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Methodology to Identify and Prioritise the Social Aspects to Be Considered in the Design of More Sustainable Residential Buildings—Application to a Developing Country

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Abstract: The priorities in the design of more sustainable buildings are quite dependent on the specific social context. In developing countries, the sustainability concept and priorities in the residential buildings sector are quite different from the ones of the developed countries, since there are still basic needs to answer. Therefore, this research is aimed at contributing to a better understanding of the concept of social sustainability in the residential building sector of the developing countries. A methodology to define and prioritise the social sustainability indicators is proposed and applied in the context of Palestine. The presented methodology is based on the sustainability indicators of international standards, on the most well know building sustainability assessment methods and in the analysis of their application to a specific context. It includes a methodology to prioritise the list of social indicators, by considering the expectations of two groups of building stakeholders: designers and building users. At the end, this research proposes a framework of social aspects to consider in the design of more sustainable residential buildings in West Bank, Palestine that is composed of twenty-one indicators, distributed among six sustainability categories and ranked according to their weight in the overall of sustainability level.

Keywords: social sustainability; sustainability indicators; social priorities; residential buildings; Building Sustainability Assessment Tool for West Bank (WB-BSATool)

1. Introduction

Sustainability or sustainable development can be identified as a holistic approach that seeks an appropriate balance between the three essential pillars of development (environment, society, and economy) at local, national, regional and global levels, covering all economy sectors [1]. People are at the heart of sustainable development, and therefore the artificial environment must be, at first, designed to meet their needs and expectations. Although the sustainable development concept is not new, still there are no common agreements on the priorities to consider at each pillar, especially at the social level [2]. McKeown [3] clarified that sustainable development is a hard term to define because, on one hand, society has difficulties to define the limits for the sustainable growth at the global scale and on the other hand, there are the ever-changing human needs and perceptions of the meaning of important concepts. For instance, truly important concepts for the humanity, such as freedom and justice, are difficult to define and vary over the time.

A sustainable residential building can be defined as a private space that provides the basic needs for the family life without putting more pressure on the environment [4]. Hence, the sustainable

housing is about ensuring a better quality of life for occupants and promoting a better balance between the individual needs and comfort (social dimension) and the environmental and economic dimensions of the sustainable development [5]. Therefore, sustainable housing design needs arbitrator planning to make a house a cosy and comfortable place with a high quality and good economic and ecological performances. The efforts towards sustainable housing require well understanding of the social sustainability because it plays a key factor in housing design and is a priority in a developing country [6]. Aesthetics and structural aspects should not be the only basic considerations when designing a house and at least other aspects related to the occupant's expectations and the cultural, social and economic values of a society must be considered. A study [7] shows that housing design fails if not considering the occupant.

Homes strongly reflect the identity of a community and are a form to communicate sociocultural values [4]. Among others, the sociocultural values of a community can be seen in its daily life, beliefs, characteristics of the residential buildings, types of jobs and gastronomy [8,9]. Authors define social sustainability in different ways, but most of them agreed that is "the positive condition within communities and the process to achieve it". They also proposed a variety of issues and criteria supporting the social sustainability as a measurable condition as health, participation, safety, accessibility to education, identity, job opportunity, and security [4,10].

According to Dikmen, the factors that shape the sociocultural factors in housing design are [11]: Family Structure and Size, Safety, Privacy, and Religion. Hall [7] stated that there are nine categories that are considered a priority from the point of view of most residents. They are the good quality living environment; available good schools; safe environment; clean and friendly neighbourhoods; pre-school child care; well-integrated social housing; careful interagency planning; community outreach workers; neighbourhood amenities and security. In the point of view of the standard ISO 21929-1 [12], the core sustainability indicators that can be directly related to the assessment of the social sustainability are: access to services by type (i.e., to public and private modes of transportation, green and open areas and user-relevant basic services); accessibility; indoor conditions and air quality; adaptability (change of use or user needs); safety; and aesthetic quality. Therefore, it is possible to conclude that there are some differences between the building occupants' social expectations and those defined by policy-makers, sustainability experts and other stakeholders in the development of the standards.

Sustainability assessment rating tools and guides are considered as one of the most effective ways for pushing buildings and construction sector into sustainability [13]. Regarding residential buildings, it is possible to list some tools in the market, such as Leadership in Energy and Environmental Design (LEED) for Homes, ITACA Protocol, Code for Sustainable Homes and Sustainable Building Tool for Portuguese Housing Buildings (SBTool^{PT}-H) [13,14]. These methods aim at minimizing the impacts of residential buildings on the natural environment while maximizing the social and economic performance of them, without ignoring the importance of the harmony between nature and humans [15]. The assessment systems are directly used to evaluate the building and indirectly they provide a better insight into the sustainable development, through the analysis and valuation of information and comparison of results [16]. Other studies [17,18] concluded that a building sustainability assessment method works as a guide, helping to collect and report information to support decision making during the different stages of the building life-cycle, from the cradle to grave, and allowing the evaluation of the overall building performance. These authors also agree that these methods can promote the sustainable development not only by guiding the stakeholders in the principles to consider to maximise the performance at the level of the three primary sustainability development dimensions (environment, society and economic) but also in satisfying the requirements for improving the functional and technical performances of buildings.

Energy, site considerations, water, material input, and indoor and outdoor environments are the typical categories included in the assessment methods. However, the number and type of sustainability indicators, the way they are organised in the method (e.g., into categories), how each indicator is assessed, and how they are aggregated to assess the global building sustainability score are the main

differences found in the comparison of the assessment methods [19]. The comparative analysis between different methods is already published by some researchers such as [14,19–21].

In fact, despite the rapid growth of the building sustainability assessment methods over the last years, they still face some difficulties. In most of these systems, there is a lack of a holistic view of social sustainability [22]. Hall [7] stated that the main reason for that is that there is no shared understanding and agreement about the concept of "social sustainability" itself. Each society has its own beliefs, language and social lifestyle what makes a challenge to the interaction and sharing of the logic from one community to another. Moreover, social sustainability is hard to measure due to the difficulties of enrolling the community needs in practice. Therefore, in many cases, the social sustainability is restricted to the health and comfort since these parameters can be more straightforward measurable [23].

Analysing the state-of-the-art presented above, it is possible to highlight the effort that has been made internationally by the standardization bodies and other institutions in the development of a more consensual definition of the sustainable construction concept. This work has been very important, mainly in the definition of the sustainability categories (macro indicators), i.e., the priorities that should be considered in the design, maintenance and management of a more sustainable built environment. Yet, there is not a broad consensus on the list of indicators that should be considered in evaluating the performance of a building at the level of each specific sustainability category and on the weight that each indicator should have in the assessment of the global sustainability. As a result of this situation, there are around the world myriads of different Building Sustainability Assessment methods (BSA). The main reason for this lack of consensus is the existence of different environmental, economic and social priorities in different parts of the globe. For example, in some underdeveloped countries, the main concern of the population is the right to housing, and the reduction of energy consumption in buildings is not a priority, as it is already low due to the lack of infrastructure and/or economic capacity of the population. In others, energy resources abound, but potable water supplies are scarce, and therefore the efficient use of this resource is one of the main priorities of these societies.

It should also be noted that the development of the list of sustainability indicators is mainly based on the knowledge of sustainability experts and/or on the opinion of representatives from different stakeholders and that, therefore, a significant part of the real building occupant's expectations might not be considered.

Based on the aforementioned context, this research is a part of an ongoing research for the development of a BSA method to be used in the specific context of a developing country (Palestine), which has a social context very different from the one that exists in other countries. This is a pioneer study in the Palestinian reality since, so far, no similar studies were developed in that country. Additionally, by considering the opinion of different stakeholders both in the definition of the list of sustainability indicators and in the development of the system of weights, i.e., by presenting a different approach to the common methodologies used so far, it also contributes to the development of the current state-of-art.

Due to the broad scope of ongoing research, this work is focused on the presentation of the methodology used for the development and ranking of the list of social indicators. In the methodology used, it was considered, along with the opinion of a set of sustainability experts, the expectations of two important groups of decision-makers in the context of the buildings: designers and occupants. The results show the existence of significant differences between the social priorities obtained for the Palestinian residential buildings and the ones defined by the three analysed BSA methods.

2. Challenges in the Path to the Sustainable Design in West Bank, Palestine

The sustainable and green building design is not a new idea in the Palestinian construction sector. Many architects, engineers, and institutions such as the Palestine Higher Green Building Council and the Rwraq Centre for Architectural Conservation, are working hard to improve the building sector and to turn the sustainability concept as a common practice. However, most of the solutions in the

Palestinian market fell on the sustainability trap while they employed strategies that do not fit the regional level. For instance, the Palestinian Museum is a sustainability certified building based on a foreign method and it is criticised by having a performance lower to the one that was expected [24], which is a critical issue connected with the success of the sustainability race in the country. That means in one way or in another that there is clearly a lack of a framework to promote sustainable design in Palestine.

Palestine is a small geographic located in the south-west of Asia at the heart of the Middle East, on the eastern coast of the Mediterranean Sea. To the east, it is bordered by Jordan and Syria, to the north by Lebanon, and to the southwest by Egypt. The Occupied Palestinian Territories (OPT) has two geographical districts, Gaza Strip and West Bank (WB), and they are separated by the state of Israel [25]. However, this paper is focused on the West Bank region due to the restricted movement between the Gaza Strip and the West Bank, where it is difficult for the researchers to access to the Gaza Strip.

WB Palestine geography consists of four varied regions. The central highlands, where most of the population lives; the semi-arid eastern slopes; the arid rift valley and the coastal plains, in the north and west [26]. According to Koppen-Geiger's classification, the Occupied Palestinian Territory belongs to the hot-summer Mediterranean climate (Csa) [27]. The West Bank has a temperate climate with a long hot dry summer and cool rainy winter. The summer temperatures reach 35 °C and the temperature may drop to zero during the winter. The rainfall is limited to the winter and spring months, between November and May. The annual rainfall is ranging from 100 to 600 mm and depends on the location [25].

The culture of WB, Palestine is closely related to the culture of the rest of the Levantine area. Hard worker, collaborator, friendly and hospitality are the main features of the Palestinian community, despite the hard life due to occupation, the high rates of poverty and unemployment [28]. In spite of the fact that Palestine is thought to be a various society, most of the population are Muslims, with a strong Christian presence as well. Therefore, it is not surprising that Islam shaped the Palestinian community and affected every side of the citizen's life [9].

WB Palestine is not just a part of a developing country that needs an urgent application of sustainable construction to improve its construction sector but is also a special case due to the occupation since 1967. West Bank faces many serious challenges and changes. The first and the most important problem is the depletion and destruction of the environmental resources, especially water and energy [29]. The second problem is the high growth rate of population, around 3–3.5%, which is higher than the projected rate of the Middle East and North Africa. Finally, the accumulation of the carbon dioxide emissions in the atmosphere which causes the risk of climate change [26].

The construction sector is one of the main activities that have a significant impact on the Palestinian economy, and it can grow or shrink but will never disappear from the Palestinian economic map. It was the second contributor in Gross Domestic Product (GDP) with about 13% of the total GDP in the Palestinian economy in 2014, and it plays a vital role in creating job opportunity, by employing around 11–15% of the Palestinian's labour force [30].

The residential buildings take the majority of the developed Palestinian land and they are considered the highest consumers of natural resources in the construction sector. Moreover, Palestinians spend a long period of their life within them [31]. Indeed, Palestinian housing problems are more persistent than ever. The average annual price of the apartments is increasing at a rate of 10%, mainly due to the limited land and the strong rise of the demand for apartments because of the rapid increase of population [31]. In addition, the method of housing design in Palestine is shifted from the end user to the developers, who focus on the cost reduction [28].

Successful house design, regardless of its type and size, is the one that meets the expectations of the end user. It is expected that the architect creates a brief that meets the expectations of the owner. However, nor the method of housing design in Palestine neither the municipalities codes support the expectations of the end user or the necessary approaches to protect the environment [24].

In the context of Palestine, keeping attention to the housing sector and repairing the country's infrastructures is essential to create adequate economically, socially and environmentally conditions and to improve the living standards of the Palestinian people. BSA is one of the applications that provide a proof that a building design succeeded to achieve a certain level of sustainability [23]. Moreover, it supports decision-making towards the implementation of sustainable design principles [17]. Therefore, developing a building sustainability assessment rating method can contribute to solving some of the West Bank residential building problems.

Based on the definition of a sustainable building, the dimensions of sustainability can be divided into the following main sustainability dimensions: environment, society, and economy. In this case study, the proposed method is limited to the society dimension because, as argued before, this is an immerging issue in what respects to the West Bank's residential sector [4,32] and there is a lack of a common understanding regarding the main priorities to consider in the design of a residential building that meets the expectations of its inhabitants.

3. Objectives

This study is intended to present a methodology to define the list of social sustainability indicators and their relative weights to be used in a future method to assess the sustainability of new or retrofitted residential buildings in WB Palestine. Besides that, it is aimed to assess the relative weight of the social indicators in comparison to the weight of the other two sustainability dimensions (Environment and Economy) in the assessment of the sustainability level of a residential building. Thus, this research has three main objectives that are aimed at filling the gap identified in the state of the art:

- To develop the list of social indicators of the "WB-BSA Tool" Building Sustainability Assessment method adapted to the WB Palestine context. The list of indicators should be based on standardization, general sustainability indicators recognised by the most well-known international BSA methods and suit the local context;
- To develop a method to define the relative importance of each indicator and sustainability dimension;
- To rank the importance of each social indicator and sustainability dimension, according to the expectations of both local building designers and inhabitants;
- To compare the results with the list of indicators and system of weights of other BSA methods, in order to highlight the specificities of the WB Palestine context.

4. Methodology

Social sustainability is the most connected dimension with the human needs. Max-Neef [33], stressed that to solve the most important human problems in a sustained way, people should be the main focus in finding out the solutions and alternatives for these issues. Therefore, integrating people's opinion in the development of a list of priorities to be considered in the design of a sustainable building, improves the people's participatory decision-making, allowing a better connection between the human needs and the new strategies to satisfy them. In this context, the questionnaire is considered as an effective tool for data collection in mass communication research [34].

The used methodology is based on quantitative and qualitative methods, which are aimed to analyse the most common sustainable building assessment methods, to define the list of social indicators and the importance that each one should have in the decision-making process when designing a building in WB Palestine.

Regarding the boundaries of an assessment method, they are generally divided into spatial and time boundaries. According to Kang [23], the building sustainability assessment methods have a more objective result, when the spatial boundary is limited to the building, where wider scales need a large amount of data which is waste of time and resources. Therefore, this study is concentrated in the residential building scale and, in addition to it, some wider aspects are considered important to assess the social sustainability, such as the accessibility to the public transport.

In terms of time boundary, the building is considered as a product and therefore the period of the assessment method covers the whole building life cycle, from the construction phase throughout operation until, the demolition phase.

Sustainability is a relatively new concept in WB Palestine's construction industry. Therefore, defining the sustainability indicators at micro-level is still a hard task. Ding [35] stressed that one solution to solve this problem is to consider the main priorities of the international standards as being also the main issues of a particular context, as a first step for developing a new building sustainability assessment for a particular location.

In the context of building sustainability assessment, indicators can be defined as worthy information regarding the impact of each building design scenario on the environment, society and economy [8]. They help to provide different solutions for the project and they also describe the relationship between cause-and-effect.

Three tools were used to define and select the social indicators in this study: literature survey, interviews and questionnaires. The literature survey covered the fields of international standards for social sustainability, the list of social indicators covered by the most common building sustainable assessment methods and rating systems and the local residential building regulations. This approach provides an opportunity to determine the initial set of indicators.

As a second step, several interviews were carried out with some private and academic Palestinian key sustainability actors. These interviews allowed to gather the opinion of experts about each indicator of the preliminary list defined in the first step. The interviewees were asked to rank the applicability and measurability of each indicator in Palestine. As a result, a list of social indicators, organised in sustainability categories, was developed.

The third step was the development of two questionnaires, based on the list of social indicators developed in the last step. One questionnaire was oriented to residential building designers and the other to house residents. This step allowed the collection of information to develop the weighting system of the WB Palestinian's social indicators and to compare different perspectives.

After defining the social indicators, the final step was the development of the weighting system, which allowed to rank each indicator according to its importance to the social sustainability of the WB Palestinian residential building sector.

The methodology used in this research is similar to the one used in similar studies, such as [4,8,23,32] and further details are presented below.

4.1. Development of the List of Indicators and Questionnaire

The definition of the preliminary set of social sustainability indicators was based on literature survey and analysis of the following data:

- The international sustainability indicators defined in ISO 21929-1 [12];
- The list of indicators of the global Sustainable Building Tool (SBTool) method, considered internationally as the most comprehensive general framework to assess the sustainability of buildings, which system of weights and benchmarks can be adapted to local contexts [36];
- Two of the most used building sustainability assessment methods used, at international level, to assess the sustainability of residential buildings, namely: Code for Sustainable Homes Version 2 [37] and LEED v4 for Homes Design and Construction [38];
- The list of indicators of a method that resulted from the adaptation of the global SBTool to the assessment of residential buildings of a particular country, namely the SBTool^{PT}-H [17].

The preliminary set of social indicators included all different social indicators identified in the BSA methods mentioned before. This approach is similar to the one used by other authors, e.g., [17,39] in the development of BSA methods for specific contexts.

After defining the preliminary list of indicators, the West Bank municipality's codes and the regulations of the Engineers Association were analysed in order to check if there are mandatory

requirements, related to social aspects that were not covered by the list. From this analysis, two additional indicators were added: fire safety and earthquake safety.

Regarding the interviews, invitation emails were sent to ten (10) sustainability experts from the private sector and academia to voluntarily participate in these interviews. A total of six (6) experts agreed to participate and as a result, a set of voice call interviews were carried out between 15 and 30 of January of 2017 with four architects, one civil engineer, and one researcher. An interview guideline was developed and sent in advance to each interviewee by email.

As a result, the interviews allowed the definition of the list of social sustainability categories and related indicators. From these discussions, some indicators that were considered as a priority were added and others that were considered as not relevant to the Palestinian context or very difficult to evaluate according to the available data were subtracted from the initial set of indicators. Table 1 presents the indicators added and subtracted from the initial set of indicators and the main justifications presented by the interviewees.

Table 1. Indicators that were added or subtracted from the preliminary list of indicators.

Added Indicators	Justification
Accessibility to the work	The movement and access restriction in the West Bank
Subtracted Indicators	
Safety from flooding	West Bank rainy season is not a season of heavy rains
Access to bicycle traffic	Bicycling is not a habit among West Bank residents and there are no urban cycling paths to connect with
The efficiency of mechanical ventilation	Residential buildings mostly rely on natural ventilation
Provide drying space	Due to the climate conditions, Palestinian people usually use an open space outdoors (e.g., roof or balcony) to dry the clothes
Provide home office	Due to the limited area for the main functions in the house design, a dedicated space for a home office is not a priority
Spatial efficiency	It is not easy to evaluate and therefore not suitable to take part in the first set of indicators developed for the Palestinian context
Functionality of layout	It is not easy to evaluate and therefore not suitable to take part in the first set of indicators developed for the Palestinian context
Universal access to the site and within the building	The assessment boundary is limited to the building and therefore this indicator is out of scope. An indicator to promote the easy access for disabled persons within the building was added to the preliminary list of indicators

The interviewees also recommended that some indicators should be changed to accommodate the WB Palestine's residential context. Table 2 lists the indicators that were modified according to expert's opinion and the related justification. The experts also argued that a long list of indicators just for one sustainability dimension would hinder the practical application of the new WB-BSATool and therefore those indicators that were judged (in the questionnaires) to have little importance in the overall building sustainability should be excluded from this list. This recommendation can also be found in the conclusion of other studies in the field of the development of BSA methods, such as [8].

Table 2. Modified indicators as requested by the experts.

Initial Indicator	Suggested Indicator	Justification
Free smoking area	Non-smoking area	Due to the limited area for the main functions in the house design
The efficiency of vertical systems	Provide a dedicated space in the house design for future installation of a lift	Installing a lift is not always a mandatory requirement, according to the local building code and conventional building practice
Indoor air quality and ventilation	Good air quality and natural ventilation	To encourage the passive design

As a result of this stage, a list of twenty-nine (29) indicators organised into seven (7) sustainability categories (C1. Cultural; C2. Heritage; C3. Indoor environment quality; C4. Health and well-being; C5. Safety and service quality; C6. Accessibility; and C7. Functional) was developed (Table 3) and included in the questionnaires.

Table 3. List of sustainability categories and respective indicators included in the questionnaire.

Category	Indicators (In)	
C1. Cultural	1.	Visual privacy
	2.	Access to private open space
	3.	Easy access for disabled people
	4.	External views
C2. Heritage	5.	Respect the cultural value and the surrounding context
	6.	Use of traditional local materials and techniques
	7.	Maintenance of the heritage value of an existing facility
C3. Indoor environment quality	8.	Air temperature and relative humidity
	9.	Appropriate daylight
	10.	Appropriate light on the environment
	11.	Good air quality and natural ventilation
	12.	Outdoor noise reduction
	13.	Indoor noise reduction
C4. Health and well-being	14.	Installation of mechanical extraction ventilation in the kitchen and bathrooms
	15.	Reduce the exposure to airborne chemical contaminants
	16.	Reduce the exposure to toxic finishing materials
	17.	Non-smoking area
C5. Safety and service quality	18.	Safety from fire
	19.	Safety from earthquake
	20.	Regulated building maintenance
	21.	Security of the house
	22.	Security of the neighbourhood
C6. Accessibility	23.	Accessibility to the public transport
	24.	Accessibility to the workplace
	25.	Accessibility to public services
	26.	Accessibility to outdoor public spaces
C7. Functional	27.	Availability of a user manual
	28.	Provide fixed space for installing an elevator in the design
	29.	Possibility to modify the house construction

Regarding the questionnaires to the building designers and building users, a descriptive methodology was used. Descriptive research involves gathering data that describe events and then these data are organised, recorded and analysed [32].

The questionnaires to the building designers and to the building users had the same structure and consisted of 32 questions, organised into seven sections. The first section was a cover letter that explained the goals of the research and stated the privacy policies of the collected data.

The next five parts consisted of questions focusing on the importance of the several social indicators. Respondents were asked to answer their opinion, regarding the importance of each indicator, using the Likert scale. The scale was organised into five levels of importance: not important at all (1); of little importance (2); important (3); very important (4); and extremely important (5).

The final part of the questionnaire was about personal data, namely the gender, age, education and the average monthly income. The personal information took place at the end of the questionnaire to avoid influencing the participants' answers.

4.2. Sampling Process

The sampling process was based on a focus group form Nablus Governorate, which is one of the largest West Bank governorates. This focus group was subdivided into two main groups:

- The professionals (designers) registered in the Engineers Association of Nablus. An online questionnaire was sent to 50 persons, between 15 and 25 of February 2017, by email. The study sample was selected among professionals who had a background in sustainable development and residential building industry, covering the fields of architecture, civil, electrical or mechanical engineering, urban planning, and building engineering. 49 answers were received, corresponding to a response rate of 98%.
- Residential building occupants in the main three areas of the Nablus Governorate: city, villages and the old city of Nablus in the age boundary of 20 to 60 years old. The study sample of this group was selected randomly and the occupants' responses were collected via an internet-based questionnaire, in Arabic, between 4 and 21 of March 2017. One hundred and three (103) from a universe of one hundred fifty answered the questionnaire. The respondent rate was 68%, and answers were collected from the three areas of the Nablus Governorate according to the distribution presented in Table 4.

Table 4. Distribution of answers among the three areas of the Nablus Governorate.

Area	City	Village	Old City	Total
Number of answers (n)	59	38	6	103
Percentage of answers (%)	57.3%	36.9%	5.8%	100%

4.3. Development of the Weighting System

There are different approaches to develop a weighting system for sustainability indicators, based on monetary or non-monetary weighting methodologies. From the analysis of different BSA methods, such as SBTool^{PT}-H, LEED, and Building Research Establishment Environmental Assessment Method (BREEM), it is possible to conclude that the non-monetary weighting methodology is used by all of them. The reason for that might be the subjectivity to associate an economic value for every sustainability indicator.

Panel weighing is considered as the most accurate method for defining the weighting system of a BSA method, where the larger and more representative the panel is, more accurate is the result [40]. Therefore, in this study, the Analytical Hierarchy Process (AHP) panellist's method was applied to evaluate the relative weight of each indicator. AHP is an organizing and analysing mathematical method for complex priorities and decisions. It was developed in the 1970s and since that, it is used as a methodology to prioritise human decision making in different fields such as government, business, project selection, healthcare and education [41].

AHP is considered as a simple technique that is able to translate the evaluations of both qualitative and quantitative data made by the decision maker into multi-criteria ranking. In addition, the AHP includes a useful tool for checking the consistency of the decision maker's evaluations, thus reducing the bias in the decision-making process [32].

AHP involves the following steps to hierarchise the priorities of a project [41]:

- Model the problem as a hierarchy containing the decision goal, the alternatives for reaching it, and the criteria for evaluating the alternatives;
- Establish priorities among the elements of the hierarchy by making a series of judgments based on pairwise comparisons of the elements;
- Synthesise these judgments to yield a set of overall priorities for the hierarchy;
- Check the consistency of the judgments;
- Come to a final decision based on the results of this process.

Both the professionals and the building occupants were asked to provide their opinion about: (1) the importance of each of the three sustainability dimensions (environmental, social and economic) in the overall building sustainability level; (2) the importance of each of the seven social sustainability

categories in the assessment of the social performance; and (3) the weight of each indicator in the evaluation of the performance of the respective sustainability category.

Based on the recommendation of the interviewed experts and in the methodology of other research, e.g., [17], for the practical use of the method under development, the final list of social indicators should be as compact as possible and at the same time include the most important indicators. Therefore, the last step of the methodology was the reduction of the list of indicators, subtracting those that according to the results have a very low contribution to the social performance.

In the analysis of the state-of-art of art, a specific method to define the cut-off rule of indicators that have little importance to the sustainability level of a building was not found. Therefore, it was decided to identify in the analysed BSA methods the lowest weight considered in the system of weights of the social indicators and to exclude from the final list of indicators every indicator with a lower weight than that threshold. From the analysis of Table 5, it was possible to conclude that, among the presented BSA methods, the considered indicator with the lowest weight has a weight of 0.4% in the overall score. It happens for the "Potential of the conditions of the building in promoting the separation of solid waste" and "Water sealing index" indicators, in the SBTool^{PT}-H. Therefore, a list considering only the indicators that contribute 0.4% or more to the overall sustainability level is proposed, which means that the list presented in Table 3 was reduced to 21 indicators. In this process, the following indicators were excluded from the final list: External views; use of traditional local materials and techniques; availability of a user manual; provide a dedicated space in the house design for future installation of a lift; possibility to modify the construction of the house; indoor noise reduction; installation of mechanical extraction ventilation in the kitchen and bathrooms; and accessibility to outdoor public spaces. Since all indicators of the Functional (C7) category were excluded, the number of sustainability categories was reduced to 6 in the final list of indicators. Based on the AHP method, the weights of the final list of indicators were calculated.

Table 5. Lowest weight of the indicators in the analysed BSA methods weighting systems.

BSA Methods	Lowest Weight (%)
Code for Sustainable Homes	0.70
LEED for homes	0.90
SBTool^{PT}-H	0.40

5. Presentation of Results and Discussion

Based on the results of the questionnaire and on the weighting method presented above, it was possible to obtain the final weight for each sustainability dimension (Table 6), social category and social indicator (Table 6).

Table 6. The relative weight of each sustainability dimension in the assessment of the sustainability level.

Dimension		Building Designers' Weight (%)	Building Occupants' Weight (%)	Average Weight (%)
D.1	Environmental	62.0%	55.0%	58.5%
D.2	Social	14.0%	24.0%	19.0%
D.3	Economic	24.0%	21.0%	22.5%

Among the three sustainability dimensions, the social one was ranked, on average, as the least important dimension with a weight of 19%. Nevertheless, there is a difference in the answers of the two groups of respondents since while the building designers rank the social dimension as the least important, building occupants rank it as being the second-most important.

Table 7 presents the results from the application of the AHP in the evaluation of the weight of each social category. Analysing this table, it is possible to conclude that the distribution of the weights among the categories was more balanced in the building occupants' valuation than in the building designers' one. A vast majority of professionals reported that indoor house quality issues (C3) are the most important in the design of a house. The building occupants reported the cultural (C1) and safety

and service quality (C5) categories as being the most important. By analysing the average weights that resulted from the two groups, it is possible to conclude that indoor quality issues (C3) were ranked as the most important priority to promote social sustainability in WB Palestinian residential buildings, with an average weight of 28%.

Table 7. The relative weight of each social category in the assessment of the social performance.

	Category	Building Designers' Weights (%)	Building Occupants' Weights (%)	Average Weights (%)
C1	Cultural	23.8%	21.3%	23%
C2	Heritage	6.7%	7.4%	7%
C3	Indoor quality	37.9%	17.8%	28%
C4	Health and well-being	12.1%	14.3%	13%
C5	Safety and service quality	15.1%	21.3%	18%
C6	Accessibility	4.4%	17.8%	11%

This supports the findings of Hall [7] that states that the most important housing priority, from the point of view of residents, is the good quality of the living environment. Cultural category (C1) was ranked as the second-most important category in the design of residential buildings. The third priority is safety and service quality (C5). Furthermore, the fourth-ranked category was health and well-being (C4), closely followed by the accessibility category (C6). Finally, the heritage category (C2) was considered as the least important among the social categories, with an average weight of 7%. To simplify the final weighting system, the average weights presented in Tables 8 and 9 were rounded to the nearest integer.

Table 8. List of social indicators and categories to be considered in the design of sustainable residential buildings in WB Palestine and respective weighting system.

Category	Indicator (In)	Indicator Weight (%)	Category Weight (%)
C1. Cultural	1. Visual privacy	59	23
	2. Access to private open space	23	
	3. Easy access for disabled people	18	
C2. Heritage	4. Respect the cultural value and the surrounding context	29	7
	5. Maintenance of the heritage value of an existing facility	71	
C3. Indoor environment quality	6. Air temperature and relative humidity	17	28
	7. Appropriate daylight	23	
	8. Appropriate light on the environment	9	
	9. Good air quality and natural ventilation	40	
	10. Outdoor noise reduction	11	
C4. Health and well-being	11. Reducing the exposure to airborne chemical contaminants	37	13
	12. Reducing the exposure to toxic finishing materials	44	
	13. Non-smoking area	19	
C5. Safety and service quality	14. Safety from fire	M	18
	15. Safety from earthquake	M	
	16. Regulated building maintenance	20	
	17. Security of the house	50	
	18. Security of the neighbourhood	30	
C6. Accessibility	19. Accessibility to the public transport	54	11
	20. Accessibility to the workplace	25	
	21. Accessibility to public services	20	

M—This indicator is mandatory in the design of every residential building in WB Palestine and due to its importance to the category "Safety and service quality" it was recommended by the interviewed experts that they were included in the list of social indicators. This was considered very important to raise the social awareness regarding this important safety issue in WB Palestine. Although this indicator does not contribute to the calculation of the overall sustainability score, only a building that overcomes the threshold values defined by local regulations can be assessed using the method under development.

Table 9. Comparison between the weights of the sustainability dimensions of the proposed and the other BSA methods in the analysis.

Sustainability Dimension	Code for Sustainable Homes	LEED for Homes	SBTool^{PT}-H	Proposed Method for WB Palestine (WB-BSATool)
	Weight (%)			
Environment	71.3	67.8	40.0	58.5
Economy	0.0	0.0	30.0	22.5
Social	24.0	25.2	30.0	19.0
Procedural	4.7	7.0	0.0	0.0

The next step was the evaluation of the relative weight of each indicator inside each category. Table 8 presents only the average weights that resulted from the two groups of respondents. Figure 1 presents the average relative weight of each indicator, together with the perspectives of the building designers and building occupants. From the analysis of these results, it was possible to conclude that Visual Privacy (In1) was the most important indicator in the Cultural Category (C1) with an average weight of 59% and, considering the weight of this category, this means that this indicator is also the most important indicator among the social indicators. Maintenance of the Heritage Value of an Existing Facility (In5) was the most important indicator of the Heritage (C2) categories. Regarding the Indoor Quality (C3), Good Air Quality and Natural Ventilation (In9) was the most important one. Reducing the Exposure to Toxic Finishing Materials (In12) had the highest weight among the Health and Well-being Indicators (C4) and Security of the House (In17) was the most important one among Safety and Service Quality (C5) category. Accessibility to the Public Transport (In19) was considered as the most important indicator among the Accessibility (C6) category.

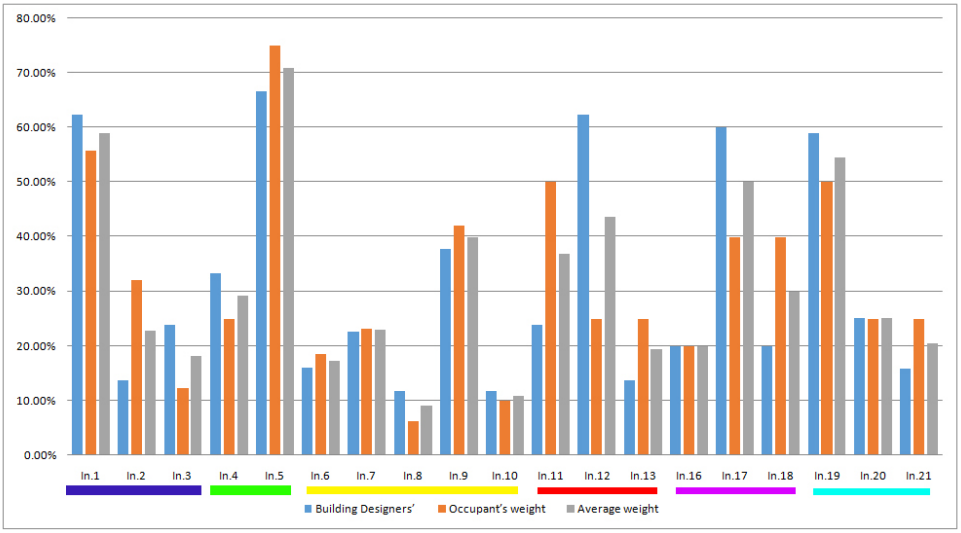

Figure 1. The relative weight of each indicator inside the six sustainability categories, showing the difference between the opinions of the building designers and building occupants.

After the presentation of the results, it is worthy to compare the results obtained in the development of the building sustainability assessment method for the WB Palestinian's residential buildings (WB-BSATool) with the systems of weights of three BSA methods already available in the market: Code for Sustainable Homes, LEED for Homes, and SBTool^{PT}-H.

The Code for Sustainable Homes, LEED for Homes and SBTool^{PT}-H are rating systems to assess the sustainability of residential buildings. Using these methods, a project is evaluated according to a number of indicators or sustainability aspects that are organised into sustainability categories, which in turn belong to different sustainability dimensions. The main sustainability dimensions are the Environment, Society, and Economy [42]. Additional dimensions are introduced when it is impossible

to connect a sustainability indicator or category with a specific sustainability dimension. That is why in the Code for Sustainable Homes and in the LEED for Homes some indicators are organised in the Procedural dimension.

Table 9 presents the weight of each sustainability dimension in the proposed method and in the other analysed three BSA methods. Analysing the figures presented in this table, it is possible to conclude that improving the sustainability of a residential building is above all focused on decreasing the environmental impacts. Additionally, LEED for Homes and the Code for Sustainable Homes do not address directly the Economic Dimension. Among the analysed methods, the SBTool^{PT}-H is the one that has a better balance between the three main sustainability dimensions.

Table 10 presents the list of social indicators of the analysed BSA tools and the weight of each indicator in the overall sustainability score. In the calculation of the listed weights, the weight of the Social dimension in the overall building sustainability was considered, based on the weighting system of each analysed method.

Table 10. List of social indicators of each studied BSA method and respective weight in the overall sustainability score.

Social Indicators	Code for Sustainable Homes	LEED for Homes	SBTool^{PT}-H	Proposed Method for WB Palestine (WB-BSATool)
	Weight (%)			
Cultural indicators				
Visual privacy in dwelling units				2.50
Ease access for disabled				0.80
Access to private open space	1.16			1.00
Provide drying space	1.17			
Provide home office	1.17			
Heritage indicators				
Maintenance of the architectural heritage				0.90
Compatibility of the design with local cultural values		3.60		0.40
Functional indicators				
Availability of home user guide	3.30		3.00	
Possibility to adapt the construction to meet future occupants needs	4.60			
Indoor quality indicators				
Thermal comfort		4.50	5.70	0.90
Indoor air quality and ventilation			2.10	2.10
Adequate daylighting	3.50		4.50	1.20
Appropriate light on the environment				0.50
Outdoor noise reduction	4.60	1.80	3.60	0.60
Health and well-being indicators				
Free smoking area		0.90		0.50
Minimizing the exposure of building occupants to indoor air pollutants		3.60		1.10
Installing Mechanical Ventilation and air Filtering in the kitchens		2.70		
Limiting the leakage of combustion gases		1.80		
Reducing the exposure to airborne chemical contaminants		2.70	2.10	0.90
Safety indicators				
Building maintenance				0.70
Safety from fire				M
Safety from earthquakes				M
Security of the house	2.20			1.70
Security of the neighbourhood				1.00
Accessibility indicators				
Access by public transportation	2.30	1.80	5.10	1.10
Access to basic services		1.80	3.90	0.40
Accessibility to the workplace				0.50

M—Please refer to the footnote of Table 8.

As can be seen in Table 10, the number and type of social sustainability indicators addressed by the different methods are not the same. In one hand, this highlights the subjectivity of the social sustainability concept and, in the other, the necessity to accommodate specific indicators related to the

local social context, as done in the SBTool^{PT}-H and in the proposed method for the WB Palestinian residential buildings (WB-BSATool).

Analysing Table 10, it is possible to conclude that the proposed method includes the highest number of social indicators. Compared to the proposed method, LEED for Homes is the one that has the highest percentage (38%) of common social indicators and the Code for Sustainable Homes is the one with the lowest percentage (23%). This means that the latter is the less suitable method for the WB Palestinian residential building conditions.

Table 10 shows that there is a general agreement among the four assessment methods on the importance of improving the indoor quality, where this category is considered as the second-most important in all methods. From the analysis of this table it is also possible to conclude that the three most important social indicators for the analysed methods are: "Possibility to adapt the construction to meet future occupants needs", "Outdoor noise reduction" and "Adequate daylighting", in the Code for Sustainable Homes; "Thermal comfort", "Compatibility of the design with local cultural values" and "Minimizing the exposure of building occupants to indoor air pollutants", in the LEED for Homes; "Thermal comfort", "Access by public transport" and "Access to basic services", in the SBTool^{PT}-H; and "Visual privacy in dwelling units", "Indoor air quality and ventilation" and "Security of the house", in the proposed method. From this, it is possible to highlight that the main social priorities are different among methods. As an example, while LEED for homes and SBTool^{PT}-H are focused on improving the thermal comfort of the occupants, in the proposed method the main concern is visual privacy.

In the list of social indicators presented in Table 10, there are only two indicators that are common to the four methods: "Outdoor noise reduction" and "Access by public transportation". "Visual privacy in dwelling units", "Easy access for disabled", "Maintenance of the architectural heritage", "Appropriate light on the environment", "Building maintenance", "Safety from fire", "Safety from earthquakes", "Security of the neighbourhood" and "Accessibility to the workplace "are indicators covered only by the assessment method proposed for the WB Palestine.

Regarding the limitations of this work, it is worthy to highlight that this study is focused on the development of the list of social indicators and respective system of weights of a new BSA method for WB Palestine. The method to assess the performance of each indicator is not yet established and during its development, it could be necessary to introduce some adjustments in the list of indicators, not only to cover the specificities of assessing new or existing residential buildings but also because it could be difficult to develop a method to assess a certain indicator in the Palestinian context. Another constraint could be the number of sustainability experts that were identified in the Nablus Governate and that agreed to participate in the first discussions regarding the definition of the preliminary set of social indicators. Sustainability is still not a common priority for the residential sector in WB Palestine and therefore it was very difficult to identify a broader list of experts. Other limitations of the study are that the proposed system of weights relies on the opinion of the people that answered to the online questionnaire and that, by the reasons mentioned before, it was not possible to include in the study the opinion of people from some parts of Palestine. Therefore, as long as the discussion and awareness around this issue raise, it could be necessary to introduce some changes in the list of indicators and weighting system.

6. Conclusions

In developing countries such as Palestine, sustainable residential building are an emerging priority, not only due to the economic and social constraints but also due to the raising awareness about the necessity to preserve the natural resources. BSA methods are an effective way to promote sustainable buildings, since the preliminary stages of design. Nevertheless, until now there are no studies regarding the development of a BSA method oriented for the specific context of Palestine. Therefore, as a first step in the development of a BSA method for Palestine, this paper was focused on discussing the indicators to consider in the assessment of the social dimension of the Sustainable

Development. Moreover, it proposed a system of weights for the developed list of indicators in order to rank the priorities to be considered in the design phase of a new or renovated sustainable residential building that meet the expectations of both building designers and occupants.

The outcome of the study is a framework that highlights the most important social aspects, when designing a sustainable building in West Bank, Palestine. This framework consists of twenty-one indicators distributed among six sustainable categories, namely: C1. Cultural; C2. Heritage; C3. Indoor environment quality; C4. Health and well-being; C5. Safety and service quality; and C6. Accessibility. From the interviews conducted in the first stage to the Palestinian experts in sustainable building, it was possible to identify their high interest in the development of a study like the one presented in this paper for the Palestinian context. They also considered it as a powerful assessment framework because it is based on scientific research and gathers the opinion of both experts and non-experts in the field of sustainable building. Moreover, and unlike other existing international methods, the developed list of social sustainability indicators and categories suit the West Bank's social context and culture.

Comparing the proposed method with other methods that already exist in the market, it is possible to conclude that even if there are some similarity in the number and type of sustainability categories, there are substantial differences in the list of social indicators that belong to each category. As an example, the visual privacy is considered the most important social indicator in the proposed method while it is not considered in any of the three analysed BSA methods for residential buildings: LEED for Homes, SBTool^{PT}-H and Code for Sustainable Homes. This result is in line with the conclusions of other studies that highlight that BSA methods are only effective if the list and structure of the sustainability indicators, the system of weights and the methodology to assess each indicator are adapted to suit the local environmental, social and economic contexts and priorities. For example, Mateus and Bragança [17] highlighted that although there are general comprehensive frameworks, as the SBTool, which system of weights and sustainability benchmarks can be adapted to specific contexts, there are always important sustainability criteria that need to be added and other that can be subtracted from the general framework, because they are considered as having high or insignificant importance, respectively, in the country where the method is going to be applied.

As a final remark, from this study it is possible to draw a number of recommendations with impacts at different scales:

- Developing a method to assess the social building sustainability should be based on scientific research and, above all, in the analysis of the local human behaviour and expectations; must include the opinion of building experts from different fields of the Architecture, Engineering and Construction (AEC) sector as well as the building occupants' expectations; and the final outcome should result from a balance between the priorities of the local context and the international goals in the field of sustainable construction;
- Taking into consideration, since the preliminary design phases of a building, the local regulations together with the list of sustainability priorities is the only possible way to achieve better and more sustainable buildings. Additionally, every occupant is a particular case and the social sustainability level of a building could also be enhanced if the potential occupants also take part in the design decisions;
- Sustainable building is today too much focusing on some Environmental aspects such as improving the energy efficiency, closing the loop of construction materials or saving water. Nevertheless, other important aspects such as the creation of a liveable and comfortable place, affordable for the occupants and more durable are also some critical priorities in developing countries such as Palestine.

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