



<http://dx.doi.org/10.26450/jshsr.2130>



**Dr. Gülşah DOĞAN**

Eskişehir Technical University, Faculty of Architecture and Design, Department of Architecture, Eskişehir / TURKEY

**Citation:** Doğan, G. (2020). A framework for assessing social sustainability from the perspective of built environment. *Journal of Social and Humanities Sciences Research*, 7(60), 2989-3009.

## A FRAMEWORK FOR ASSESSING SOCIAL SUSTAINABILITY FROM THE PERSPECTIVE OF BUILT ENVIRONMENT

### ABSTRACT

Social sustainability, which aims to define, regulate, and develop social life based on human and human relations and interactions in social life, requires a multi-faceted and in-depth understanding of the relation between the built environment and society. Considering that social sustainability is fundamentally related to how people feel and behave in the built environment, the effect of the built environment on the social interactions, sense of place, sense of social ties and community, sense of safety and security, health and physical well-being, and community participation highlights the importance assessing the spatial quality of the built environment in terms of social sustainability. Based on these considerations, this study tries to answer two crucial questions regarding social sustainability: (i) With what approach and by what criteria should the built environment be addressed in order to improve social sustainability through the built environment? (ii) What method should be followed in terms of expressing the spatial characteristics of the built environment directly related to social sustainability? Thus, this study proposes a novel assessment framework, which associates the aesthetic and functional quality of the built environment with its various spatial attributes at different spatial levels, for the assessment of social sustainability.

**Keywords:** Social sustainability; built environment; aesthetic spatial quality; functional spatial quality; social sustainability assessment framework

### SOSYAL SÜRDÜRÜLEBİLİRLİĞİN YAPILI ÇEVRE PERSPEKTİFİNDEN DEĞERLENDİRİLMESİNE YÖNELİK BİR ÇERÇEVE

### ÖZET

İnsanı ve insanın toplumsal yaşamdaki ilişkilerini/etkileşimlerini temel alarak sosyal yaşamın tanımlanmasını, düzenlenmesini ve geliştirilmesini amaçlayan sosyal sürdürülebilirlik, yapılı çevre ve toplum arasındaki ilişkinin çok yönlü ve iyi anlaşılmasını gerektirmektedir. Sosyal sürdürülebilirliğin temelde insanların yapılı çevre içinde kendilerini nasıl hissettikleri ve nasıl davrandıklarıyla ilişkili olduğu düşünüldüğünde, yapılı çevrenin sosyal etkileşimler, yer duygusu, sosyal bağlar ve topluluk duygusu, emniyet ve güvenlik duygusu, sağlık ve fiziksel refah ile toplumsal katılım üzerindeki etkisi yapılı çevrenin mekansal kalitesinin sosyal sürdürülebilirlik bağlamında değerlendirilmesinin önemini belirginleştirmektedir. Bu düşünceler temelinde bu çalışma sosyal sürdürülebilirlik ile ilişkili iki önemli soruya cevap aramaktadır: (i) Yapılı çevre yoluyla sosyal sürdürülebilirliği geliştirmek için yapılı çevre hangi yaklaşımla ve hangi ölçütlerle ele alınmalıdır? (ii) Yapılı çevrenin sosyal sürdürülebilirlik ile doğrudan ilişkili mekansal niteliklerini ifade etmek bağlamında nasıl bir yöntem izlenmelidir? Bu bağlamda ele alınan bu çalışmada, sosyal sürdürülebilirliğin değerlendirilmesine yönelik olarak yapılı çevrenin estetik ve işlevsel kalitesini farklı mekan seviyelerindeki çeşitli mekansal niteliklerle ilişkilendiren özgün bir değerlendirme çerçevesi önerilmiştir.

**Anahtar Kelimeler:** Sosyal sürdürülebilirlik; yapılı çevre; estetik mekansal kalite; işlevsel mekansal kalite; sosyal sürdürülebilirlik değerlendirme çerçevesi

## 1. INTRODUCTION

Social sustainability, which initially constitutes the weakest link of the sustainable development idea defined by the environmental, economic and social dimensions in [1], has evolved towards a higher definition that includes important goals for the purpose of sustainable development. This situation has resulted in a new perspective and a complete paradigm change in the idea of sustainable development. From the point of this perspective, economic and environmental sustainability is defined as the goal of sustainable development and the means for its success [2]. In addition, sustainable development research is initially limited to environmental and economic issues as well. However, social sustainability has

gained increased recognition as a fundamental component of sustainable development only in recent years [3]. As a result of this recognition, social sustainability has become increasingly intertwined with the sustainable communities and urban sustainability discourses [3], and social sustainability, in fact, has been seen to refer to the whole of sustainable development [2]. Nowadays, the increasing importance of social sustainability has brought the need for more research on social sustainability from the perspective of the built environment. In order to form a basis for such a research study, one must consider several dimensions related to social sustainability, each of which will be briefly elaborated in the following.

The quality of life is one of the best indicators of social sustainability in the built environment [4]. According to [5], the socially sustainable societies offer a good quality of life, and social sustainability is a situation that advances life in society and a process through which this high situation can be achieved. In another definition of social sustainability that emphasizes the process, the relationship between the built environment and social sustainability is drawn attention by defining social sustainability as “a process for creating sustainable, successful places that promote well-being, by understanding what people need from the places where they live and work [6]”.

According to [7], the goal of sustainable development is to construct built environments that enhance the quality of life. On the other hand, the importance of the built environment in terms of social sustainability is emphasized, and five interrelated elements are defined on the basis of common aspects of social life in a socially sustainable society. These elements, which are related to the characteristics of the built environment, are described as social interaction, participation in collective groups or social networks in a community, social stability, pride and sense of place, and safety and security [8]. In this context, “social sustainability is about people’s quality of life, now and in the future, and it describes the extent to which the built environment supports individual and collective well-being, and social sustainability combines the design of the physical environment with a focus on how people who live in and use a space relate to each other and function as a community” [9].

Social sustainability is associated with providing social equity, social inclusion, and social capital in the built environment [10]. In such a built environment, the social interaction and social stability in society are cared for, the social participation is supported for all individuals, the human health and well-being are improved, the spatial justice is ensured, the safety and security feelings are established, and the sense of belonging and place attachment to the living environment are felt. However, every step towards shaping such a built environment makes an effect on social life as well. This situation requires that the design of the built environment and the design of social life be considered together in terms of social sustainability. This is due to the fact that social sustainability is on the one hand opportunities offered by the built environment to its users and the possibilities to access these opportunities, and on the other hand an effort to produce a built environment that responds to the dynamics of social life to be accepted by the society. This point of view is an important situation related to the fact that social sustainability is both a result and a process.

The interactions between the social life and built environment bring the spatial attributes of the built environment to the fore in terms of social sustainability. Emphasizing the effect of the built environment on the social relations and social interactions, the environmental variables affect the frequency and quality of social connections and the physical design features of built environment enhance the sense of community [11]. According to [4], which underlines the social interactions in the built environment in terms of social sustainability, social interactions are recognized as a common issue among the definitions of social sustainability. This is due to the fact that a socially sustainable society requires that people need to work together and interact. Furthermore, the social interactions and social loyalty in society are needed to reach a certain level of life quality, and the social interactions create a community feeling and establish a common sense of purpose and other social benefits [4]. Both the social interaction among people and the long-term effect of the social interaction on the built environment are remarked in [12]. On other hand, according to [13], the absence of the social interactions in an urban environment leads to greater urban problems such as threats to the safety and to the sense of security of the residents.

Social sustainability is an important indicator that reveals the quality of life and well-being of people and communities. The livability of the built environment as an indicator of the quality of life is also one of the main determinants of social sustainability in the built environment. The livability level of the built

environment basically lies at the intersection between space and social sustainability. In this context, the extent to which the built environment allows the encouragement and improvement of social sustainability in social life (individual or social) becomes directly related to the spatial characteristics of the physical environment. According to [14], the criteria used to define the spatial attributes of the built environment are functional quality, technical quality, aesthetic quality, and economic quality. Furthermore, these criteria collectively reveal the spatial quality, which provides the opportunity to evaluate the competence of the built environment in meeting the user needs associated with social sustainability.

Among the spatial quality components, the criteria of the functional quality and the aesthetic quality provide a more important framework for social sustainability in the built environment. According to [15], which establishes a relationship between the functional qualities of space and the socio-cultural purpose and values, express the functional qualities of space as a reflection of the socio-cultural goals and values related to the shaping of the space. This perspective basically emphasizes the importance of functional quality in the context of social sustainability. On the other hand, in [16], it is emphasized that the aesthetic quality can contribute to the well-being level and quality of life of people. In addition, the venues with aesthetic quality create an important opportunity to encourage social interaction, support the integrity of the local community, keep the social pride alive, and strengthen social ties. As a result, based on the aforementioned studies, dealing with social sustainability in the built environment on the basis of functional quality and aesthetic quality constitutes a meaningful and comprehensive study field.

Whether it is taken as a process as a result, it is not easy to make a social sustainability assessment in the built environment due to its dynamic and multi-layered nature. On the other hand, the multi-faceted and better understanding of the relationship between the built environment and society is increasingly important in the context of social sustainability. It is a fact that most of the social sustainability criteria are directly related to the spatial attributes of the built environment as well. Consequently, developing a framework that will ensure the assessment of the spatial attributes of the built environment on the basis of social sustainability will definitely contribute to the social sustainability studies by means of presenting a unique perspective. In light of these considerations, this study proposes a framework for the assessment of social sustainability. This framework associates the aesthetic and functional quality of the built environment with the different spatial attributes of the built environment at different spatial levels, starting from the building's spatial structure to its relations with the surroundings. It should be emphasized that the effects of the aesthetic and functional attributes on the livability of the built environment and users are proved to be very comprehensive. The proposed framework provides a method for addressing this comprehensive structure within a well-established systematic point of view. This point of view makes it possible to present the criteria of the aesthetic quality and the functional quality using the specialized study topics as building's spatial structure, building's form, location and orientation of the building, openings in the building, open and semi-open spaces associated with the building, building-vegetation relationship, building-scenery relationship, building-street relationship, and building-building relationship.

The rest of the study is organized as follows. In Section 2, the spatial quality approach will be explained from the perspective of the livability of the built environment; and the functional and aesthetic quality of the built environment will be evaluated in the context of social sustainability. In Section 3, different spatial attributes at the level of a single building and the level of its surroundings will be elaborated and discussed in the context of social sustainability. Section 4 presents the proposed framework. Finally, Section 5 will conclude this study.

## **2. SPATIAL QUALITY WITH THE DIMENSION OF SOCIAL SUSTAINABILITY**

The livability is one of the main determinants of social sustainability in the built environment as a quality of life indicator. According to [17], livability is a general term used for the various attributes of the environment related to meeting user needs, and it is connected to the opportunities of the environment as a whole and the relative access to these opportunities. In addition, in [18], Preiser explains the livability (habitability framework) based on the competencies of space to satisfy the user needs that arise due to the interaction of the built environment with users. These needs, on the other hand, are actually building performance indicators, and these indicators are evaluated under three headings: health, safety

and security level, functionality and efficiency level, and psychological comfort and satisfaction level in [18]. Preiser points out that his building performance evaluation is in parallel to the building performance evaluation of Roman architect Vitruvius who lived in the 1st century BC. The building performance indicators described by Vitruvius are utility (*utilitas*), durability (*firmitas*), beauty (*venustas*), which are still valid today. In addition to these approaches, Voordt and Wegen [14] define the measurable and subjective features of a building under four main headings as functional quality, technical quality, aesthetic quality, and economic quality. Specifically, the criteria defined in these studies are given in Table 1.

**Table 1.** Indicators for the Performance and Quality of a Building

| Vitruvius [14] | Preiser [18]                                 | Voordt and Wegen [14] |
|----------------|--|-----------------------|
| Utility        | Functionality and efficiency level           | Function              |
| Durability     | Health, safety and security level            | Technology            |
| Beauty         | Psychological comfort and satisfaction level | Aesthetics            |
|                |  | Economy               |

At the intersection of the spatial quality of the building or built environment, which can be evaluated based on Table 1, and social sustainability, space has a character that develops the social interaction of space [11], the sense of place [19], the sense of place attachment [20], the sense of safety and security [21], and the sense of comfort [22]. However, in order for a space to develop these senses, the interaction of people with space and other people and understanding this interaction are required in terms of the following: (i) Space should be designed and used in a way to serve the desired purposes in social life [23, 24]. (ii) It should be well-integrated into the environment with flexible and adaptable qualities and create long-term value [25]. (iii) Space should stimulate interactions in social life by supporting those activities that are desired to take place in the space effectively and efficiently [14, 26]. (iv) It should create a living space by establishing social bonds [27] and improve the health, comfort and satisfaction level of its user [16], [28-30]. Based on these points, addressing the spatial attributes of a building or built environment on the basis of spatial quality provides the opportunity to evaluate their competences in meeting user needs. In this study, the spatial attributes of a building or built environment are evaluated on the basis of functional quality and aesthetic quality, and they are evaluated in terms of social sustainability.

## 2.1. Functional Quality of Built Environment

An important aspect that will make the built environment livable by supporting its safe, healthy, productive, effortless, and comfortable use is the functional quality of space. In [15], a relationship between the functional qualities of space and the socio-cultural purposes and values is established. In this relationship, these qualities are expressed as a reflection of the socio-cultural goals and values related to the shaping of space. In addition, these goals and values constitute a reference to the basic appearance of a space. It is also possible to express this situation as the effect of the socio-cultural goals and values on the functional qualities.

The functional quality plays an important role in supporting human activities in the built environment. According to [31], the better the quality of the space, the greater the increase in optional activities. The spaces that can meet all functional requirements are the places that provide opportunities for social interaction among people, where equal reach and access opportunities are fulfilled for everyone, and productive, healthy and safe working and living environments are created. Moreover, the functional quality of a built environment directly affects the ability of users to maintain their social lives. However, the places that are not used for their intended purposes and that do not support activities and human relations or interactions appropriately face the danger of transforming into non-living spaces over time. With respect to [23], the lost spaces that are not associated with use do not contribute positively to their environment or users, and therefore need to be redesigned. This is because those spaces that have lost their functionality and social meaning are the ones that lead their environment to be transformed into problematic areas. As a result, the unused environments become desolate over time and turn into places with security and health problems for social life.

The functional quality is also related to the usability of the built environment, and it is an expression of the extent to which it is suitable for the actions that can take place within it. At this point, the criteria for

evaluating the functional quality of space are determined by [14] as reachability and parking facilities, accessibility, efficiency, flexibility, safety and security, spatial orientation, privacy, territoriality and social contact, health and physical well-being, and sustainability. These criteria constitute a comprehensive assessment area in terms of comprehending the relationship between the built environment and social sustainability. Therefore, in this study, they are used as the criteria that define the functional quality of space. However, the sustainability criterion is not addressed in a separate section, since it includes all social sustainability issues that can be covered under the other criteria.

## 2.2. Aesthetic Quality of Built Environment

The aesthetic quality is defined by [14] as a spatial quality component related to how beautiful and encouraging the space is perceived, its harmony with the original texture and culture of the city, and how it is experienced and interpreted by the user. According to [16], the aesthetic quality is relevant to the attractiveness of a site (curtilage), municipality or city, and it is important in terms of contributing to the well-being and quality of life of people who live, work or visit there. Furthermore, this standard states that creating and maintaining aesthetic quality can help to mitigate the impacts of cultural globalization and become an incentive for sustainable economic development.

The existence of spaces that are defined only through the functional requirements without taking the aesthetic values into consideration will cause a routine sameness and perceiving all spaces with the same meanings. In terms of fostering social sustainability, on the other hand, the spaces with aesthetic values that make a difference in their surroundings are required. The extraordinary buildings with a distinctive character stand out as a sign in their surroundings. These buildings with their mass and surface formations also have the effect of developing a sense of belonging, place attachment, and local identity. In addition, a building reveals various values regarding the aesthetic quality through attributes, such as its spatial structure, its form and mass, materials used in the building, the texture and color of its facades, its openings, its relationship with the street, its relationship with other spaces or structures around it, its scale in the surroundings, its relationship with the human scale, etc. Schulz [32], in his work named *Geniuc Loci*, states that the identity of the place is the precondition of the human identity.

According to [33], which discusses the aesthetic quality of space in the context of formal and symbolic aesthetics, the formal aesthetic emphasizes the structure of the form, and the symbolic aesthetics focuses on the content and meaning of the form. The formal and symbolic aesthetic qualities of the built environment together become the determinants of the image, identity and meaning values of that environment. These values encourage social interaction, support the integrity of the local community, keep social pride alive, and strengthen social ties. Therefore, within the scope of this study, the aesthetic quality criterion has been discussed in terms of highly interrelated concepts of the image value, the identity value, and the meaning value of buildings.

## 3. SOCIAL SUSTAINABILITY AT DIFFERENT SPATIAL LEVELS

The built environment is the sum of the physical components that constitute the interior attributes of the buildings and their surroundings relations. The interior attributes of a building and its relationship with the surroundings, together, are the organization of spatial components that meet the needs of users, such as social interaction, social inclusion, social equality, social justice, sense of place, social ties and sense of security. This organization also determines the livability of the built environment in terms of physical, social and cultural aspects. For this reason, the physical components of a built environment (such as form, location, openings, open and semi-open spaces, etc.) should be evaluated with their influence on the relations and interactions in social life, beyond limiting a volume. During the evaluation of these components in terms of social sustainability, the built environment, which sometimes has unifying, separating, limiting or directing features, becomes the determinant of the way people participate in social life. That's why people feel different emotions and exhibit different behaviors in environments with different physical characteristics. Considering that social sustainability is basically related to how people feel and behave in the built environment, the effects that are listed in the following become important in the built environment:

- The effect of the built environment on social interaction [4], [11], [12], [35], [36]
- The effect of the built environment on the sense of place [19], [20], [34] [37-42]



- The effect of the built environment on social ties and sense of community [4], [11], [34], [43-47]
- The impact of the built environment on the sense of safety and security [4], [21], [28], [34], [48-54]
- The impact of the built environment on health and physical well-being [27-30], [47], [55-57]
- The impact of the built environment on social participation [4], [34], [41], [54], [58-60]

### **3.1. Social Sustainability at the Level of a Single Building**

#### **3.1.1. Building's Spatial Structure**

The spatial structuring of a building is basically related to the organization of the physical and visual attributes of space, among which the function of the building is one of the most important components. According to [61], "the function is a characteristic spatial pattern, and a characteristic part of an overall spatial pattern". It is possible to express the concept of spatial pattern in this definition as the organization of spaces and the way that the relations between spaces come together. In addition, the relations between spaces have an effective role in the spatial organization of the building in general. On the other hand, the methods used in the positioning and functioning of spaces also affect the spatial relationships that will determine the degree of functional efficiency of these spaces. The organization of spaces actually means the organization of relations among people in this two-way relationship between the spatial structuring and spatial relations [61].

In the context of the spatial structuring of building, it is possible to talk about a successful space organization that will promise social sustainability only when it is possible for all users to easily access all spaces within the building; when the expected levels of privacy and social interaction are provided; when flexible usage opportunities are created for all users; when the spaces are reached easily and without the risk of being lost within the building; when the sense of belonging, loyalty and trust are felt.

#### **3.1.2. Building Form**

The mass and surface formation of a building creates both an original character, image and identity of the outdoor space in the context of the relationship that it establishes with its surroundings, and affects the perception and movement of the outdoor user in terms of its approach to the building. In relation to the building form, the formal elements such as scale, proportion, transparency, openings, mass movements provide visual and physical participation of a building in the outdoor in different ways. Furthermore, with their mass and surface formations, buildings can contribute to the process of creating a strong local identity. The relations established through actions and activities that take place in closed, open and semi-open spaces can create a strong social unity. In this context, the mass and surface formations of buildings are of great importance in terms of the relationship they will establish with social life, together with the use of indoor and outdoor spaces.

A building that attracts attention by its mass and surface formation enriches the spatial experiences of its users in that built environment. That users find a place beautiful, interesting and original makes them spend more time in that place. Those buildings with distinctive character in their surroundings provide people with information about where they are and contribute to the legibility of that environment.

#### **3.1.3. Location and Orientation of the Building**

One of the most important parameters that will ensure social sustainability in relation to the location of the building is to provide accessibility, which is one of the most basic human rights, to services and facilities that are needed in the built environment. All people in a built environment have the right to access all kinds of services and facilities of public value [62]. Therefore, accessing all basic services within certain distances in relation to the location of the building is a must. Furthermore, the accessibility is defined by [58] as "the ability of people to access and participate in opportunities and activities" and it is placed at the center of social justice and social inclusion policies. Social justice can be achieved by ensuring that people have access to a range of activities that are typical for their society which they live in. In terms of social inclusion, which is defined as the participation of people in society, more participation requires more accessibility.

In a built environment, the accessibility that is provided by not only motor vehicles but also slow transportation methods such as walking and cycling is important for social sustainability as well. The accessibility by means of slow transportation methods has the potential to increase individuals' social interactions and relationships. The fact that the location of a building allows physical activities directly affects the usability and livability of the built environment. For this reason, the location and orientation decisions in terms of social sustainability should be made by taking the transportation facilities and the ease of access to these facilities into account.

### **3.1.4. Openings in the Building**

The openings in the building establish the relationship between indoor and outdoor spaces and organize the spatial flow and orientation. The openings are an indication of human existence in space and they reveal life in the interior [63]. According to [64], the openings provide a unique interaction between the life inside the building and the street; but, viewing a street from the window is most successful on the second and third floors. In addition, the street becomes just sight at higher floors and the vitality of the interaction is lost.

The openings in the building due to the relationship established with outdoor space have a direct impact on the user's health, comfort and well-being as well. In this context, it has been observed that the visual communication with nature is particularly beneficial, which reduces stress, provides mental relaxation, improves the perceived quality of life, improves emotional functionality, and significantly increases psychological functionality and job satisfaction [65]. According to [66], the windows close to workstations are highly valued for the office workers and these windows are a source of satisfaction with the physical environment.

### **3.1.5. Open and Semi-Open Spaces Related to the Building**

The attributes of the open spaces on the ground floor and the courtyard spaces create social interaction by providing visual and physical contact at various degrees between the building and the exterior. These spaces support the interaction of indoor and outdoor spaces and establish a connection between the interior and the external public space.

The ground floors are attractive places for users that use streets and other urban spaces since the visual contact of users outside with the building is primarily provided at the ground floor level. For the ground floors, [31] uses the expression "the place where the building meets the city, the city dwellers have close contact with the buildings, we can touch the buildings and the buildings can touch us". In this context, the nature of the uses at the ground floor level, the relationship of these uses with the whole building, and the way the ground floors open to the outside affect the perception of the interior and exterior users and the use of space. In addition, the diversity of use on the ground floors attracts many people to space and supports the vital activities in urban space [67]. Thus, it positively affects the use of the urban space by supporting the use of the spaces around the building. According to [63], usage diversity is an important factor in the visually attractive appearance of urban spaces and visual experiences of people. This situation both ensures the continuity of the user density on the streets and other urban spaces and creates an effect that reinforces the sense of security in people. As a result, the presence of ground floors (terraces, ground floor cafes, etc.) associated with the building, which is also opened to the outside, in order to meet the needs of indoor users, both increase the usability and general acceptance of the building and enrich the social life of users.

Either open or semi-open spaces associated with a building, the courtyards are the areas that are enclosed by a building or wall, and open to the sky. The primary purpose of the courtyard is to provide light and air to the spaces surrounding it, and the secondary purpose is to create a sheltered or private outdoor space that can be used in conjunction with the interior spaces of the building [68]. The courtyards, which exist in different ways within the building, are associated with both the spaces in the building and the built environment which the building is located in. This spatial diversity has different potentials in terms of spatial perception and functionality. While the courtyard space sometimes creates an entrance area for the building in direct connection with the street, sometimes it can be a more private space that can be accessed from various places of the building. In this context, the way the courtyard participates in the building actually becomes the determinant of the way it takes place in social life. According to [69], on

the other hand, the most important advantage of the buildings with courtyards is security and privacy. Depending on the function of the building, the need for greater security and privacy, or the desire to strengthen social interaction through the courtyard space is related to the positioning characteristics of the courtyard within the whole building.

The nature of open spaces is seen as an important factor in terms of enhancing people's satisfaction and quality of life, promoting better use of urban spaces, and increasing the social, environmental and economic value of the built environment [67], [70]. By transferring various actions related to the function of the building to the courtyard as being an open space (for example, the therapy space for the hospital, the playground for the school, the meeting place for the residential group, etc.), and the interior-exterior union is created, which significantly contributes to the usability and image of space.

### **3.2. Social Sustainability at the Level of Surrounding Environment**

#### **3.2.1. Building-Vegetation Relationship**

Plants in the immediate vicinity of a building have effects, such as providing shade to spaces, blocking wind, reducing the effect of wind, directing wind, shifting airflow, filtering dust, defining space, and directing view. Planting provides protection especially in summer from the direct sunlight coming into the building and from the reflected rays with heat energy from the soil or other surfaces, for the building [72]. Grass and other ground covers in the immediate vicinity of the building can reduce the temperature of the air by absorbing the sun's rays and providing cooling through evaporation.

The building-vegetation relationship meets a psychological need for people to see plant species such as trees, flowers and grass in the built environment and contributes positively to the creation of a sense of trust in the built environment. According to [72], which points out that the afforested outdoor spaces are used better than the treeless spaces, planting has a negative relationship with total crimes, property crimes, and violent crimes in neighborhoods. In this context, in [72], it is further underlined that the green areas in residential areas are positively associated with increased social security. [72] draw attention to the nature of planting, and the shrub-like plants that obstruct the view create more fear than the tall and overgrown trees, and the high vegetation is associated with the less fear of crime. Similarly, investigating the relationship between green spaces and people's sense of social security, [52] states that more green spaces in people's living environments are associated with increased feelings of social security, as opposed to being seen as a dangerous hiding place for criminal activities that cause feelings of insecurity. However, it should be noted that the vegetation in the built environment should be carried out in a way that provides clear visibility without creating hiding spots.

#### **3.2.2. Building-Scenery Relationship**

The presence of the scenery creates an important environmental value for space. The surrounding scenery or the viewpoints to larger field results in the spaces where people can feel physically and psychologically comfortable and peaceful. According to [47], which establishes a relationship between outdoor views and human health, providing visual and/or physical access to outdoor spaces through large windows, pleasant outdoor views, balconies, and courtyard spaces are helpful elements for a healthy mental state. Furthermore, the potential of the built environment to improve health outcomes in relation to the impact of that environment on coping with stress and facilitating recovery is evaluated in [47].

According to [55], nature or the experiences in nature may have positive effects on human health and well-being. Based on these effects, [55] further claims that the buildings that contain the properties of natural environments and nature's stimulants, such as plants indoors or in the landscape, and the buildings with exterior views support human health and well-being. In the studies conducted by [65], it was revealed that the view that can be observed from a hospital bed has an effect on the patient's health. In these studies, it was found that the healing times of patients looking at the wall view are longer than that of the ones looking at nature view, the windowless rooms have a negative effect especially on critical patients, and the depression patients whose room windows are looking at natural areas leave the hospital in much shorter times.



In [73], the effects of outdoor views and indoor plants in workplace environments on the human physiological response are examined. Specifically, six different situations are studied, which are (i) window with city view, (ii) window with city view and indoor plants, (iii) window with nature view, (iv) window with nature view and indoor plants, (v) office, without windows view and plants, (vi) office with only indoor plants, without window view. According to [73], the participants are less nervous and less anxious when looking at nature and/or when indoor plants are found, and they experience a high degree of tension and anxiety when outdoor vision and indoor plants are not available.

### 3.2.3. Building-Street Relationship

Streets are the places that connect the local urban community, as well as providing transportation within the built environment. In this respect, the street is not only a physical element in the city but also a social element [74]. Strong streets should play a role in helping the formation of society and supporting the integration of people [75].

The building attributes that affect the livability of space and the social life of people in terms of the building-street relationship are basically the geometry of the buildings and their position relative to each other. Through the geometry of the building, the internal-external relations that are created by the spaces, such as balconies, terraces, cascades in mass, level differences, arcaded ground floors, ground floors raised on columns affect the formation of the actions and activities associated with the use of the building and its surrounding. Especially the building's windows opening to streets, balconies, entrances, and open spaces on the ground floors are the elements that have an effect on the formation of social relations and that stimulate social interaction. Building edges, one of the components related to the geometry of the buildings, are the spatial elements that support the use of both the building and the urban space as well. If the edges are not successful, space will definitely not be alive [64]. Unless the building is directed to the outer space surrounding it, the space around the building will be useless and empty. In the long term, such a situation causes the building to be socially isolated. On the other hand, the fact that the building edges are alive makes the building a part of the social fabric and the city. This is actually the feeling that makes space a place. According to [19], we grasp places with our action-based knowledge. In addition, the place is not dead like a location, it has nature containing life, and it represents a way of taking root for human existence and experience. For this reason, the building geometries and building edges, which play an important role in making a space a place, gain importance in terms of social interaction, place attachment, and a sense of trust.

In the building-street relationship, the locations of buildings relative to each other are important since they determine the spatial enclosure. According to [76], the spatial enclosure refers to the degree to which streets and other urban areas are visually defined by buildings, walls, trees, and other vertical elements. The ratio of the street width to the building height should be 1 or close to 1. If this ratio is less than 1, it may create a fear of closed space and reduce the light entrance to the spaces. If this ratio is greater than 1, it will create an expansion in the space and cause the loss of the spatial effect [77]. According to [64], which states that there is a feeling of comfort in the outdoor spaces that have a certain degree of enclosure, people organize various activities and participate in social activities. The effect of enclosure in the building-street gives the feeling of being surrounded and the space becomes easily legible due to the feeling of enclosure. The fact that people can easily define the place they live in makes them feel comfortable and safe in psychological terms. According to [78], creating a good spatial enclosure in the streets has positive effects on safety as well as aesthetics. [78] also draws attention to the relationship between the spatial enclosure and crime potential in space, and states that a strong enclosure effect has a significant effect on pedestrian safety. Accordingly, the buildings located continuously along the sidewalk provide eyes on the street, which can deter crime-related activities. In addition, the side-by-side location of buildings also limits dark and scary hiding zones among buildings, and reduces the number of escape routes available for criminals trying to escape.

### 3.2.4. Building-Building Relationship

With respect to the geometry and location of a building, the geometry and positioning of the other buildings (detached, adjacent, side by side, or mutual positioning on the street, etc.) and their height relations are the factors that create obstacles in the built environment in terms of daylight, natural ventilation, and outdoor views. Thus, the formal features of the built environment become important in

terms of the outdoor microclimate [71], [79-84]. In addition, the climatic comfort conditions of the outdoor space due to the building-building relationship affect the user preferences as well. People who do not feel comfortable in a place due to extreme heat, low temperature caused by shadows during the day, and disturbing wind effects may tend to move away from that place. On the other hand, social sustainability focuses on the fact that people are healthy, comfortable, prosperous, and productive in the built environment. This situation requires that the climatic comfort conditions be provided in the physical space. According to [84], promoting the idea of designing the city's buildings in relation to the adjoining outdoor spaces will encourage the development of building proposals that simultaneously address the quality of the urban spaces that emerge. Such spaces can foster a vibrant urban social life by accommodating a myriad of activities in order for the built environment to reach a more sustainable future. Environments with a suitable microclimate contribute to social sustainability with their supportive effects on the use of space. The relationships between user comfort in the use of public spaces and the effect of microclimate conditions have been associated with walkability and liveliness of public spaces in [85], [86]. On the other hand, improving the quality of outdoor spaces in relation to microclimatic effects has an effect on user comfort and actions such as walking, sitting and waiting [87].

#### **4. ASSESSING SOCIAL SUSTAINABILITY IN THE CONTEXT OF BUILT ENVIRONMENT**

Social sustainability, the importance of which becomes more evident in the context of mutual interactions between social life and built environment, is basically evaluated by the opportunities offered by the built environment to its users on the basis of health, comfort, and well-being and access to these opportunities. Thus, a social sustainability assessment approach in the context of the built environment must be directly related to user satisfaction and the performance of the spaces that determine this satisfaction. In the light of these rationales, this study emphasizes the need to grasp the spatial characteristics of the built environment and its relationship with social sustainability, and thus proposes a framework that will enable social sustainability to be considered and assessed in the context of the built environment.

##### **4.1. Need for an Assessment Framework**

Every step taken in shaping the built environment has a direct or indirect impact on social sustainability. However, when it is aimed to develop social sustainability through the built environment, the spatial qualities that will directly affect social sustainability and the way of assessing these spatial qualities become more noticeable. In the context of revealing the mentioned spatial qualities of the built environment, this study basically seeks answers to two questions:

1. With what approach and by what criteria should the built environment be addressed in order to improve social sustainability through the built environment?
2. What method should be followed in terms of expressing the spatial characteristics of the built environment directly related to social sustainability?

The first question requires discussing social sustainability in relation to space and understanding how social sustainability can be improved in the built environment. In this context, the approach known as the spatial quality allows the spatial qualities of the built environment to be discussed in the context of social sustainability. On the basis of this approach, especially the aesthetic and functional quality criteria make it possible to consider the competencies of the built environment to meet the user needs from the perspective of social sustainability. On the other hand, the second question brings forward the development of a method to grasp the spatial characteristics of the built environment that directly affect social sustainability in a meaningful order. Such a method should further offer a perspective that will deal with social sustainability in the built environment in a holistic approach.

It is observed in the studies in the literature, which consider the relationship between the built environment and social sustainability, that they often confine their discussions to certain characteristics of the built environment. These discussions, which are scattered under different topics in many studies, therefore shed light only on a certain part of social sustainability. For example,

- Ulrich [65], in the design of health facilities, correlates the creation of a psychologically supportive physical environment with the enhancement of human well-being. Accordingly, the visual relationship established with the outdoor space has a direct impact on the user's health and physical well-being. As a result, this study reveals the importance of openings in the building in terms of social sustainability. However, while considering the openings in the building in the context of social sustainability, the issues of "image, identity meaning", "efficiency", "flexibility", "safety and security", "spatial orientation", and "privacy-social interaction" should also be considered as other important social sustainability components. Note that these issues are identified from the studies in the literature (as listed in Table 2 later in this section) as the spatial quality criteria related to the aesthetic and functional attributes of the built environment.
- In [80], the relationship between the wind effects in the built environment and pedestrian comfort is considered in the context of outdoor use, which is basically one of the components that emphasize the building-building relationship in the context of health and physical well-being. However, while the building-building relationship is established, "image, identity, meaning", "efficiency", "safety and security", "spatial orientation", and "privacy-social interaction" should be evaluated as other important social sustainability components as well.
- In [95], the vitality of urban streets on the basis of the relationship between spatial and social functions (street accessibility and sociability) is explained. This relationship is one of the components that reveal the building-street relationship in the context of accessibility. However, in the building-street relationship, the issues of "image, identity meaning", "reachability and parking facilities", "accessibility", "safety and security", "spatial orientation", "health and physical well-being", and "privacy-social interaction" should be considered as important aspects related to social sustainability in the built environment as well.

Rather than focusing on a single aspect of social sustainability in the built environment, which is a very comprehensive subject, a holistic and systematic perspective can provide a framework that makes it possible to see many different issues together and to establish different relations between these issues. Such a framework requires to demonstrate by which spatial quality criteria the issues associated with social sustainability can be evaluated in the built environment and through which qualities of the built environment the spatial quality established on the basis of these criteria can be achieved. With the framework proposed in this study, it may be possible to facilitate the understanding of the integrity of the relationships between the built environment and social sustainability and to create a basis for future social sustainability studies.

#### 4.2. Proposed Assessment Framework

The proposed assessment framework is shown in Figure 1 and Figure 2. In these figures, the framework focuses on spatial quality, which is evaluated based on the aesthetic and functional quality of the built environment in terms of social sustainability. These spatial quality criteria constitute a basic framework for questioning the competence of the built environment to meet user needs. Based on very detailed and up-to-date literature survey, whose results will be presented in Table 2, "image, identity, and meaning" criterion is determined to be the aesthetic quality criterion; "reachability and parking facilities", "accessibility", "efficiency", "flexibility", "safety and security", "spatial orientation", "privacy, territoriality, and social contact", "health and physical well-being" criteria are chosen to be the functional quality criteria.

In the proposed framework in Figure 1 and Figure 2, furthermore, the spatial competencies of the built environment based on social sustainability, starting from the buildings' spatial structure to their relations with the surroundings, are discussed on the basis of the different spatial attributes of the built environment at different spatial levels. In this context, the physical conditions in the built environment and the opportunities offered by the built environment to its users are evaluated on the basis of "open and semi-open spaces related to the building", "openings in the building", "location and orientation of the building", "building form", and "building's spatial structure" at the level of a single building; "building and building relationship", "building and street relationship", "building and scenery relationship", and "building and vegetation relationship" at the level of building surroundings. According to Figure 1 and Figure 2, for example, the following conclusions are possible:

- The spatial quality of a built environment based on "image, identity, and meaning" should be assessed with the attributes of the built environment that are "building and building relationship", "building and street relationship", "building and vegetation relationship", "building's form", "location and orientation of the building", and "openings in the building".
- The spatial attributes of a built environment based on "location and orientation of the building" should be assessed with the quality criteria of the built environment that are "image, identity, and meaning", "reachability and parking facilities", "efficiency", "safety and security", and "spatial orientation".

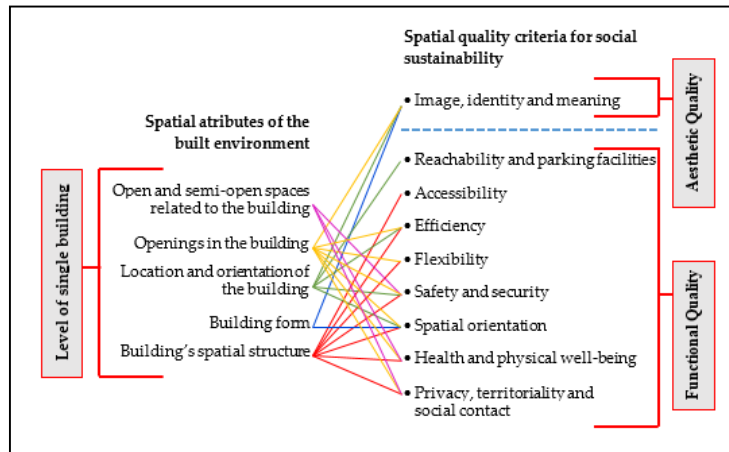


Figure 1. Relationship Between the Spatial Attributes of the Built Environment and Spatial Quality Criteria at the Level of a Single Building

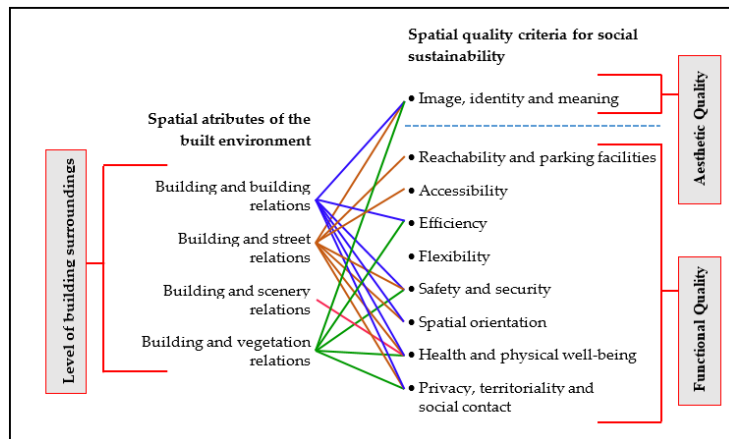


Figure 2. Relationship Between the Spatial Attributes of the Built Environment and Spatial Quality Criteria at the Level of Building Surroundings

As a result, based on Figure 1 and Figure 2, a two-way relationship between the spatial attributes of a built environment and the spatial quality criteria can be easily established. In addition, the framework proposed in these figures provides both a method to enhance social sustainability in the built environment, and a set of assessment subjects under which the quality criteria can be defined. This point of view can provide a strong basis during an architectural design process in terms of including social sustainability aspects into the design as a design guide. Furthermore, it is also possible to benefit from it during an environmental assessment of the built environment in terms of social sustainability. Figure 1 and Figure 2 are extracted from Table 2 that provides an up-to-date and throughout survey of social sustainability and the built environment. It should be emphasized that the literature survey in Table 2 includes not only the studies that directly address social sustainability but also those studies whose contents are clearly related to social sustainability, even though they do not particularly discuss social sustainability.

**Table 2.** Effects of the Spatial Quality Criteria on the Built Environment and Users, and the Importance of these Effects in Terms of Social Sustainability

|  | <b>Importance of Social Sustainability</b>   | <b>Impacts on the Built Environment and Users</b>  |
|--|--|--|
| <b>Reachability and parking facilities</b> | <ul style="list-style-type: none"> <li>• Mitigate the impacts of cultural globalization [16]</li> <li>• Sense of place [19], [88]</li> <li>• Avoid the proliferation of identical neighborhoods [11]</li> <li>• Spatial justice [62]</li> <li>• Social justice/Social inclusion/Social exclusion [58]</li> <li>• Social inclusion [89]</li> <li>• Social equality [90]</li> <li>• Social cohesion [60], [91]</li> <li>• Increasing the quality of life [92]</li> <li>• Increasing the level of well-being [92]</li> <li>• Improving human health [60], [91]</li> </ul> | <ul style="list-style-type: none"> <li>• Ease of access to basic services [92]</li> <li>• Ease of access to public transportation facilities [89]</li> <li>• Increase of slow transport possibilities [60]</li> <li>• Potential to increase social interaction [60]</li> <li>• Access to employment opportunities [91]</li> <li>• Access to affordable housing [91]</li> <li>• Facilitating daily street meetings and viability of local amenities [91]</li> <li>• Promoting physical activity [91]</li> </ul>   |
| <b>Accessibility</b>                       | <ul style="list-style-type: none"> <li>• Social inclusion [93]</li> <li>• Social justice / Social inclusion / Social exclusion [58]</li> <li>• Social participation, social bonds and sense of identity [59]</li> <li>• Improving social relationships, quality of life and well-being, maintaining social ties [59]</li> <li>Independence of individuals</li> </ul>   | <ul style="list-style-type: none"> <li>• Access to the location area of the building [94]</li> <li>• Healthy activities such as cycling and walking become attractive</li> <li>• More active use of the built environment</li> <li>• Fast and easy access to activities [95]</li> <li>• Ease of access to basic services [92]</li> <li>• Outdoor accessibility [94], [96]</li> <li>• Interior accessibility [96]</li> <li>• Accessibility of means of transport [94], [96]</li> <li>• Ease of use of certain buildings [96]</li> </ul>   |
| <b>Efficiency</b>                          | <ul style="list-style-type: none"> <li>• Improving the quality of life [92]</li> <li>• Supporting desired activities in the space [14]</li> <li>• Social inclusion [58], social equality [90], social cohesion [91]</li> <li>• Sense of security in space [21]</li> <li>• Social security and well-being [24]</li> </ul>   | <ul style="list-style-type: none"> <li>• Providing sufficient floor space for all desired activities [14]</li> <li>• Enabling daily users and visitors to participate in events without difficulty [26]</li> <li>• Making appropriate access arrangements [14]</li> <li>• Design features that allow different activities at different times [99]</li> <li>• Versatile spaces, furniture and equipment that can be used for different events [99]</li> <li>• An efficient floor plan [14]</li> <li>• Ensuring the spatial clustering of activities, creating short distances and preventing physical barriers between spaces [26]</li> </ul>   |
| <b>Flexibility</b>                         | <ul style="list-style-type: none"> <li>• Social cohesion [25]</li> <li>• Social participation [25]</li> <li>• Social benefits [24]</li> <li>• Preservation of the identity and characteristics of the place [25]</li> </ul>  | <ul style="list-style-type: none"> <li>• Suitability for different social uses [97]</li> <li>• Creating long-term value [25]</li> <li>• Health, well-being, security, indoor quality, quality of life and good interaction with other users [25]</li> <li>• Maintaining user satisfaction and attractiveness of the building [24] <ul style="list-style-type: none"> <li>• Prevention of crime through the continuous use of the building [24]</li> <li>• Ensuring livability of the building and its surroundings and preserving the vitality of the built environment [24]</li> <li>• Supporting the continuous and optimal use of space [98]</li> </ul> </li> </ul>   |
| <b>Spatial Orientation</b>                 | <ul style="list-style-type: none"> <li>• On the basis of health and well-being: <ul style="list-style-type: none"> <li>○ Spatial anxiety [100] due to stress, anger, confusion and fear, insecurity [101]</li> <li>○ Waste of time, decreased security, stress [102]</li> <li>○ Promoting recovery [103]</li> <li>○ Health [104]</li> </ul> </li> <li>• Satisfaction [104]</li> </ul>  | <ul style="list-style-type: none"> <li>• Use of the built environment by all [104], [105]</li> <li>• Easy to wayfinding in the built environment [101]</li> <li>• The individual's ability to understand the environment, sense of control - sense of empowerment in terms of autonomy [103]</li> <li>• Facilitating user access, increasing productivity, preventing accidents, reduction of disabled users' isolation, reduction of visitors' confusion, employee errors and stress, saving time and money [104], easy understanding and using of the built environment at all scales [105]</li> <li>• Understanding of space organization [102], [103], [105]</li> <li>• Understanding the horizontal and vertical circulation system in the building [102], [103]</li> </ul> |



**Table 2.** Effects of the Spatial Quality Criteria on the Built Environment and Users, and the Importance of these Effects in Terms of Social Sustainability (*Cont.*)

|  | Importance of Social Sustainability   | Impacts on the Built Environment and Users  |
|--|---|---|
| Health and physical well-being             | <ul style="list-style-type: none"> <li>• Quality of life and sense of satisfaction [57]</li> <li>• Health and well-being:               <ul style="list-style-type: none"> <li>○ Easier coping with stress and recovery, decrease anxiety, decrease blood pressure and decrease pain [47]</li> <li>○ Reduced stress level and increased satisfaction [28]</li> <li>○ Mental health and well-being [29]</li> <li>○ Well-being [55], [56]</li> </ul> </li> <li>• Social interaction, social commitment [28]</li> <li>• Sense of community [30]</li> <li>• Opportunities for socialization and strengthening social ties in the space [27]</li> <li>• Social gains, social ties in the neighborhood, satisfaction and security [29]</li> </ul> | <ul style="list-style-type: none"> <li>• Creating environments that allow neighbors to get to know each other [29]</li> <li>• Providing the opportunity to spontaneously participate in social encounters [55]</li> <li>• Establishing the opportunity to engage in a wide variety of typical behaviors (creativity, self-expression, cooperation, exploration) [55]</li> <li>• Existence of sensory variations that allow people to actively choose conditions appropriate to their current needs and desires [55]</li> <li>• An interesting visual environment [55]</li> <li>• Freedom to move between different social settings [14], [55]</li> <li>• Integrating art [14]</li> <li>• Presence of outdoor views and indoor plants [55], [73]</li> <li>• Providing places for meeting, social interaction, exercise and resting in the built environment [47]</li> <li>• Providing regular exercise opportunities [55]</li> <li>• Providing visual and / or physical access to outdoor spaces [28], [47]</li> <li>• Providing visual and / or physical access to natural green spaces [14], [28], [29], [47], [55]</li> </ul> |
| Privacy, territoriality and social contact | <ul style="list-style-type: none"> <li>• Well-being [106]</li> <li>• Place attachment [107]</li> <li>• Social change [106]</li> <li>• Regulation of social interaction [108-110]</li> <li>• Quality of life [106], [107], [111]</li> <li>• Facilitating and supporting social behavior [112], [113]</li> <li>• Sense of belonging to social groups [106]</li> </ul>   | <ul style="list-style-type: none"> <li>• Controlling the amount of interaction with others [106], [108]</li> <li>• Different degrees of privacy in the built environment [63], [106], [111], [114], [115]</li> <li>• Opportunity to choose between social interaction/activity and privacy in spaces with different degrees of privacy [111], [114], [116]</li> <li>• The formation of different levels of permeability between the private space-public space and interior-exterior in the built environment [63], [110], [115]</li> <li>• Controlling the borders of private property [109]</li> <li>• Creating visual and auditory privacy [63]</li> <li>• Controlling unwanted interactions in work environments: architectural privacy vs. psychological privacy [117]</li> <li>• Creating personal space [113], [118]</li> <li>• Personalization of space [106], [112], [113]</li> <li>• Establishing dominance over territorial space [106], [112], [113], [118]</li> </ul>  |
| Image, Identity, Meaning                   | <ul style="list-style-type: none"> <li>• Well-being and quality of life of communities [16]</li> <li>• Mitigate the impacts of cultural globalization [16]</li> <li>• Sense of place [19], [88]</li> <li>• Avoid the proliferation of identical neighborhoods [11]</li> </ul>   | <ul style="list-style-type: none"> <li>• Environmental image and legibility of the city [101]</li> <li>• The way the user perceives his environment in a legible built environment [101]</li> <li>• Stimulating the interests of people through the "silhouette of the buildings", "the mass composition of the building" and "the surface formation features of the façade (texture, color, material, etc.)" [119]</li> <li>• Visual image and mental image: Differences in environmental images formed in individuals' minds and having individuals perceived environment differently [120]</li> <li>• Certain physical elements and the way these elements are arranged to attract attention in the space, evoking various emotions, creating a lasting effect [88]</li> </ul>   |

## 5. CONCLUSIONS

Nowadays, social sustainability, which is associated with the whole of sustainable development, beyond being a sustainable development component, requires a versatile and good understanding of the relationship between the built environment and society. Since social interactions between people and the quality of these interactions are organized through the built environment, the built environment plays an important role in facilitating or preventing the development of actions in social life. According to [61], the role of space in shaping society is so direct and effective that it cannot be ignored, and space actually shapes the organization in social life. In [63], it is remarked that space and society are two concepts that are directly related to each other, and that human behavior is affected by the built environment and space cannot be thought without a social context. As a result, shaping the built environment actually means shaping social life.

It is possible to explain the projection of social sustainability on the built environment with the livability level of that environment, which reveals the quality of life and well-being of people and communities and lies at the intersection between space and social sustainability. For this reason, understanding the interaction between space and social sustainability and working towards the development of social sustainability through the built environment are becoming more and more important today. Based on these considerations, this study introduces a framework to understand the relationship between the built environment and social sustainability and to assess social sustainability in the context of the built environment. This framework is based on associating the aesthetic and functional quality criteria of the built environment with the different spatial attributes of the built environment in the context of social sustainability. However, the aesthetic and functional quality criteria are proved to be very comprehensive in terms of evaluating the spatial attributes of the built environment and the effects of these attributes on users. When both social sustainability and the built environment are studied together, they turn into a very grifting and intertwined multi-layered structure. As a result, the framework proposed here introduces a large number of specialized topics that reveal which criteria are related to the aesthetic and functional attributes of the built environment. This situation creates a system for the built environment to be handled in a certain hierarchy from indoor to outdoor and to define social sustainability within this hierarchy. The development of such a system clarifies the boundaries on which issues are related to which spatial attribute and to what extent in the context of social sustainability in the built environment.

Based on the proposed framework here, in future studies, it is possible to consider each association established as a single research topic to evaluate social sustainability in the built environment. However, in the context of the developing and changing interpretations of social sustainability over time, it is also possible to change or transform the relations between the spatial attributes of the built environment and the user needs, and to establish new relations among them.

As seen in the approach developed in this study, social sustainability has a structure that can be evaluated in the context of the aesthetic and functional qualities of the built environment and the user requirements in the built environment. It has been clearly demonstrated here that these elements that define social sustainability in the built environment should be reconsidered in all built environment production processes for sustainable development as well.

## REFERENCES

1. World Commission on Environment and Development (WCED). *Our Common Future*; Oxford University Press: Oxford, UK, 1987.
2. Assefa, G.; Frostell, B. Social sustainability and social acceptance in technology assessment: A case study of energy technologies. *Technol. Soc.* **2007**, *29*, 63-78. doi:10.1016/j.techsoc.2006.10.007
3. Colantonio, A. Social sustainability: a review and critique of traditional versus emerging themes and assessment methods. Proceedings of the Second International Conference on Whole Life Urban Sustainability and Its Assessment, Loughborough, England, 2009; 865-885.
4. Karuppanan, S.; Sivam, A. Social sustainability and neighbourhood design: An investigation of residents' satisfaction in Delhi. *Local Environ.* **2011**, *16*, 849-870. doi:10.1080/13549839.2011.607159
5. Mckenzie, S. Social sustainability: Toward some definitions. Howke Research Institute Working Paper Series No 27, University of South Australia, 2004.
6. Palich, N.; Edmonds, A. Social sustainability: Creating places and participatory processes that perform well for people. *Environment Design Guide*, **2013**, 1-13. www.jstor.org/stable/26151925 (accessed on 25 September 2020)
7. Magent, C.S.; Korkmaz, S.; Klotz, L.E.; Riley, D.R. A design process evaluation method for sustainable buildings. *Architect Eng Des Manag* **2011**, *5*, 62-74. doi:10.3763/aedm.2009.0907

8. Dempsey, N.; Bramley, G.; Power, S.; Brown, C. The key to sustainable urban development in UK cities? The influence of density on social sustainability. *Prog Plann* **2012**, *77*, 89-141. doi:10.1016/j.progress.2012.01.001
9. Bacon, N.; Cochrane, D.; Woodcraft, S.; Brown, J. Creating strong communities: How to measure the social sustainability of new housing developments. The Berkeley Group, London, England, 2013. <https://www.berkeleygroup.co.uk/media/pdf/7/8/berkeley-reports-and-opinions-social-sustainability-reports-creating-strong-communities-part-one.pdf> (accessed on 25 September 2020)
10. Bramley, G.; Power, S. Urban form and social sustainability: the role of density and housing type. *Environ Plann B Plann Des* **2009**, *36*, 30-48. doi:10.1068/b33129
11. Talen, E. Sense of community and neighbourhood form: An assessment of the social doctrine of new urbanism. *Urban Stud* **1999**, *36*, 1361-1379. doi:10.1080/0042098993033
12. Yiftachel, O.; Hedgcock, D. Urban social sustainability: the planning of an Australian city. *Cities* **1993**, *10* 139–157. doi:10.1016/0264-2751(93)90045-K
13. Mardiah, W.M.R.W.N. Compact urban form for sociability in urban neighbourhoods. *Int J Soc Sci Humanity Stud* **2015**, *5*, 822-826.
14. Voordt, T.JM.; WEGEN, H.BR. *Architecture in use: An Introduction to the Programming, Design and Evaluation of Buildings* 1st ed.; Architectural Press: Oxford, UK, 2005.
15. Voordt, T. JM.; Vrieling, D.; Wegen, H. BR. Comparative floorplan-analysis in programming and architectural design. *Des Stud.* **1997**, *18*, 67-88. doi:10.1016/S0142-694X(96)00016-6
16. *ISO 21929-1:2011. Building Construction-Sustainability in Building Construction-Sustainability Indicators - Part 1 - Framework for Development of Indicators for Buildings*. International Organization for Standardization: Geneva, Switzerland, 2011.
17. Veenhoven, R. The four qualities of life, ordering concepts and measures of the good life. *J. Happiness Stud.* **2000**, *1*, 1-39. doi:10.1023/A:1010072010360
18. Preiser, W. The habitability framework: A conceptual approach toward linking human behavior and physical environment. *Des Stud.* **1983**, *4*, 84-91. doi:10.1016/0142-694X(83)90038-8
19. Relph, E. *Place and Placelessness*. Pion Limited: Londra, UK, 1976.
20. Altman, I.; Low, S. *Place Attachment*. Plenum: New York, USA, 1992.
21. Newman, O. *Defensible Space: People and Design in the Violent City*. Architectural Press: London, UK, 1972.
22. Carr, S.; Francis, M.; Rivlin, L.G.; Stone, A.M. *Public Space*. Cambridge University Press: Cambridge, UK, 1992.
23. Trancik, R. *Finding Lost Space: Theories of Urban Design*. Van Nostrand Reinhold: London, UK, 1986.
24. Manewa, A.; Siriwardena, M.; Ross, A.; Madanayake, U. Adaptable buildings for sustainable built environment. *Built Environ. Proj. Asset Manag.* **2016**, *6*, 139-158. doi:10.1108/BEPAM-10-2014-0053
25. Nakib, F. Toward an Adaptable Architecture: Guidelines to Integrate Adaptability in the Building. Proceedings of the CIB World Congress 2010 - Building a Better World, Salford Quays, UK, 2010.
26. Mzoori, F.A. *Spatial Configuration And Functional Efficiency Of House Layouts*. Lap Lambert Academic Publishing: Germany, 2014.
27. Mouratidis, K. Built environment and social well-being: How does urban form affect social life and personal relationships?. *Cities* **2018**, *74*, 7–20. doi:10.1016/j.cities.2017.10.020

28. McIntre, M.H. A Literature Review of the Social, Economic and Environmental Impact of Architecture and Design. Information and Analytical Services Division, Scottish Executive, Education Department, Victoria Quay, Edinburgh, 2006. <https://core.ac.uk/download/pdf/4156836.pdf> (accessed on 25 September 2020)
29. Sullivan, W.C.; Chang, C.Y. Making Healty Places. In *Mental Health and the Built Environment*; Dannenberg A.L., Frumkin H., Jackson R. J., Eds.; Island Press, Washington, USA, 2011; pp. 106-116.
30. Thompson, S.; Kent, J. Connecting and strengthening communities in places for health and well-being. *Aust. Plan.* **2014**, 51, 260-271. doi:10.1080/07293682.2013.837832
31. Gehl J.; Kaefer L.J.; Reigstad, S. Close encounters with buildings. *Urban Des. Int.* **2006**, 11, 29–47. doi:10.1057/palgrave.udi.9000162
32. Schulz, C. N. *Intentions in Architecture*. MIT Press: Oslo, Norway, 1988.
33. Lang, J. *Environmental Aesthetics: Theory, Research and Applications*. Cambridge University Press: New York, USA, 1988.
34. Bramley, G.; Dempsey, N.; Power, S.; Brown, C.; Watkins, D. Social sustainability and urban form: evidence from five British cities. *Environ. Plan A* **2009**, 41, 2125-2142. doi:10.1068/a4184
35. Dempsey, N.; Bramley, G.; Power, S; Brown, C. The social dimension of sustainable development: defining urban social sustainability. *Sustain. Dev.* **2011**, 19, 289-300. doi:10.1002/sd.417
36. Farida, N. Effects of outdoor shared spaces on social interaction in a housing estate in Algeria. *Front Archit. Res.* **2013**, 2, 457-467. doi:10.1016/j.foar.2013.09.002
37. Proshansky, H.M. The city and self-identity. *Environ Behav* **1978**, 10, 147-169. doi:10.1177/0013916578102002
38. Stokols, D.; Shumaker, S.A. Cognition, Social Behaviour, and the Environment. Erlbaum. In *People in Places: A Transactional View of Settings*. Harvey, J., Eds.; Lawrence Erlbaum Assoc.: New Jersey, USA, 1981; pp. 441-488.
39. Steadman, C.R. Is it really just a social construction: The contribution of the physical environment to sense of place. *Soc. Nat. Resour.* **2003**, 16, 671-685. doi:10.1080/08941920309189
40. Jorgensen, B.S.; Stedman, R.C. A comparative analysis of predictors of sense of place dimensions: Attachment to, dependence on, and identification with lakeshore properties. *J. Environ. Manage* **2006**, 79, 316–327. doi:10.1016/j.jenvman.2005.08.003
41. Manzo, L.C.; Perkins, D.D. Finding common ground: The importance of place attachment to community participation and planning. *J. Plan. Lit.* **2006**, 20, 335- 350  
doi:10.1177/ 0885412205286160
42. Suratkon, A.; Jusoh, S. Indicators to Measure Design Quality of Buildings. Proceeding of the First International Conference on Science, Engineering & Environment, Tsu City, Japan, 19-21 November 2005.
43. Lund, H. Pedestrian environments and sense of community. *J Plan Educ Res* **2002**, 21, 301-312. doi:10.1177/0739456X0202100307
44. Kim, J.; Kaplan, R. Physical and psychological factors in sense of community: new urbanist kentlands and nearby orchard village. *Environ Behav* **2004**, 36, 313–340. doi:10.1177/0013916503260236
45. Francis, J.; Giles-Corti, B.; Wood, L.; Knuiman, M. Creating sense of community: the role of public space. *J Environ Psychol* **2012**, 32, 401-409. doi:10.1016/j.jenvp.2012.07.002
46. Kent, J.; Thompson, S. The three domains of urban planning for health and well-being. *J. Plan. Lit.* **2014**, 29, 239-256. doi:10.1177/0885412214520712

47. Ochoda, C.; Ndetei, D.M.; Moturi, W.N.; Otieno, J.O. External built residential environment characteristics that affect mental health of adults. *J. Urban Health* **2014**, 91, 908-927. doi:10.1007/s11524-013-9852-5
48. Moffat, R. Crime prevention through environmental design – a management perspective. *Can. J. Criminol.* **1983.**, 25, 4, 19-31.
49. Crowe, T. *Crime Prevention Through Environmental Design: Applications of Architectural Design and Space Management Concepts*. Butterworth-Heinemann: Oxford, UK, 2000.
50. Cozens, P. Planning, crime and urban sustainability. *WIT Trans. Ecol. Environ.* **2007**, 102, 187-196. doi:10.2495/SDP070181
51. Cozens, P. Crime prevention through environmental design in Western Australia: Planning for sustainable urban futures. *Int. J. Sustain. Dev. Plan.* **2008**, 3, 272-292. doi:10.2495/SDP-V3-N3-272-292
52. Maas, J.; Spreeuwenberg, P.; Westra, M.V.W.; Verheij, R.; Vries, S; Groenewegen, P.P. Is green space in the living environment associated with people's feelings of social safety? *Environ. Plan A* **2009**, 41, 1763-1777. doi:10.1068/a4196
53. Ratnayake, R. Environmental features and sense of safety. *WIT Trans. Ecol. Environ.* **2013**, 179, 377-388. doi:10.2495/SC130321
54. Deniz, D. Improving Perceived safety for public health through sustainable development. *Procedia Soc Behav Sci* **2016**, 216, 632-642. doi:10.1016/j.sbspro.2015.12.044
55. Heerwagen, J.H. Design, Productivity and Well Being: What are the Links? Processings of the American Institute of Architects Conference on Highly Effective Facilities, Cincinnati, Ohio, 12-14 March 1998.
56. Rogers, D.S.; Duraiappah, A.K.; Antons, D.C.; Munoz, P.; Bai, X.; Fragkias, M.; Gutscher, H. A vision for human well-being: transition to social sustainability. *Curr Opin Environ Sustain* **2012**, 4: 61-73. doi: 10.1016/j.cosust.2012.01.013
57. Bäckman, M.; Greger, S.; Hatami, Z.; Honkonen, J.; Keinonen, T.; Kola, J.P.; Liao, T.; Mattelmäki, T.; Niinimäki, K.; Paavilainen, H.; Soini, K.; Vaajakallio, K., Viña, S. *Designing for Wellbeing*; Aalto University Publication Series, Art+Design+Architecture: Helsinki, Finland, 2013.
58. Farrington, J.; Farrington C. Rural accessibility, social inclusion and social justice: towards conceptualisation. *J Transp Geogr* **2005**, 13, 1-12. doi:10.1016/j.jtrangeo.2004.10.002
59. Rosso, A. L.; Taylor, J.A.; TABB, L.P.; Michael, Y.L. Mobility, disability, and social engagement in older adults. *J Aging Health* **2013**, 25, 617-637. doi:10.1177/0898264313482489
60. Oosterlinck, S.; Van Den Broeck, J.; Albrechts, L.; Moulart, F.; Verhetsel, A. *Strategic Spatial Projects: Catalysts for Change*. Routledge: London, UK, 2010.
61. Hillier, B.; Hanson, J.; Peponis, J. What do we mean by building function? In *Design for Building Utilization*; Powell, J.A., Cooper, I., Lera, S., Eds.; Spon, London, UK, 1984; pp. 61-72.
62. Soja, E.W. Lessons in Spatial Justice. Hunch: Berlage Institute Report, 1, 1999.
63. Carmona, M.; Heath T.; Oc, T.; Tiesdell, S. *Public Places-Urban Spaces*. Architectural Press: Great Britain, 2003.
64. Alexander, C. *A Pattern Language*. Oxford University Press: New York, USA, 1977.
65. Ulrich, R. Effects of interior design on wellness: Theory and recent scientific research. *J Healthc Des* **1991**, 3, 87-109.
66. Danielsson, C.B. The Office - An Explorative Study: Architectural Design's Impact on Health, Job Satisfaction and Well-being. PhD Thesis. Royal Institute of Technology, Stockholm, Sweden, 2010.



67. Gehl, J. *Life Between Buildings*. Van Nostrand Reinhold Co.: New York, USA, 1987.
68. Bednar, M.J. *The New Atrium*. McGraw-Hill: New York, USA, 1986.
69. Rapoport, A. *Kültür, Mimarlık, Tasarım*. (Translation: S. Batur). YEM Yayın: Istanbul, Turkey, 2004.
70. Beck, H. Linking the quality of public spaces to quality of life. *J. Place Manag. Dev.* **2009**, 2, 240-248. doi:10.1108/17538330911013933
71. Shishegar, N. Residential block configurations and passive solar strategies: Analyzing the impacts of design parameters on outdoor and indoor solar access. *J Building Sustain* **2016**, 1, 1-8.
72. Hami, A.; Emani, F. Spatial Quality of Natural Elements and Safety Perception in Urban Parks. International Conference on Agricultural, Ecological and Medical Sciences (AEMS-2015). Feb. 10-11, Penang (Malaysia). (2015).
73. Chang, C.Y.; Chen, P.K. Human responses to window views and indoor plants in the workplace. *HortScience* **2005**, 40, 1354-1359. doi:10.21273/HORTSCI.40.5.1354
74. Moughtin, C. *Urban Design: Street and Square*. Architectural Press: Oxford, UK, 2003.
75. Jacobs, J. *The Death and Life of Great American Cities*. Vintage: New York, USA, 1961.
76. Lynch, K.; Hack, G. *Site Planning*. MIT Press: USA, 1984.
77. Ashihara, Y. *Exterior Design in Architecture*. Van Nostrand Co.: New York, 1970.
78. Jaskiewicz, F. Pedestrian Level of Service Based on Trip Quality. Urban Street Symposium, Conference Proceedings, G-1. Dallas, Texas. (1999).
79. Oke T. R. The distinction between canopy and boundary-layer urban heat islands. *Atmosphere* **1976**, 14, 268–277. doi:10.1080/00046973.1976.9648422
80. Bottema, M. A method for optimisation of wind discomfort criteria. *Building Environ* **2000**, 35, 1-18. doi:10.1016/S0360-1323(98)00065-1
81. Ratti, C.; Raydan, D.; Steemers, K. Building form and environmental performance: archetypes, analysis and an arid climate. *Energy Build.* **2003**, 35, 49-59. doi:10.1016/S0378-7788(02)00079-8
82. Ali-Toudert, F. Dependence of outdoor thermal comfort on street design in hot and dry climate. Freiburg University: Institute of Meteorology Reports, No. 15. (2005).
83. Huang, Y.; Musy, M.; Hégron, G.; Chen, H.; Li, B. Towards Urban Design Guidelines from Urban Morphology Description and Climate Adaptability. Proceedings of the Conference on Passive and Low Energy Architecture, Dublin, Ireland, 2008.
84. Sharmin, T.; Steemers, K. Effect of Canyon Geometry on Outdoor Thermal Comfort: A Case-study of High-density, Warm-humid Climate. Proceedings of the Conference on Sustainable Architecture for a Renewable Future, Munich, Germany, 2013.
85. Jacobs, A.; Appleyard, D. Toward an urban design manifesto. *J Am Plann Assoc* **1987**, 53, 112–120. doi:10.1080/01944368708976642
86. Lynch, K. *A Theory of Good City Form*. MIT Press: Cambridge, USA, 1981.
87. Whyte, W.H. *The Social Life of Small Urban Spaces*. Project for Public Spaces: New York, USA, 1980.
88. Ewing, R.; Clemente, O. *Measuring Urban Design: Metrics for Livable Places*. Island Press: Washington DC, USA, 2013.
89. Beard, J.; Hurst, N.; Heath-brook C.; Wardman, M.; Batley, R.; Gordon, A. Valuing the Social Impacts of Public Transport, Final Report. Department for Transport, United Kingdom, 2003. <http://www.socialvalueuk.org/app/uploads/2016/07/DfT-final-report.pdf> (accessed on 25 September 2020).

90. Burton, E. *The Compact City and Social Justice*. Housing Studies Association Spring Conference: Housing, Environment and Sustainability. University of York, 2001.
91. Barton, H.; Mitcham, C.; Tsourou, C. *Healthy Urban Planning and Transport*. WHO Regional Office for Europe. Transport, Health and Environment Programme for Europe, 2003.
92. Elena, S.; Monzón, A.; Pérez, E.; Mancebo, S. *The Use Of Accessibility Measures To Assess Efficiency And Equito Effects Of High Speed Rail Projects: Application To The Case Of Spain*. Proceedings of the 55th Annual North American Meeting of the Regional Science Association, New York, USA, 19-22 Nov. 2008.
93. Vanderveen, A.; Laat, P.; Domincus, M.; Mohammadi, M. *Integral Accessibility: A Matter of Social Inclusion Recommendations on Measures for Dutch Policy on Accessibility in the Public Built Environment to Comply with the UN 'Convention on Rights of Persons with Disabilities*. Proceedings of the 7th International Conference on Sustainable Development in Building and Environment- SuDBE2015, Reading, UK, 27-29 July 2015.
94. Rapley, C.E. *Accessibility and development: environmental accessibility and its implications for inclusive, sustainable and equitable development for all*. The Department of Economic and Social Affairs (DESA), United Nations.
95. Mahdzar, S.S.B.S. *Sociability vs Accessibility: Urban Street Life*. PhD Thesis, University of London, London, 2008.
96. ISO 21542:2011. *Building construction-Accessibility and usability of the built environment*. International Organization for Standardization, Geneva, Switzerland, 2011.
97. Schneider, T.; Till, J. *Flexible housing: opportunities and limits*. *Archit. Res. Q.* **2005**, 9, 157-166. doi:10.1017/S1359135505000199
98. Sinclair, B.R.; Mousazadeh, S.; Safarzadeh, G. *Agility, adaptability + appropriateness: conceiving, crafting & constructing an architecture of the 21st century*. *ARCC J* **2012**, 9, 35-43. doi:10.17831/enq:arcc.v9i1.65
99. Chiddick D. (2006). *Promoting space efficiency in building design*. Space Management Group Report, University of Lincoln, UK, 2006. <http://www.smg.ac.uk/documents/PromotingSpaceEfficiency.pdf> (accessed on 25 September 2020).
100. Lawton, C.A. *Strategies for indoor wayfinding: the role of orientation*. *J. Environ Psychol* **1996**, 16, 137-145. doi:10.1006/jevp.1996.0011
101. Lynch, K. *The Image of the City*. MIT Press, Cambridge, USA, 1960.
102. Doğu, U.; Erkip, F. *Spatial factors affecting wayfinding and orientation - a case study in a shopping mall*. *Environ Behav* **2000**, 32, 731-755. doi:10.1177/00139160021972775
103. Arthur, P.; Passini, R. *Wayfinding: People, Signs, and Architecture*. McGraw-Hill: New York, USA, 1992.
104. Hunter, S. *Design Resources, DR-01 Architectural Wayfinding*. IDeA Center, University of Buffalo, 2010. <https://www.ueducation.org/product-category/publications/design-resources/> (accessed on 25 September 2020).
105. Hunter, S. *Design Resources, DR-14 Spatial Orientation, Environmental Perception and Wayfinding*. IDeA Center, University of Buffalo, 2010. <https://www.ueducation.org/product-category/publications/design-resources/> (accessed on 25 September 2020).
106. Altman, I. *Environment and Social Behavior: Privacy, Personal Space, Territory, and Crowding*. Brooks/Cole Publishing Company: Monterey, USA, 1975.
107. Harris, P.B.; Werner, C.M.; Brown, B.B.; Ingebritsen, D. *Relocation and privacy regulation: a cross cultural analysis*. *J. Environ Psychol* **1995**, 15, 311-320. doi:10.1006/jevp.1995.0027

108. Pedersen, D.M. Psychological functions of privacy. *Journal of Environmental Psychology* **1997**, 17, 147–156.
109. Madanipour, A. *Public and Private Space of the City*. Routledge: New York, USA, 2003.
110. Richards, J. Place making for the creative class. *Landscape Architecture* **2007**, 32-38.
111. Witte, N. Privacy: Architecture in Support of Privacy Regulation. MSc Thesis, University of Cincinnati, Ohio, USA, 2003.
112. Edney, J. J. Human territories: comment on functional properties. *Environ Behav* **1976**, 8, 31-47. doi:10.1177/001391657600800109
113. Hall, E.T. *Hidden Dimension*. Anchor Books: New York, USA, 1966.
114. Bently, I.; Alcock, A.; Murrain, P.; Mcglynn, S.; Smith, G. *Responsive Environments, A Manual For Designers*. Architectural Press: Oxford, UK, 1985.
115. Robinson, J. W. Institutional Space, Domestic Space, And Power Relations: Revisiting Territoriality With Space Syntax. Proceedings of the 3rd International Space Syntax Symposium, Atlanta, USA, 2001; pp. 1-10.
116. Lewis, S. *Front to Back: A Design Agenda For Urban Housing*. Architectural Press: Oxford, UK, 2005.
117. Vischer, J. C. The effects of the physical environment on job performance: towards a theoretical model of workspace stress. *Stress Health* **2007**, 23, 175-184. doi:10.1002/smi.1134
118. Preiser, W.; Vischer, J. *Assessing Building Performance*. Elsevier, Oxford, UK, 2005.
119. Stamps, A. *Psychology and the Aesthetics of the Built Environment*. Kluwer Academic/Plenum Publishers, New York, USA, 2000.
120. Rapoport, A. *Human Aspects Of Urban Form: Towards A Man-Environment Approach to Urban Form And Design*. Pergamon Press, Oxford, UK, 1977.