Article

The Role of Collective Spaces in Achieving Social Sustainability: A Comparative Approach to Enhance Urban Design

Mohammed Itma * and **Sameh Monna**

Architectural Engineering Department, An Najah National University, Nablus P.O. Box 7, Palestine;
samehmona@najah.edu
* Correspondence: moitma@najah.edu

Abstract: Achieving social sustainability is an important aim towards achieving sustainable development goals for 2030. This paper aims to evaluate the compatibility of collective spaces with the contemporary social needs in the residential areas in Palestine. It is hypothesized that collective spaces such as cul-de-sacs have the potential for a contribution towards social sustainability. A field research for urban design architectural components for cul-de-sacs and grid streets in Nablus city was conducted based on social sustainability values. Then, a questionnaire was developed to measure people's satisfaction with living in such collective spaces in terms of social sustainability values. The results show that the satisfaction in collective spaces rises in the cul-de-sac housing compared to grid street houses. Based on these results, a cul-de-sac is a high-potential approach for enhancing social interaction in collective spaces because it provides the four values of social sustainability: privacy, security, equality, and environmental quality. Such qualities are very basic and essential human needs to be considered in housing design. Finally, proposed guidelines for designing contemporary collective spaces based on learning from traditional cul-de-sacs were introduced to enhance future social sustainability.

Keywords: housing design; cul-de-sac; social sustainability; privacy; collective spaces

1. Introduction

The outdoor collective spaces in most residential areas play a major role in social stability and unification. These are important components of the housing environment because they provide places for complimentary activities of housing units, mainly social interaction [1–3]. Thus, good outdoors should ensure good social relations, a good sense of belonging to the place, and a stable social life for the residents [4]. Accordingly, providing collective outdoor spaces that are easily accessible from all houses should be the purpose of the designer to meet the basic needs of the residents. Hence, this study aims at highlighting a potential approach for designing sustainable collective spaces to ensure a good social life for the current and coming generations: the traditional cul-de-sac of Palestine.

1.1. Traditional Cul-De-Sacs

Cul-de-sac is a French term that means a road with a closed-end or a way without an exit [5]. In terms of housing design, it is a type or pattern of domestic streets or passageways which is dead-ended and used mainly for pedestrians [6]. Today, the cul-de-sac is widely used in residential street planning because they are an efficient way of reducing the total used area of streets and crossing points. Moreover, it creates a suitable environment for pedestrians in housing areas [7]. Because of that, it is common in urban areas around the world, both in traditional and contemporary housing design.

However, the concept of the cul-de-sac in the traditional architecture of Arabic cities goes beyond a simple dead-end street. Cul-de-sacs could be a generator for the unique

organization of Arab cities, which were built in successive phases to meet the users' gradual needs [8]. It was an important organizing component that played a major role in generating the homogenous fabric of the old cities [9]. Thus, the cul-de-sac became a central urban space located in the center of each group of clusters in the traditional residential areas. The summation of these groups with their central cul-de-sac could successfully generate a wide range of compact fabric in a form of endless clusters [10].

Cul-de-sacs are collective spaces in traditionally residential areas that play a major role in social unification. These are important components of the housing environment because they provide places for complimentary activities of housing units, mainly social interaction. Thus, good outdoors should ensure good social relations, a good sense of belonging to the place, and a stable social life for the residents. The cul-de-sac is also a tool for enhancing social belonging to their territory; hence, many scholars have studied the potential of the cul-de-sac for increasing the social quality of the contemporary housing environment compared to grid streets [11–13]. Other scholars have concentrated on the safety benefits of using the cul-de-sac in planning housing areas [10]. Moreover, such types of streets can be perfectly designed for providing privacy for a group of housing units in the neighborhood [12]. In addition, the cul-de-sac used to be a symbol of the need for privacy from public areas. An important reason for using it in traditional housing is to define the territory for a specific group of inhabitants in the city [14]. It has also been considered as a shared space for limited income housing instead of private inner spaces (courtyards) for houses of wealthy people. Through architectural treatments, elements of the cul-de-sac are delivering a strong message of privacy for the inhabitants by using "small entrances", which give the feeling that that area should not be trespassed upon without permission [15].

For all these benefits, cul-de-sacs have been the main collective spaces in the Palestinian cities throughout history. They have been used for doing daily activities and socializing. They have had an important effect on maintaining the privacy of the houses and encouraging social activities for residents. The demand of the Palestinian family for privacy inside homes has controlled the attitude of people when choosing their place of living. However, the need for privacy is an important human need that may contradict other human needs such as social interaction [16]. Palestinian families seek for social interaction with neighbors and guests, in a way that protects the privacy of the family [17]. Hence, seeking privacy and social interaction simultaneously is a dilemma that historically assisted in shaping the built environment in Palestinian cities [18]. Accordingly, cul-de-sacs are likely to be the urban elements for solving this dilemma.

It is believed that taking such traditional streets into account in contemporary planning is a step toward sustainable communities [19]. Many countries have realized the necessity of recovering their ancient cities and working to integrate traditional concepts into contemporary life. For that reason, learning from traditional concepts is an important approach to contemporary housing design [20]. Approaches for using the traditional urban planning forms in contemporary cities to strengthen social life have been the objective of several studies [21–23]. Moreover, the adaptation and learning from the traditional urban forms in the traditional city can help to distinguish the social identity of the residents in contemporary cities [24]. On the other hand, the cul-de-sac can lead to territoriality and gated communities if there is a lack of interconnection with the neighboring communities [25]. In certain communities such as in Palestine, this is enhancing privacy. Thus, recovering the components of traditional cities gives the community its character and distinction. Researchers have also shown that recovering the traditional concepts in a contemporary way could assist in the continuity of the cultural and social characteristics of the community [26].

1.2. Social Sustainability in the Built Environment

Social sustainability as a pillar for sustainable development is the focus of this study because there is limited researches on this pillar compared to other pillars; economic and

environmental sustainability [27]. Social sustainability is defined as the continuity and the stability of the social environment in everything related to society or its organizations, while sustainability means the ability to continue or for something to be continued for a long time [28].

Before proposing the cul-de-sac as a design approach for outdoor collective spaces, it is important to understand the relationship between the built environment and social sustainability, because all physical components of the housing environment such as houses, services, collective, and common spaces will affect social sustainability [29]. There have been many interpretations for clarifying social sustainability; this study discusses those more related to the built environment. Bramley et al. [30] argued that social sustainability relates to two factors: the first is social justice; which includes access to services and opportunities, and the second is the sustainability of communities, which includes various dimensions such as belonging to the neighborhood, social interaction, security, environmental quality, home satisfaction, stability, and participation in collective civic activities. Hancock [31] concentrated on the provision of services and activities that formulates an adequate environment of social interaction, which constitutes an important and necessary infrastructure for social sustainability. Polese and Stern argued in their book Social Sustainability of Cities that social sustainability was based on supporting the environmental connection with the sociocultural desires of the groups, encouraging social integration, and improving the quality of life for all segments of the population. Another study has considered four factors that guide the social sustainability: justice, security, adaptability, inclusion or social interaction as the principles of social sustainability [32].

Based on the previous review, this study extrapolates four important values that should be found in outdoor collective spaces to encourage social interaction: privacy, security, equality, and environmental quality. These are supposed to build a comfortable environment with equal access to different facilities and spaces, and adequate distances to conserve the privacy of homes. Moreover, they should contain components for users to feel secure and comfortable, which encourage cooperation and social interaction between neighbors. This study argues that the mentioned four values are encouraged by the traditional cul-de-sac of Palestine.

Accordingly, the main objective of this paper was to verify how far traditional cul-de-sac could satisfy the contemporary users' needs for collective spaces in the modern era, and how far it can participate in the achievement of future social sustainability to recommend it for future housing designs. It is assumed that the cul-de-sac is still a potential approach for enhancing social interaction because it provides the four values that should be found in outdoor collective spaces: privacy, security, equality, and environmental quality, which are very basic and essential human needs to be considered in housing design [33,34].

2. Materials and Methods

This study made use of a combination of methodological tools that combined data collection for as-built drawings, and observation of users' behavior. The observation included visiting case studies and taking notes about the architectural components and residents' behavior. Conducted visits had different periods of the day and the year. Moreover, the study adopted interviews with residents, and surveying people's opinions through questionnaires. The collected data were then analyzed. Accordingly, the study of this paper was carried out in three main phases: 1. data collection and observations, 2. interviews and questionnaires, and 3. data classification and analysis.

Hence, this study used two approaches to verify the paper's hypothesis: the first was quantitative, which was based on an as-built architectural analysis for the cul-de-sacs in Nablus old city, and a selection of a representative case study for the analysis of this kind of collective spaces. The old city of Nablus was chosen for the survey. On one hand, it is considered one of the representative cities with considerable old collective spaces. The city is also rich in its architectural heritage and has a special urban fabric that has been throughout the ages representing in its entirety a local and global heritage. On the other

hand, the municipality of Nablus has implemented many projects to restore many houses around cul-de-sacs as an attempt to raise the standard of living, relying on the traditional concept of maintenance and restoration operations. In that sense, this paper highlights one of the important experiences of rehabilitating traditional cul-de-sac housing in Nablus city: the Al-Atoot cul-de-sac, which was physically rehabilitated to meet the needs of residents. This field survey focused on collecting data from the field by taking photographs and drawing plans, elevations, and sections, for the selected cul-de-sac, and comparing them to the original drawings of Nablus municipality, to understand the characteristics of a traditional cul-de-sac.

The second approach was qualitative through a questionnaire survey for two main types of traditional housing referring to domestic street type: cluster houses around cul-de-sacs, and houses on grid streets.

The first approach aimed to identify the physical characteristics of the cul-de-sac as existing collective spaces in traditional housing design to identify the suitable case studies to conduct the questionnaire survey. The old city is divided into six quarters Al habaleh, Al Gharb, Al yasmeneh, Al qaisareyya, Al aqaba, and Al qaryon [35]. The cul-de-sac collective spaces type was identified based on an onsite analysis as can be seen in Figure 1 below. Then, a specific cul-de-sac was selected for the analysis of the physical characteristics and the questionnaire interviews.

Figure 1. A map clarifying the main cul-de-sacs in the old city of Nablus, and an example of a grid street and cul-de-sac.

The main objective of the field observation of residents' behavior was to find out how they responded to different elements of street design and to what extent these architectural elements affected the social interaction and privacy of the residents in the external and internal spaces of homes. During this period, photos and sketches were taken and notes were written. This method assisted the authors in designing questionnaires and interviews for the following phase.

2.1. The Case Study

The Al-Atoot cul-de-sac was selected because it is one of the famous cul-de-sacs in the old city that contains around 30 houses. The houses areas were measured to be in the

range 90–160 square meters. All in all, it is in a relatively good physical condition. The cul-de-sac is composed of three common sets of components: entrances, corridors, and courtyards as seen in Figure 2. The sequence of corridors and courtyards that starts with a main broken entrance is articulated to gather and form many forms and shapes of the cul-de-sac. This sequence of corridors and courtyards makes the place suitable for both static and dynamic activities: circulation and socialization. The entrances of houses are opened to the courtyards and sometimes to the inner corridors. The cul-de-sac is also surrounded by a series of rooms spread on the ground and first floor. It includes shared services like storage and guest rooms on the ground floor, and houses for families on the first floor.
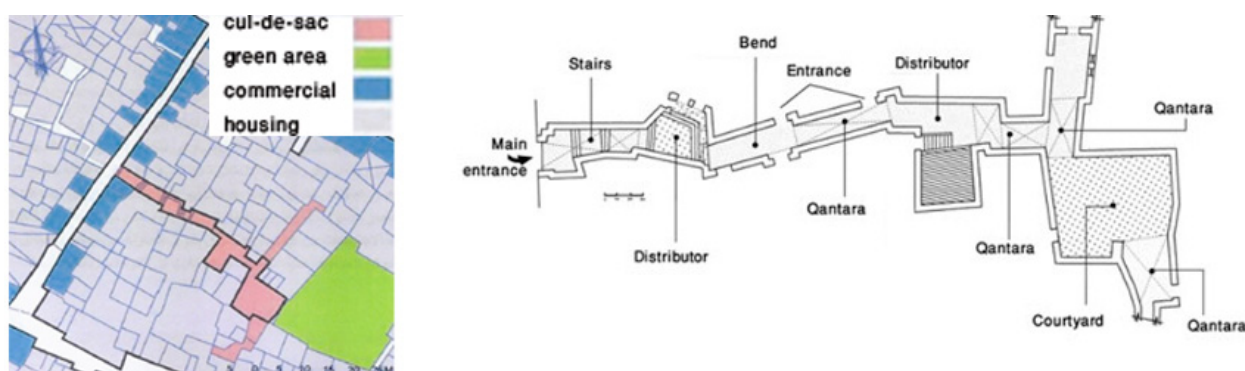

Figure 2. Master plan for the outdoor spaces of Al-Atoot cul-de-sac in the traditional area of Nablus old city.

The shape of the Al-Atoot cul-de-sac is irregular as all traditional cul-de-sacs, and the area of the cul-de-sac is also influenced by the number of floors surrounding it. As for paths, they are bending due to the spontaneous nature of the compact fabric inside old cities, which had an organic growth. Thus, most traditional housing was unplanned. Paths are also narrow and shaded because they are surrounded by two or three floors of houses. In some parts, wider paths can exist to provide more light and to serve as a distributor for the entrances of houses instead of courtyards. However, no matter whether the shape of the paths is irregular, it should be useful to increase the privacy, safety, and social interaction of inhabitants.

It should be noted here that there is a sequence between the exposed areas and covered areas within the cul-de-sacs. Covered areas are shaped by the upper rooms named "Al-Qantara" in Arabic, which are flying across these paths. These rooms were constructed for two reasons: the first was to provide a shaded space in the path for rest, which was protected from rain and sun. The second was to increase the density of buildings inside the residential area by providing extra rooms above the open-to-air space that served as part of the house on the first floor [8]. As a result, Al-Qantara has a great importance in the continuity and density of the traditional fabric. Moreover, the cul-de-sac has many environmental benefits due to its composition, it serves like the courtyards as a climate moderator for the surrounding houses, because it provides shade and a cool atmosphere for houses with minimum costs [36].

2.2. The Questionnaire Survey

Surveying people's opinions is one the important methods to measure the reaction and the comfort level of the residents for indoor and outdoor spaces [37]. The questionnaire was designed to highlight the potential of the cul-de-sac for adapting to contemporary social needs compared to grid residential streets in Nablus old city. The need for both privacy and social interaction was translated into several questions. Then, we chose thirty different houses around the cul-de-sac, and another thirty houses on grid streets to do the survey. The researchers tried to adopt comprehensive and varied criteria for choosing the sample

houses. The sample contained 30 houses around the cul-de-sac and 30 houses around the grid street because the number of houses around the selected cul-de-sac was 30 houses. Thus, all surveyed houses were around a single street of both types to obtain as accurate results as possible. However, the selected houses varied in location and characteristics such as the number of floors, date of the building, building materials, size, and orientation. The selected samples also varied in householders' characteristics in terms of family size, kind of ownership, and level of income. This variation was adapted to obtain accurate results as much as possible. Figure 3 clarifies the characteristics of the chosen sample.
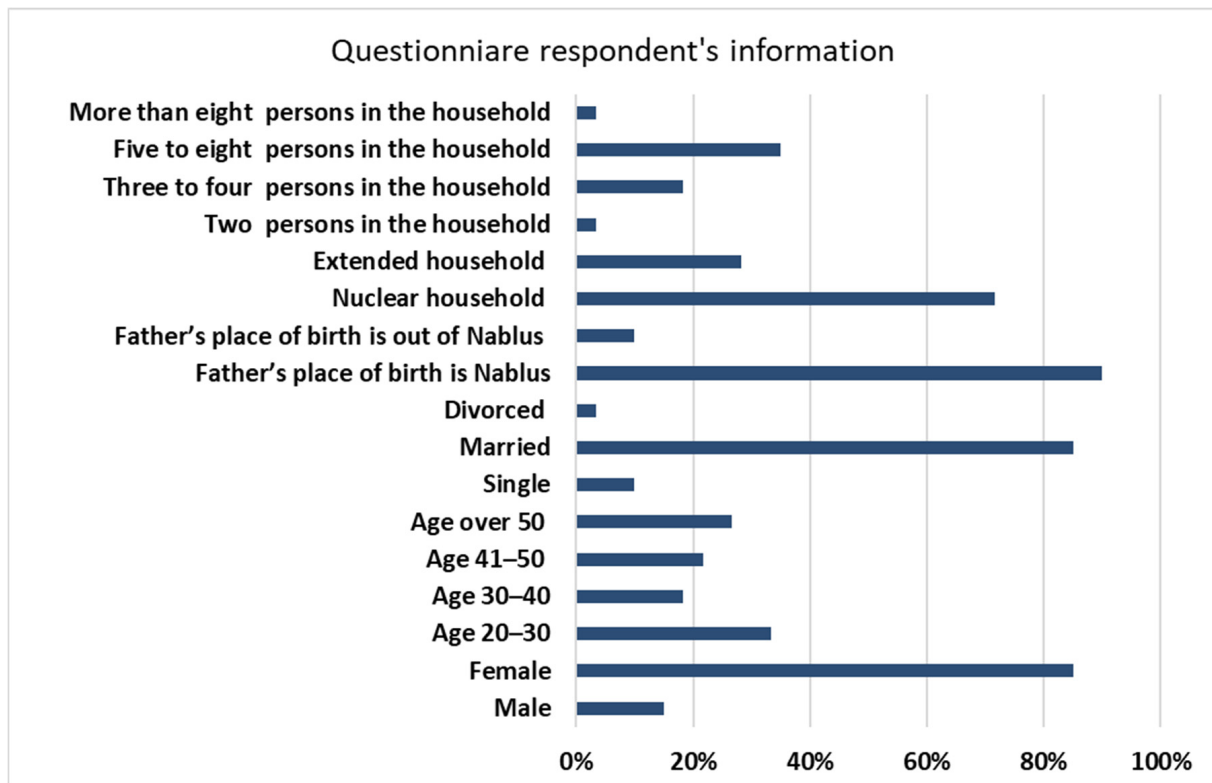

Figure 3. Characteristics of the chosen respondents' sample.

The number of family members of selected households also varied from 4 to 7 persons, with an average of around 6 persons in each house. The typical respondent was a woman, 20–30 years old, married, born in the city of Nablus, and living with a nuclear family with 5 to 8 persons in the house. Recipients were asked to answer questions about their opinion of living in cul-de-sac and grid housing in terms of their contemporary and social sustainability needs.

3. Results

For a better understanding of the benefits of the cul-de-sac, the study first surveyed many simple houses on grid streets to explore their social characteristics. Figure 4 clarifies four of the most common characteristics of the grid streets in the residential areas. The first was the lake of environmental qualities such as the shading in most cases, the second was the existence of commercial activities which sometimes could interrupt the social interaction between neighbors, and this was related to cultural reasons in most cases. It was observed that women, children, and the elderly did not comfortably socialize or stay for a long time in front of shops and other commercial activities. The third was that grid streets are public and not collective, which makes it possible to be used by all residents, and visitors, even from outside the old city. This fact lowered the privacy and feeling of security of residents in the place and suggested more formal relations between neighbors.

The fourth was the existence of cars, which are common on grid streets, as these are straight and easily connected with the main streets of the city and it is thus possible for cars to enter cars. Although car accessibility can be a benefit for the residents, it was observed that much of these streets were not suitable for children to stay on, as modern paving facilitates cars movement. Such characteristics of grid streets are going against social comfort in many terms: privacy, security, equality, and environmental qualities, which mainly discourage residents from staying for a long time on these streets.
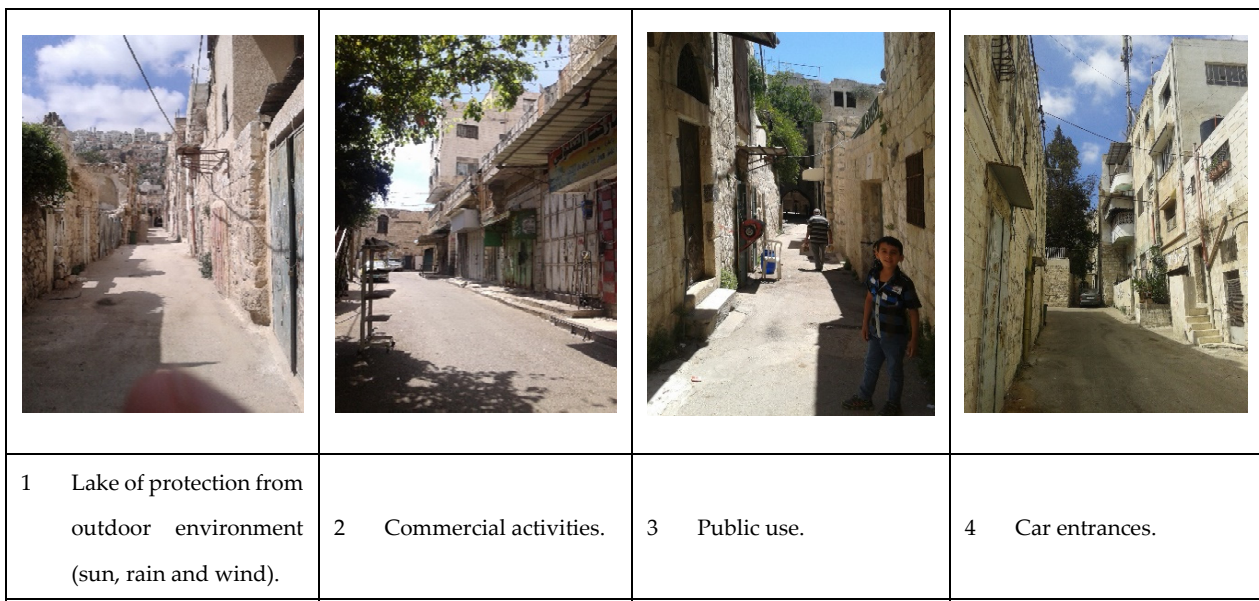
1　Lake of protection from outdoor environment (sun, rain and wind).	2　Commercial activities.	3　Public use.	4　Car entrances.

Figure 4. Typical grid streets in the traditional housing.

The following presents the result of analyzing the selected cul-de-sac to compare it with the grid streets.

3.1. Result from On-Site Analysis

Analyzing the floor plan for the selected cul-de-sac, many design elements preserve the privacy and security of the houses from the outside streets and encourage social interaction compared to grid street houses, such as the distribution of the entrances of houses along the street to avoid being in direct visual contact with each other, which increases the privacy and security of each house. The linear extension of the space as a local street gives the ability for a temporary feel of territoriality that requires distancing between groups and individuals to comfortably socialize. This facilitates the presence of different groups of neighbors who want to maintain a kind of privacy and distance from other groups on the same street. Children, for example, can play in a part of the space, maintaining adequate distance to prevent disturbing parents. See Figure 5 for different spaces inside the cul-de-sac.

Compared to grid street houses, the consideration of privacy and security inside the cul-de-sac is used for protecting the privacy of the surrounding housing visually and acoustically. The entrances of front houses on the street sides are designed to prevent exposing the interior of the house to the outside; a slight shift of the door is enough to maintain houses' privacy. In addition, none of the openings of each house can look directly at other openings or private spaces. It is also noticeable that the openings on the ground floor are very limited. The orientation of houses toward their inner spaces (courtyard) makes it possible to reduce the number of openings to the cul-de-sac on the ground floor. However, the existing windows of the first floor are small and elevated compared to the level view of people. In Arabic, Meshrabia is also used to cover large windows or balconies with wooden transparent sheets. Other techniques are used for maintaining the privacy

and security of houses from the street such as raising the door level of the house using stairs and shading some parts of the street using Al-Qantara as illustrated in Figure 5.
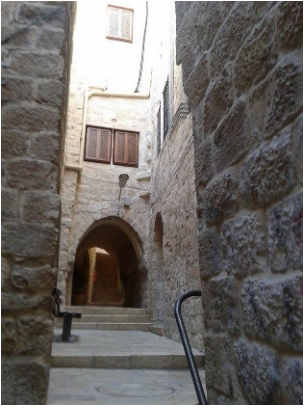
1. Most windows are high from the street level, avoiding openings on the ground floor.	2. Raising the entrance of some houses, and avoiding facing in-front entrances.	3. Using traditional balconies of wood (Meshrabia).	4. Using shaded areas over the street (Al-Qantara) to pass from one level to another level of private area.

Figure 5. Components of privacy and security in the cul-de-sac.

The cul-de-sac also provides the residential houses with the appropriate shared space to increase social contact between the neighbors through several techniques, the most important of which are the ease of access to the space in an almost equal way from all the houses and the appropriateness of the space size for the residents, which provide the opportunity for all residents to use the space fairly. Because the observation revealed that there was not an overcrowding in the space during different times of the day, there was no need to estimate a specific number of square meters for the area for each family. On the other hand, the environmental comfort factors within the space such as providing ventilation, solar control, and covering some places encourage staying in the cul-de-sac in most seasons of the year. The space also contains elements of strengthening social interaction between neighbors, which depend on visual communication between floors using exposed staircases. Other elements increase the possibility of social communication between individuals and groups in a safe and healthy environment, for example, shaded areas from the street, as shown in Figure 6.

1. Sizable and accessible spaces near houses entrances.	2. A healthy open-air space that provides a comfortable environment.	3. Shaded spaces that encourage social interaction in different weather conditions.	4. Exposed stairs provide strong relations between different floors.

Figure 6. Components of equality and environmental quality in the cul-de-sac.

3.2. Surveying People's Opinion

During the questionnaire, the extent of residents' satisfaction with the external spaces represented by the cul-de-sac and its elements that stimulated privacy and social interaction was identified. The comparison with the residents of grid street houses was the method used to find out the extent of the residents' satisfaction with both types of housing with the outdoors. The following summarizes the survey results, which are reported in two main parts: satisfaction with privacy from the street inside houses and satisfaction with outdoor spaces for social interaction.

3.2.1. Satisfaction with Privacy and Security

Eight questions of the questionnaire were designed to include all aspects of privacy that should be present in residential housing to provide comfort and reassurance to the residents as shown in Table 1. Visual privacy, which is the feeling that the inside of the house is not exposed to the street or other neighboring houses, was considered one of the most important aspects and was addressed by three questions. These questions were also asking about the importance and the meaning of privacy with the different groups of residents, such as children, elderly, men, and women. It is necessary that the assembling spaces around the houses are suitable for the use of all these groups and that these spaces provide privacy for each activity and each group by providing appropriate distances between individuals and groups within the cul-de-sac or grid street. The second aspect was the acoustical privacy, which is the feeling that what is happening inside the house is not heard from the street or the neighbors' houses; this was addressed by two questions. Satisfaction with the view, a secure place for children, and the hierarchy of spaces from public to private were the other aspects represented by one question for each.

Table 1 shows the results of the questionnaire in terms of residents' satisfaction with privacy. It can be noticed that the satisfaction with privacy is higher in the cul-de-sac houses compared to the simple houses in all sections, which means more satisfaction in all aspects of privacy for the cul-de-sac urban form. It is also noted that there are surprising scores in the analysis of the results, in the extent of satisfaction with the view of the house, where the simple house type takes a lower score of 37% compared to 65% for cul-de-sac houses. Although these houses may be located directly on streets wider than the cul-de-sac, they did not provide a satisfactory view for their residents. This is probably because residents

search for privacy and do not feel comfortable viewing public or commercial streets, as the houses would be exposed to the public street. It is also interesting to note the high difference in the respondents' satisfaction between the two types in the hierarchy of privacy from the public to the private (31% in simple houses and 54% in cul-de-sac houses). This gap indicates the importance of preserving the privacy of the residential area as a whole, from public areas, semiprivate to private, in addition to the importance of preserving the privacy of homes from the street. Acoustics and visual privacy with neighbors and visual privacy from the streets are seeing the highest satisfaction in the cul-de-sac (75%, 73%, and 71%, respectively).

Table 1. Satisfaction of residents on social interaction in both traditional types of housing in terms of privacy and security: simple houses and cul-de-sac houses.

	Building Type	
Satisfaction on Privacy	**Cul-De-Sac Houses**	**Grid Street Houses**
Acoustical privacy with neighbors	75%	62%
Acoustic privacy between male and female sections within the street	67%	56%
Visual privacy from the street (can people see you?)	71%	58%
Visual privacy between males and females within the street	65%	43%
Visual privacy with neighbors	73%	54%
Satisfaction with the view	65%	37%
A secure place for children to play	59%	35%
Hierarchy of outdoor spaces from private to public	54%	31%

3.2.2. Satisfaction with Equality and Environmental Quality

The second part of the questionnaire was also designed in eight questions that included most aspects that should be available in the collective space to encourage social interaction in terms of equality and environmental quality. Those aspects included proximity of public services, the environmental aspects of the space such as lighting and ventilation, as well as aspects related to the shape, size, and accessibility of the space. Residents were also asked about their relationship with neighbors as an indication of the success of these design aspects in increasing social interaction. The relevance of the space for women, children, and secure social interactions were also addressed

Table 2 shows the results of the questionnaire regarding social interaction within the outdoor spaces. The results show a better degree of satisfaction of the residents in the cul-de-sac houses compared to the residents of the simple houses in all questions except for the intimacy with the neighbors where the two results are almost similar. Moreover, the satisfaction with the proximity of public services is close for both types (50% and 48% for cul-de-sac and simple houses, respectively). This confirms that the lack of social interaction between neighbors in simple houses compared with the cul-de-sac type is probably due to the urban design of the outdoor space and not to other personal and proximity of services reasons. The highest satisfaction for cul-de-sac was with the security and safety of the space (65%) followed by the environmental aspects such as ventilation and lighting (61%); regarding the comparison of the two types, the highest difference in the responses was for environmental aspects (61% to 33%) followed by relevant space for women (65% to 29%) and area and shape of the outdoor spaces (55% to 31%) for cul-de-sac and simple houses, respectively. However, it is interesting that the lowest number in the table is when we asked about the existence of suitable spaces for social interaction in the simple house. This confirms the residents' need for suitable spaces for social interaction in this type of housing.

Table 2. Satisfaction of residents on social interaction in both traditional types of housing in terms of equality and environmental quality: simple houses and cul-de-sac houses.

	Building Type	
Satisfaction with Social Interaction	**Cul-De-Sac Houses**	**Grid Street Houses**
The proximity of public services	50%	48%
Ventilation and lights encourage staying on the street	61%	33%
Area and shape of outdoor spaces	55%	31%
Intimacy with neighbors	73%	74%
Relevant spaces for women to stay in	56%	29%
Relevant spaces for social interaction	51%	28%
Do your children have a good playing area location?	54%	37%
Do you think your street is a safe place for contacting others?	65%	51%

Although all the previous questions in Tables 1 and 2 showed a relatively good degree of satisfaction from the residents of the cul-de-sac, there was still a chance to increase the proportion of residents' satisfaction through some design improvements. The personal interviews and observations with the residents revealed several aspects that reduced the residents' satisfaction with the external spaces due to the need for modernization that pushed many residents to leave the old town and live in the modern housing in the city. They searched for the modern means provided by these housing units, such as parking lots, modern building materials, and modern infrastructure. This indicates that the design idea of the external spaces in itself is not the reason for the desire of some residents to leave their houses in the old city. From these results, it can be concluded that the use of the cul-de-sac concepts in a modern way in contemporary housing will necessarily increase the percentage of residents' satisfaction with this type of space.

The objective when conducting the questionnaire was to ensure the effectiveness of the architectural components that were monitored through the architectural analysis in terms of maintaining a balance between privacy and social interaction. From the above, it can be concluded that the results of the questionnaire demonstrated the validity of the hypothesis discussed in Section 3.1 that the cul-de-sac maintains, to a good degree, a sustainable social atmosphere in residential areas. The previous results also confirmed the importance of adequate collective spaces in the residential areas. Most recipients aimed to maintain strong social relationships with neighbors as simply as possible. For that reason, most families preferred to have relevant outdoor spaces in their housing environment to practice their social interaction. The cul-de-sac could successfully make the required balance between privacy and social interaction in the residential areas. The proper reason for the satisfaction with the cul-de-sacs is because of its character, which should be maintained in any future design. The following summarizes the cul-de-sacs' characteristics and their potential for privacy and social interaction that should be maintained in any future urban housing design, which is illustrated in Table 3:

Table 3. Guidelines for designing sustainable collective space in the Palestine housing based on learning from traditional cul-de-sacs.

Recommendations	Environmental Considerations		Visual Consideration		Spatial Design			Planning
	The Sequence of Exposed and Shaded Areas	Bending Paths	Linear Expansion	Raising the Elevation of Openings	The Sequence of Paths and Squares	Fair Distribution of Spaces	Narrow Streets	Hierarchy of Privacy
Maintaining user privacy inside the collective space	X	X	X		X			X
Maintaining houses' privacy from the outdoor space				X				X
Maintaining privacy in the public area							X	X
Encouraging social interaction between individuals	X		X			X	X	
Encouraging social interaction between groups	X		X		X			
Encouraging staying in the collective space	X	X			X	X		X

Table 3 includes some proposed guidelines for designing sustainable collective spaces based on learning from the traditional cul-de-sacs' structure and supported by the results from the questionnaire survey. The table shows the most important design elements found in the traditional cul-de-sacs that should be redesigned in a new way in contemporary housing. These elements are classified in four categories that should enhance sustainability in designing collective spaces: the first is environmental considerations, which deals with shading areas and bending paths. The second is visual considerations, which deals with linear expansion and raising the elevation of openings. The third is spatial design, which deals with the sequence of paths and squares, a fair distribution of spaces, and narrow streets. Finally, the fourth is planning, which deals with the hierarchy of privacy in the collective space.

The table shows the recommended human needs that should be preserved in urban design, which are related to the balance between privacy and social interaction. The table also shows the relations of human needs with the suggested design treatments related to environmental, visual, special, and planning aspects to achieve these needs using the (x) symbol. Most of these treatments serve more than one purpose as shown in the table. However, it can be noticed that the sequences of exposed and shaded areas and the hierarchy of spaces are the most important treatments due to their connection with most of the mentioned needs.

4. Conclusions

In the modern era, and after centuries of adapting the cul-de-sac concept for organizing houses around it, this type of street is still suitable for all users, keeping them away from the crowded areas and cars movement. The circulation elements inside the cul-de-sac also help to create a strong relationship between residents based on cooperation. As a result, the cul-de-sac is a very motivating approach for contemporary families and can play an important role in achieving social sustainability to the future generations.

The results of the study showed that the concept of the traditional cul-de-sac was still in line with the current time needs, because it maintained the four values that enhance social sustainability and social interaction: equality, privacy, security, and environmental quality. It maintained these values through its structural components: hierarchy of privacy, a fair distribution of spaces, a sequence of shade and open to the air, and a sequence of paths and squares. Hence, the hypothesis of the study was verified, and the comparison between cul-de-sacs and grid houses was the leading parameter during the analysis stages. The comparison showed the potential of the cul-de-sac as a qualified collective space for socially and environmentally sustainable communities. The used methodologies–field study and questionnaire survey–showed the positive effects of the cul-de-sac on sustainability values compared with simple urban spaces. This paper provided a recommendation for the future urban design of collective spaces for housing projects, city planning and urban design including environmental considerations, visual considerations, and special design and planning.

Finally, the results and recommendations from this research are in line with many attempts to recover this traditional idea in contemporary housing. Some of the well-known architects tried to learn from such ideas to recover traditional concepts in a contemporary way: habitat 67 in Canada is an example [38]. The study recommends further research to enhance the learning from such urban forms and apply this urban form in the contemporary housing of Palestine towards housing that encourages socially and environmentally sustainable communities. The results from this study can be utilized for similar cities in Palestine such as Jerusalem, Hebron, and Bethlehem. It is also recommended to conduct further studies to examine the applicability of the results for other cities in different climate and cultural contests.

References

1. Porotto, A.; Ledent, G. Crisis and Transition: Forms of Collective Housing in Brussels. *Buildings* **2021**, *11*, 162. [CrossRef]
2. Perović, S.K.; Šestović, J.B. Creative Street Regeneration in the Context of Socio-Spatial Sustainability: A Case Study of a Traditional City Centre in Podgorica, Montenegro. *Sustainability* **2019**, *11*, 5989. [CrossRef]
3. Do, D.T.; Mori, S.; Nomura, R. An Analysis of Relationship between the Environment and User's Behavior on Unimproved Streets: A Case Study of Da Nang City, Vietnam. *Sustainability* **2019**, *11*, 83. [CrossRef]
4. Dragutinovic, A.; Pottgiesser, U. Reuse of common space as a tactic for mass housing revitalization. In Proceedings of the 16th International docomomo Conference Tokyo Japan 2020+ 1, Inheritable Resilience: Sharing Values of Global Modernities, Tokyo, Japan, 29 August–5 September 2021.
5. Rey, J.R.-D. *Le Nouveau Petit Robert*; Le Petit Robert: Montréal, QC, Canada; Paris, France, 1994.
6. Sheppard, M. *Essentials of Urban Design*; Csiro Publishing: Clayton, Australia, 2015.
7. Eisner, S.; Gallion, A.; Eisner, S. *The Urban Pattern*; John Wiley & Sons: New York, NY, USA, 1993.
8. Ragette, F. *Traditional Domestic Architecture of the Arab Region*; American University of Sharjah: Sharjah, United Arab Emirate, 2003.
9. Dumper, M.; Stanley, B. *Cities of the Middle East and North Africa: A Historical Encyclopedia*; ABC-CLIO: Santa Barbara, CA, USA, 2007.
10. Rapoport, A. *House Form and Culture*; Prentice-Hall: Englewood Cliffs, NJ, USA, 1969.
11. Brown, B.B.; Werner, C.M. Social Cohesiveness, Territoriality, and Holiday Decorations: The Influence of Cul-de-Sacs. *Environ. Behav.* **1985**, *17*, 539–565. [CrossRef]
12. Cozens, P.; Hillier, D. The Shape of Things to Come: New Urbanism, the Grid and the Cul-De-Sac. *Int. Plan. Stud.* **2008**, *13*, 51–73. [CrossRef]
13. Rachele, J.N.; Learnihan, V.; Badland, H.M.; Mavoa, S.; Turrell, G.; Giles-Corti, B. Neighbourhood socioeconomic and transport disadvantage: The potential to reduce social inequities in health through transport. *J. Transp. Health* **2017**, *7*, 256–263. [CrossRef]
14. Signoretta, P.; Cuesta, R.; Sarris, C.; Signoretta, P. *Urban Design: Method and Techniques*; Routledge: Oxford, UK, 2003.
15. Hakim, B.S. *Arabic Islamic Cities: Building and Planning Principles*; Routledge: New York, NY, USA, 2013.
16. Hall, E. *The Hidden Dimension*; Anchor Books: New York, NY, USA, 1966.
17. Al-Amad, E. *Continuity and Change in Traditional Domestic Architecture of Palestine: Transformation of Traditional Concepts of House Design in Nablus*; University of Glasgow: Scotland, UK, 1998.
18. Itma, M. Impact of Sociocultural Values on Housing Design in Palestine. In *Climate Change and Sustainable Heritage*; Cambridge Scholars Publishing: Newcastle, UK, 2018; pp. 130–142.
19. Sharifi, A.; Murayama, A. Changes in the traditional urban form and the social sustainability of contemporary cities: A case study of Iranian cities. *Habitat Int.* **2013**, *38*, 126–134. [CrossRef]
20. Al-Amad, E.M. Traditional Concepts and New Housing Design in Palestine. *Open House Int. J.* **2003**, *28*, 58–67.
21. Furuseth, O.J. Neotraditional planning: A new strategy for building neighborhoods? *Land Use Policy* **1997**, *14*, 201–213. [CrossRef]
22. Ford, L.R. Lynch revisited: New urbanism and theories of good city form. *Cities* **1999**, *16*, 247–257. [CrossRef]
23. Choguill, C.L. Developing sustainable neighbourhoods. *Habitat Int.* **2008**, *32*, 41–48. [CrossRef]
24. Nikeghbali, S. Adapting Design Principles of Traditional Courtyard Housing for Future Urban Design. *J. Sustain. Dev.* **2017**, *10*, 200. [CrossRef]
25. Charmes, E. Cul-de-sacs, Superblocks and Environmental Areas as Supports of Residential Territorialization. *J. Urban Des.* **2010**, *15*, 357–374. [CrossRef]
26. Hochschild, T.R. The Cul-de-sac Effect: Relationship between Street Design and Residential Social Cohesion. *J. Urban Plan. Dev.* **2015**, *141*, 5014006. [CrossRef]
27. Sassi, P. *Strategies for Sustainable Architecture*; Taylor & Francis: New York, NY, USA, 2006.
28. Oxford Dictionaries. 2022. Available online: https://www.oxfordlearnersdictionaries.com/definition/english/sustainability?q=sustainability (accessed on 21 January 2022).
29. Abed, A.; Al-Jokhadar, A. Common space as a tool for social sustainability. *Neth. J. Hous. Built Environ.* **2021**, *37*, 399–421. [CrossRef]
30. Bramley, G.; Brown, C.; Dempsey, N.; Power, S.; Watkins, D. Social Acceptability. In *Dimensions of the Sustainable City*; Springer: Dordrecht, The Netherlands, 2010; pp. 105–128.
31. Polese, M.; Stren, R.E. *The Social Sustainability of Cities: Diversity and the Management of Change*; University of Toronto Press: Toronto, ON, Canada, 2005; p. 75, ISBN 080208320X.

32. Ghahramanpouri, A.; Saifuddin, A.; Sedaghatnia, S.; Lamit, H. Urban Social Sustainability Contributing Factors in Kuala Lumpur Streets. *Procedia-Soc. Behav. Sci.* **2015**, *201*, 368–376. [CrossRef]

33. Abraham, H.M. A Theory of Human Motivation. In *Theoretical Readings in Motivations: Perceptive on Human Behaviour*; Levine, F.M., Ed.; Rand McNally College: Chicago, IL, USA, 1975.

34. Salamati, A. Urban Housing in Iran, In Response to Socio-Cultural and Environmental Conditions. Ph.D. Thesis, University of Strathclyde, Glasgow, UK, 2001.

35. Coccolo, S.; Monna, S.; Kaempf, J.H.; Mauree, D.; Scartezzini, J.L. Energy demand and urban microclimate of old and new residential districts in a hot arid climate. In Proceedings of the PLEA 2016—36th International Conference on Passive and Low Energy Architecture, Los Angeles, CA, USA, 11–13 July 2016.

36. Callejas, I.A.; Durante, L.C.; Diz-Mellado, E.; Galán-Marín, C. Thermal Sensation in Courtyards: Potentialities as a Passive Strategy in Tropical Climates. *Sustainability* **2020**, *12*, 6135. [CrossRef]

37. Monna, S.; Barlet, A.; Hussein, M.H.; Bruneau, D.; Baba, M. Human thermal comfort for residential buildings in hot summer and cold winter region, a user based approach. *J. Physics Conf. Ser.* **2019**, *1343*, 12150. [CrossRef]

38. Itma, M.A.; Atmeh, M.A. Cul-de-sac in the sky "Re-reading Habitat 67". *J. Eng. Res. Technol.* **2019**, *6*, 20–25.