (2006). Sustainable urban forms: Their typologies, models, and concepts. *Journal of Planning Education and Research*, *26*(1), 38–52. https://doi.org/10.1177/0739456X05285119

Jacobs, J. (2006). *The death and life of great american cities*. Random House.

James, A. C., Gallaher, C. M., & Krmenec, A. J. (2020). Individual experience and associated perceptions: How crime victimization influences the construction of safety. *Papers in Applied Geography*, *6*(2), 119–131. https://doi.org/10.1080/23754931.2020.1744473

Jenks, M., & Dempsey, N. (2005). The Language and meaning of density. In M. Jenks, & N. Dempsey (Eds.), *Future forms and design for sustainable cities* (pp. 287–309). Routledge.

Kamruzzaman, M., Wood, L., Hine, J., Currie, G., Giles-Corti, B., & Turrell, G. (2014). Patterns of social capital associated with transit oriented development. *Journal of Transport Geography*, *35*, 144–155. https://doi.org/10.1016/j.jtrangeo.2014.02.003

Karaarslan, F., & Karaarslan, Ö. M. (2013). Modern kent mekânlarında mahallenin konumu: Modern kent mekanı olarak güvenlikli siteler ile mahallenin işlevsel kıyası. *II Türkiye Lisansüstü Çalışmalar Kongresi*, 1185–1204.

Karji, A., Woldesenbet, A., Khanzadi, M., & Tafazzoli, M. (2019). Assessment of Social Sustainability Indicators in Mass Housing Construction: A case study of Mehr Housing Project. *Sustainable Cities and Society*, *50*, 101697. https://doi.org/10.1016/j.scs.2019.101697

Karuppannan, S., & Sivam, A. (2011). Social sustainability and neighbourhood design: An investigation of residents' satisfaction in Delhi. *Local Environment*, *16*(9), 849–870. https://doi.org/10.1080/13549839.2011.607159

Kaźmierczak, A. (2013). The contribution of local parks to neighbourhood social ties. *Landscape and Urban Planning*, *109*(1), 31–44. https://doi.org/10.1016/j.landurbplan.2012.05.007

Koenig, J. G. (1980). Indicators of urban accessibility: Theory and application. *Transportation*, *9*(2), 145–172. https://doi.org/10.1007/BF00167128

Kuo, F. E., Bacaicoa, M., & Sullivan, W. C. (1998). Transforming inner-city landscapes. *Environment and Behavior*, *30*(1), 28–59. https://doi.org/10.1177/0013916598301002

Kyttä, M., Broberg, A., Haybatollahi, M., & Schmidt-Thomé, K. (2016). Urban happiness: Context-sensitive study of the social sustainability of urban settings. *Environment and Planning B: Planning and Design*, *43*(1), 34–57. https://doi.org/10.1177/0265813515600121

Lam, T. M., Wang, Z., Vaartjes, I., Karssenberg, D., Ettema, D., Helbich, M., Timmermans, E. J., Frank, L. D., den Braver, N. R., Wagtendonk, A. J., Beulens, J. W. J., & Lakerveld, J. (2022). Development of an objectively measured walkability index for the Netherlands. *International Journal of Behavioral Nutrition and Physical Activity*, *19*(1), 50. https://doi.org/10.1186/s12966-022-01270-8

Lan, F., Gong, X., Da, H., & Wen, H. (2020). How do population inflow and social infrastructure affect urban vitality? Evidence from 35 large- and medium-sized cities in China. *Cities*, *100*, 102454. https://doi.org/10.1016/j.cities.2019.102454

Landorf, C. (2011). Evaluating social sustainability in historic urban environments. *International Journal of Heritage Studies*, *17*(5), 463–477. https://doi.org/10.1080/13527258.2011.563788

Lang, J. T. (1987). *Creating architectural theory: The role of the behavioral sciences in environmental design*. Van Nostrand Reinhold.

Larimian, T., Freeman, C., Palaiologou, F., & Sadeghi, N. (2020). Urban social sustainability at the neighbourhood scale: Measurement and the impact of physical and personal factors. *Local Environment*, *25*(10), 747–764. https://doi.org/10.1080/13549839.2020.1829575

Lättman, K., Olsson, L. E., & Friman, M. (2018). A new approach to accessibility – examining perceived accessibility in contrast to objectively measured accessibility in daily travel. *Research in Transportation Economics*, *69*, 501–511. https://doi.org/10.1016/j.retrec.2018.06.002

Lewicka, M. (2010). What makes neighborhood different from home and city? Effects of place scale on place attachment. *Journal of Environmental Psychology*, *30*(1), 35–51. https://doi.org/10.1016/j.jenvp.2009.05.004

Lewicka, M. (2011). Place attachment: How far have we come in the last 40 years? *Journal of Environmental Psychology*, *31*(3), 207–230. https://doi.org/10.1016/j.jenvp.2010.10.001

Livingston, M., Bailey, N., & Kearns, A. (2010). Neighbourhood attachment in deprived areas: Evidence from the north of England. *Journal of Housing and the Built Environment*, *25*(4), 409–427. https://doi.org/10.1007/s10901-010-9196-3

Lotfata, A., & Ataöv, A. (2020). Urban streets and urban social sustainability: A case study on Bagdat street in Kadikoy, Istanbul. *European Planning Studies*, *28*(9), 1735–1755. https://doi.org/10.1080/09654313.2019.1656169

Low, S., & Smart, A. (2020). Thoughts about Public Space During Covid-19 Pandemic. *City & Society*, *32*(1), ciso.12260. https://doi.org/10.1111/ciso.12260

Lund, H. (2002). Pedestrian environments and sense of community. *Journal of Planning Education and Research*, *21*(3), 301–312. https://doi.org/10.1177/0739456X0202100307

Lund, H. (2003). Testing the Claims of New Urbanism: Local Access, Pedestrian Travel, and neighboring behaviors. *Journal of the American Planning Association*, *69*(4), 414–429. https://doi.org/10.1080/01944360308976328

Maas, J., Spreeuwenberg, P., van Winsum-Westra, M., Verheij, R. A., Vries, S., & Groenewegen, P. P. (2009). Is Green Space in the living Environment Associated with People's feelings of Social Safety? *Environment and Planning A: Economy and Space*, *41*(7), 1763–1777. https://doi.org/10.1068/a4196

Martal, A. (1999). *Değişim sürecinde İzmir'de sanayileşme: 19. Yüzyıl*. Dokuz Eylül Yayınları.

Maslow, A. H. (1954). *Motivation and personality*. Harper & Row Publishers.

McLeod, S. (2007). Maslow's hierarchy of needs. *Simply Psychology*, *1*, 1–18.

McMillan, D. W., & Chavis, D. M. (1986). Sense of community: A definition and theory. *Journal of Community Psychology*, *14*(1), 6–23. https://doi.org/10.1002/1520-6629(198601)14:1<6::AID-JCOP2290140103>3.0.CO;2-I

Meegan, R., & Mitchell, A. (2001). It's Not Community Round Here, it's neighbourhood': Neighbourhood Change and Cohesion in Urban Regeneration Policies. *Urban Studies*, *38*(12), 2167–2194. https://doi.org/10.1080/00420980120087117

Mehan, A. (2017). An Integrated Model of Achieving Social sustainability in Urban Context through Theory of Affordance. *Procedia Engineering*, *198*, 17–25. https://doi.org/10.1016/j.proeng.2017.07.070

Mesch, G. S., & Manor, O. (1998). Social Ties, Environmental Perception, and local attachment. *Environment and Behavior*, *30*(4), 504–519. https://doi.org/10.1177/001391659803000405

Miles, R., & Song, Y. (2009). Good" neighborhoods in Portland, Oregon: Focus on both Social and Physical environments. *Journal of Urban Affairs*, *31*(4), 491–509. https://doi.org/10.1111/j.1467-9906.2009.00457.x

Moulay, A., Ujang, N., & Said, I. (2017). Legibility of neighborhood parks as a predicator for enhanced social interaction towards social sustainability. *Cities*, *61*, 58–64. https://doi.org/10.1016/j.cities.2016.11.007

Mouratidis, K. (2018). Is compact city livable? The impact of compact versus sprawled neighbourhoods on neighbourhood satisfaction. *Urban Studies*, *55*(11), 2408–2430. https://doi.org/10.1177/0042098017729109

Nash, V., & Christie, I. (2003). *Making sense of community*. Institute for Public Policy Research.

Neal, Z. (2010). Seeking common ground: Three perspectives on public space. *Proceedings of the Institution of Civil Engineers: Urban Design and Planning*, *163*(2), 59–66. https://doi.org/10.1680/udap.2010.163.2.59

Ng, M. K., Cook, A., & Chui, E. W. T. (2001). The Road not travelled: A sustainable urban regeneration strategy for Hong Kong. *Planning Practice and Research*, *16*(2), 171–183. https://doi.org/10.1080/02697450120077370

Nunnally, J. C., & Bernstein, I. H. (1994). *The assessment of reliability*. McGraw-Hill.

Park, S. H., & Park, B. H. (2012). Influence of neighborhoods characters on social capital. *Social Welfare Policy*, *39*(2), 85–123.

Pierson, J. (2002). *Tackling social exclusion*. Routledge.

Polese, M., & Stren, R. (2000). Understanding the new sociocultural dynamics of cities: Comparative urban policy in a global context. In M. Polese, & R. Stren (Eds.), *The Social sustainability of cities* (pp. 3–38). University of Toronto Press. https://doi.org/10.3138/9781442682399

Porta, S., & Renne, J. L. (2005). Linking urban design to sustainability: Formal indicators of social urban sustainability field research in Perth, Western Australia. *URBAN DESIGN International*, *10*(1), 51–64. https://doi.org/10.1057/palgrave.udi.9000136

Pot, F. J., van Wee, B., & Tillema, T. (2021). Perceived accessibility: What it is and why it differs from calculated accessibility measures based on spatial data. *Journal of Transport Geography*, *94*, 103090. https://doi.org/10.1016/j.jtrangeo.2021.103090

Rydin, Y., & Pennington, M. (2000). Public participation and local Environmental Planning: The collective action problem and the potential of social capital. *Local Environment*, *5*(2), 153–169. https://doi.org/10.1080/13549830050009328

Sachs, I. (1999). Social sustainability and whole development: Exploring the dimensions of sustainable development. In E. Becker, & T. Jahn (Eds.), *Sustainability and the Social Sciences* (pp. 25–28). Zed Books.

Schwanke, D. (2003). *Mixed-use development handbook*. Urban Land Institute.

Shaftoe, H. (2000). Community safety and actual neighbourhoods. In H. Barton (Ed.), *Sustainable communities: The potential for eco-neighbourhoods* (pp. 230–245). Earthscan Publications.

Shirazi, M., & Falahat, S. (2012). Compact urban form, question or solution? Examining the compact city in the Middle Eastern context: Challenges and opportunities. *International Journal of Urban Sustainable Development*, *4*(2), 246–259. https://doi.org/10.1080/19463138.2012.694817

Shirazi, M. R., & Keivani, R. (2019). Urban social sustainability: Theory, policy and practicepolicy. In *Urban Social Sustainability: Theory, Policy and Practicepolicy* (Issue February 2019). https://doi.org/10.4324/9781315115740

Shirazi, M. R., & Keivani, R. (2021). Social Sustainability of Compact Neighbourhoods evidence from London and Berlin. *Sustainability*, *13*(4), 2340. https://doi.org/10.3390/su13042340

Shirazi, M. R., Keivani, R., Brownill, S., & Butina Watson, G. (2022). Promoting Social sustainability of Urban Neighbourhoods: The case of Bethnal Green, London. *International Journal of Urban and Regional Research*, *46*(3), 441–465. https://doi.org/10.1111/1468-2427.12946

Silburn, R., Lucas, D., Page, R., & Hanna, L. (1999). *Neighbourhood Images in Nottingham: Social Cohesion and Neighbourhood Change*.

Soltani, S., Gu, N., Ochoa, J. J., & Sivam, A. (2022). The role of spatial configuration in moderating the relationship between social sustainability and urban density. *Cities*, *121*, 103519. https://doi.org/10.1016/j.cities.2021.103519

Southworth, M. (2005). Designing the Walkable City. *Journal of Urban Planning and Development*, *131*(4), 246–257. https://doi.org/10.1061/(ASCE)0733-9488(2005)131

Stender, M., & Walter, A. (2019). The role of social sustainability in building assessment. *Building Research & Information*, *47*(5), 598–610. https://doi.org/10.1080/09613218.2018.1468057

Stokols, D., & Shumaker, S. A. (1981). People in places: Transactional view of settings. In J. H. Harvey (Ed.), *Cognition, social behavior, and the environment* (pp. 441–488). Lawrence Erlbaum Associates.

Stott, B. M., Stott, N., & Wiles, C. (2009). *Learning from the past? Growth areas and new communities*.

Talen, E., & Koschinsky, J. (2014). Compact, Walkable, diverse neighborhoods:Assessing Effects on residents. *Housing Policy Debate*, *24*(4), 717–750. https://doi.org/10.1080/10511482.2014.900102

Weingaertner, C., & Moberg, Å. (2014). Exploring Social sustainability: Learning from perspectives on Urban Development and companies and products. *Sustainable Development*, *22*(2), 122–133. https://doi.org/10.1002/sd.536

Wood, L., Frank, L. D., & Giles-Corti, B. (2010). Sense of community and its relationship with walking and neighborhood design. *Social Science and Medicine*, *70*(9), 1381–1390. https://doi.org/10.1016/j.socscimed.2010.01.021

Woodcraft, S. (2012). Social Sustainability and New Communities: Moving from Concept to Practice in the UK. *Procedia - Social and Behavioral Sciences*, *68*, 29–42. https://doi.org/10.1016/j.sbspro.2012.12.204

Ye, N., Kita, M., Matsubara, S., Okyere, S. A., & Shimoda, M. (2021). Socio-Spatial changes in Danwei Neighbourhoods: A case study of the AMS Danwei compound in Hefei, China. *Urban Science*, *5*(2), 35. https://doi.org/10.3390/urbansci5020035

Yiftachel, O., & Hedgcock, D. (1993). Urban social sustainability: The planning of an australian city. *Cities*, *10*(2), 139–157. https://doi.org/10.1016/0264-2751(93)90045-K

Yin, L. (2013). Assessing walkability in the City of Buffalo: Application of Agent-Based Simulation. *Journal of Urban Planning and Development*, *139*(3), 166–175. https://doi.org/10.1061/(ASCE)UP.1943-5444.0000147

Yoo, C., & Lee, S. (2016). Neighborhood built environments affecting Social Capital and Social Sustainability in Seoul, Korea. *Sustainability*, *8*(12), 1346. https://doi.org/10.3390/su8121346

Zhang, H., Matsuoka, R., & Huang, Y. J. (2018). How do Community Planning features affect the place relationship of residents? An investigation of Place attachment, Social Interaction, and Community Participation. *Sustainability*, *10*(8), 2726. https://doi.org/10.3390/su10082726

Zuniga-Teran, A. A., Stoker, P., Gimblett, R. H., Orr, B. J., Marsh, S. E., Guertin, D. P., & Chalfoun, N. V. (2019). Exploring the influence of neighborhood walkability on the frequency of use of greenspace. *Landscape and Urban Planning*, *190*, 103609. https://doi.org/10.1016/j.landurbplan.2019.103609