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Article

Awareness of Green Building in West Bank Palestine

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Abstract: This study evaluates the awareness of green buildings in the West Bank, Palestine, and the importance of applying the green building concept to the public. Green building practices are a significant role in attaining sustainability, particularly in the construction industry. This practice is constructed for minimizing impacts on the environment as well as decreasing building effects on occupants. The key issue is the establishment of a solid knowledge foundation for Palestine that will equip the public, professionals, development agencies and governments with accurate and relevant knowledge generated within the framework of the state's social needs, its cultures, and its biophysical environment to guide their decisions and actions towards establishing a sustainable built environment. The hypothesis tested was that the implementation of green technology will be beneficial in terms of cost and benefit for the improvement of the environment in West Bank, Palestine. The validity and reliability of data were considered to increase the quality of the data. The results show that there is a positive significant relationship between awareness level and the efficiency of building green practices in West Bank, Palestine. Therefore, motivation and government support are crucial to increase the awareness level of the importance of green building development in West Bank, Palestine. The survey conducted revealed that although the fieldwork professionals are aware of the green building concept, the general public is not aware of this concept as there was only minor efforts are developed in implementing it. A lot more work is necessarily needed to enhance public awareness of the application of green building and further stimulate measures and strategies towards a sustainable built environment.

Keywords: green building; west bank; Palestine; level awareness.

1. Introduction

To accommodate the growing population, modern cities have been replacing the greenery with solar absorbing materials such as asphalt and concrete for roads and these causes poor ventilation where the surface temperature and ambient temperature to increase (Reda et al., 2017). This poor ventilation then leads to pollutant concentration in the highly populated cities, which in turn affect the human health and lead to the increase of power consumptions (Etminan et al., 2018). Due to the sector's enormous depletion of natural resources and energy, produces a large amount of waste and contributes significant amounts of toxic air emissions (Ngwepe & Aigbavboa, 2015), this industry faces urgent pressure as regards environmental

management and sustainability in many countries. To shift from conventional practice into sustainable building practice, it requires a thorough move in decision making throughout the entire life cycle of a building, which includes its design, construction, operation, and disposal. The only way to fully achieve the principles of sustainability is to work towards it as a team.

A typical list of participants in the building industry includes the client (owner), designer (architects and engineers), constructors (builders), and the public (Omar et al., 2016). Considering that the green movement in Palestine is still at its infancy, the awareness of this topic considered low. This study, therefore, aims to measure the level of awareness of many aspects of green building within those four groups. It emphasizes the factors affecting the implementation of sustainable construction in Palestine, while exploring the relative importance of those factors from each group's point of view, propose solutions to increase awareness, and improve Palestine's ability to undertake green building projects. The results of this study can be used as a basis for further studies to improve implementation of green construction and overcome the barriers. Knowledge or awareness as these words will be used interchangeably in this paper is the amount of information from participants on green buildings.

2. Concept of Green Building Construction

A study by Abidin & Jaapar (2008) defined green building as maintaining a balance between the human need for buildings (as shelter and business operations) and infrastructure (quality of well-being) and preserving natural resources and ecosystems for the current and future generations. Windapo (2014) elaborated that green building, or sustainable design, is the practice of increasing the efficiency with which buildings and their sites use energy, water and materials, and of reducing impacts on human health and the environment for the entire lifecycle of a building (Windapo, 2014). According to Pearce & Ahn (2013) green building is defined as reduction in energy, material and water usage, reduction of wastes, careful consideration of land use, air quality and indoor environment. While, Liu et al. (2014) in their study defined green building "buildings that, throughout their lifecycle, maximize the resource savings (including energy, land, water, and materials saving), protect the environment, reduce pollution, provide people with healthy, comfortable and highly efficient space, and exist harmoniously with nature." A common theme among the definitions is the consideration of green building as the most effective way to undertake environmentally-friendly construction while taking economic and social factors into account (Akadiri et al., 2012).

3. Public Awareness

Delivering sustainable construction requires action from all stakeholders. It requires willingness to explore new territory in construction approach and prepares to adopt new products, ideas and practices. It has been argued that a major obstacle to green building programs is the lack of public awareness/knowledge on the benefits of green building constructions. According to Angonese & Lavarda (2014) knowledge is the preservation of memory traces within recurrent patterns of behaviour and is socially developed through participation and reflection of practices rather than simply resulting from the independent thinking of individuals. In a study conducted by Granlund (2001), a lack of knowledge is one factor responsible for the failure to implement a system. Hence, creating awareness is the first and biggest step to ensure in keeping the green buildings development on hand. The principal of "awareness" in the industry is to make a target audience "aware of" a product, service or issue. A study by Umar & Khamidi (2012) stated that it is vital having set of consumer-friendly "brand" terminology in the core statements for public awareness campaign where they are repeated throughout all outreach efforts, this to ensure public hears and understand it's purpose. People will respond when it is beneficial for them personally, for the neighbourhood and knowing that their small part play a role to the whole.

A study conducted by Diyana & Abidin (2013) found that to encourage a person or organization to commit to green building practices, their personal values must be satisfied. The researchers also stressed that intention and forethought will lead to prospective actions. Having public awareness on sustainable concepts and its related benefits which meet their personal gain will be the driver in promoting green building projects. (Zainul Abidin, 2010) demonstrated that public awareness and involvement is the key for the expansion of green building practices in Malaysia. The results were then confirmed after the Malaysian government urged the professional bodies and developers to take proactive actions to initiate into the sustainability concept within their domain and be responsive to the need for better environmental and social protection. With regard to buyers' awareness of sustainable concepts, a study carried out in New Zealand by Eves & Kippes (2010), illustrated that despite voluntary government measures supporting green building

project implementation, consensus over the importance of such construction was low. Based on the findings of these outlined studies, there is a strong need for effective ways to further develop the public level of green building awareness.

4. Materials and Methods

This was a descriptive cross-sectional study and it used a quantitative method design. The research type was adopted from a similar study by Sichali & Banda (2017), "Awareness, Attitudes and Perception of Green Building Practices and Principles in the Zambian Construction Industry," (2017). This study carried out surveys to investigate the awareness level of green building in Westbank, Palestine. The questionnaire was designed based on a thorough literature review, which clarified the major benefits in implementing green building in both developing and developed countries. After collecting data from experts and previous studies, the final draft of the questionnaire for this study was written to include the following sections:

Section 1	Collected the demographic characteristic of respondents. The respondents are categorized by sex, age, highest educational attainment, years of experience, qualification, organization type, and position in organization
Section 2	This section explored the awareness of green building where the participants were asked to define green building technology, to identify assessment tools, such as Leadership in Energy and Environmental Design (LEED), Building Research Establishment Environmental Assessment Methodology (BREEAM), etc.
Section 3	This section aimed to highlight the respondents' level of agreement with green building benefits statements.

The respondents are categorized by sex, age, highest educational attainment, years of experience, qualification, organization type, and position in organization. The data gathered was measured on a Likert Scale and analysed quantitatively.

4.1. Sample Selection and Distribution

The research scope encompasses the construction industry in Palestine, and the respondents included client/public (owner), consultant (architects, project manager, consultant and engineers), and contractors (builders) of Westbank territory. Achieving valid results required a thorough process of selecting a representative random sample, as surveying the entire industry was not feasible (Sudman & Blair, 1999). The total number of distributed questionnaires was 65, and the number returned was 33. Of these, 6 were from the owners, 21 from the designers, and 6 from the contractors.

Table 1. Selected sample (SS) of GB Survey

	Sample	Collected	Percentage
Client/public	15	6	17.6%
Consultant	35	21	61.8%
Contractor	15	6	17.6%
Total	65	33	100%

As indicated in Table 1, the percent of retained from the owner was 6/33 and equals 17.6%, accordingly the percentage of retained from the consultants and the contractors were 61.8% and 17.6%, respectively.

5. Result and Discussion

This study was conducted in July 2019 in Westbank, Palestine as to investigate the awareness of the respondents in GB projects and whether this experience, if any, was in Palestine. The result of socio-demographic variables of the study participants summarized in Table 2.

5.1. Demographic Characteristic of the Respondents

Table 2. Socio-demographic variables of the study participants

Demographic	Frequency	Percentage
Gender		
Male	22	64.7%
Female	11	32.4%
Age		
Less than 30 years	5	14.7%
Between 30 - 39	9	26.5%
Between 40 – 49	12	35.3%
Between 50 – 59	5	14.7%
More than 60 years	2	5.9%
Highest qualification		
High school	2	5.9%
Diploma	10	29.4%
Bachelor's degree	14	41.2%
Master's degree	4	11.8%
PhD	3	8.8%
Years of experience		
Less than 5 years	4	11.8%
Between 5 – 10	4	11.8%
Between 11 – 15	6	17.6%
Between 16 – 20	17	50%
More than 20 years	2	5.9%
Professional group		
Owner/Public	6	17.6%
Consultant	21	61.8%
Contractor	6	17.6%
Years of experience in sustainable/green building field		
None	14	41.2%
Less than 5 years	13	38.2%
Between 5 to 10	4	11.8%
More than 10 years	2	5.9%

Table 2 displays most of the respondents were males (n = 22, 64.7%). Most of the respondents (n = 12, 35.3%) were aged between 40 to 49 years. Half of the respondents (n = 17, 50%) had between 16 to 20 years of working experience. More than half respondents were under consultant category (n = 21, 61.8%) and close to half of the respondents (n = 14, 41.2%) were without any prior experience in green building.

5.2. Respondent's Awareness on Green Building Concept

This study investigated the level of awareness on green building practices in Westbank, Palestine. The study discovers that most of the people heard about green building concept, where, (n =24, 70.6%) and only (n = 9, 26.5%) did not (see Figure 1).

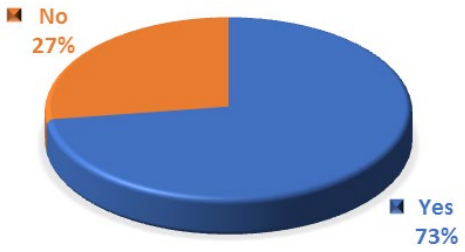

Figure 1. Have you ever heard of green building?

According to the survey conducted, one of the questions that most of the people give high priority was; what does "green building" mean to you? Most of the people (n = 8, 23.5%) believe that is all about Energy efficiency. While (n = 7, 20.6%) voted No idea on this question. Environmentally friendly and Preservation of natural resources both gained similar number of votes with (n = 6, 17.6%). Water conservation and build with recycled material have (n = 4, 11.8%) and (n = 2, 5.9%) respectively (see Figure 2).

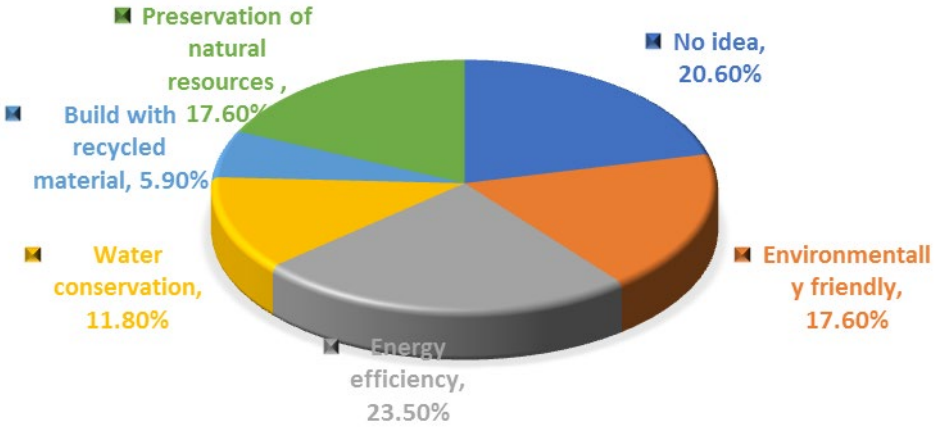

Figure 2. What does green building means to you?

Figure 3 captures the majority of the responded do not live in green building which (n = 16, 47.1%) while only (n = 9, 26.5%) claim that they are living in a green building. However, there are quite a number, (n = 8, 23.5%) stated that they have no idea whether the house they are living in is a green building.

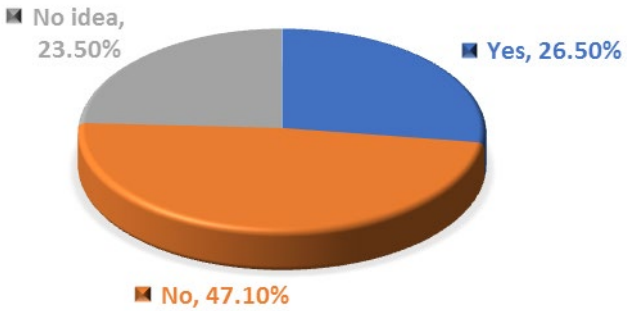

Figure 3. Are you living in a green home?

Figure 4 displays the green building green building rating system, more than half respondents (n = 19, 55.9%) have chosen LEED, while (n = 6, 17.6%) chosen None. BREEAM gained (n = 4, 11.8%), whereas GBIM (n = 2, 5.9%), ENERGY STAR and GREEN STAR both having (n = 1, 2.9%).

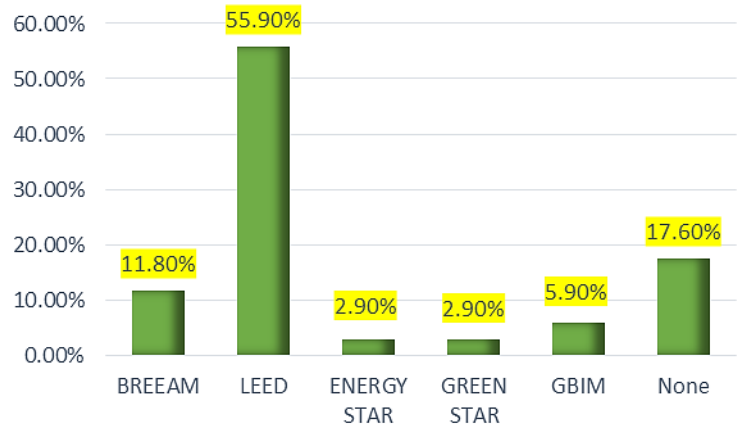

Figure 4. Are you aware of green building rating system?

Figure 5 reveals that most of the people (n = 13, 38.25%) believe that Westbank has a low demand for green building construction. while (n = 11, 32.4%) believe that it is extremely low demand and only (n = 3, 8.8%) believe that the demand for green building construction as moderate. However, there were (n = 6, 17.6%) chose No idea in giving their opinion on green building demand at their area.

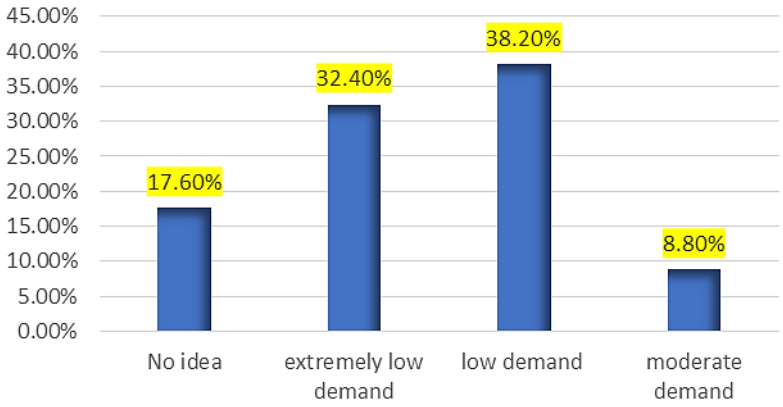

Figure 5. Level of demand for green building construction

5.3. Analyses of the respondents' opinion on the benefits of green building construction

Table 3 shows the descriptive results for questions related to the significant benefits of GB on the environment and economy aspect. A one-sample t-test was used to assess whether respondents believe that it is significantly important or not important with each variable. The findings clearly show a positive agreement with the statements on possible environmental and economic impacts. The ranking of these benefits by importance according to respondents' answers is shown in Table 3.

Table 3. Benefits of Implementing Green Building Practices

	Benefit statement		Mean	St. Dev	*t*-value (2-tailed)	Sig.	RII	Rank	Overall
Environmental	(Be1)	Conserve natural resources	3.394	0.899	2.516	0.017	67.880	5	6
	(Be2)	Minimize the emission of toxic substances throughout building project	3.818	0.465	10.115	0.000	76.360	3	4

		life cycle							
	(Be3)	Improve water conservation	4.758	0.502	20.117	0.000	95.150	1	1
	(Be4)	Protect ecosystem and biodiversity	3.606	0.496	7.016	0.000	72.120	4	5
	(Be5)	Reduce energy consumption	4.333	0.736	10.407	0.000	86.670	2	2
	(Be6)	Preserve open spaces	2.576	1.146	-2.126	0.041	51.520	6	8
Economic	(Bec1)	Reduce operating cost (maintenance)	4.152	0.834	7.934	0.000	83.030	1	3
	(Bec2)	Increase the market for fieldwork professionals' skills	3.606	0.496	7.016	0.000	72.120	2	5
	(Bec3)	Improve marketability for buildings	3.303	0.810	2.150	0.039	66.060	3	7
All statements			3.7273	0.7093	7.2383	0.0108	74.55		

Note: Critical value of t: at degree of freedom (df) = N-1 = 33-1 = 32 and significance (Probability) level 0.05 equals "2.01"

Table 3 illustrates that the total average mean for all sustainability buildings benefits equal 3.7273, average t-test equal 7.2383, and the average p-value equal 0.0108 which is less than 0.05, that means that all sustainability buildings benefits are valuable and important, and the results are confident. The SD were also used to quantify the amount of variation or dispersion of respondent opinions regard to" sustainability buildings benefits. As shown in Table (3), the average SD were 0.7093. It is closed to zero, which indicate that the respondents' results are consistent and are not spread out over a wider range of values. This means that results are confident. According to Table 3;

- p-value = 0.0108 < 0.05, and t statistics (7.2383) > t critical (2.01), so, there is a statistically significant differences attributed to the respondents' opinions at the level of $\alpha \leq 0.05$ between the statistical mean (3.7273) and hypotheses mean (3) on the field of benefits of sustainable (green) buildings.
- Average mean = 3.7273> 3 (Neutral RII), so most of sustainability buildings benefits are valuable and important.
- SD = 0.7093 it is closed to zero, so the respondents' results are consistent and are not spread out over a wider range of values. So, the results are confident.

The findings revealed that three questions received strongly positive responses focused on the importance of green building including the environmental and economic impact assessment. The respondents positively agreed that green building can help to improve water conservation. The findings revealed that "Improve water conservation" benefit statement (Be3) (RII =95.15%; p-value = 0.00*; t-value = 20.117; SD = 0.5019) as the most valuable benefit of green buildings to the people in Westbank. It has been ranked in the first position in the environment benefits (Table 3) as well as in the overall benefits. "Reduced energy consumption" benefit statement (Be5) (RII =86.67%; p-value = 0.00*; t-value = 10.407; SD = 0.736) has been ranked as second in position for environment benefits as well as for overall benefits. While "Reduce operating cost (maintenance)" benefit statement (Bec1) RII = 83.03%; p-value = 0.00*; t-value = 7.934; SD = 0.83371) has been ranked as first in position for economic benefits and third for overall benefits.

These questions (Be3, Be5, and Bec1) had a mean of 4.7576, 4.3333 and 4.1515 respectively. The p-value of these three questions were 0.000 which less than 0.05, and the t statistics for (Be3) were 20.117 > t critical (2.01), (Be5) were 10.407 > t critical (2.01), and (Bec1) were 7.934 > t critical (2.01). With having SD closed to zero, the respondents' results are consistent and are not spread out over a wider range of values. It can be said that results are confident.

6. Conclusion

This paper evaluated the level of awareness of green building in the construction industry in Westbank, Palestine. The study sample was chosen randomly from building owners (clients/public), contractors, and consultants (architects, project manager, consultant and engineers). The results were analyzed and discovered a generally good awareness level of GB construction in Palestine from the professionals. Although the awareness level among the professionals were high, the public community were having low level of awareness and low attitude on green building practices as only 26.5% claimed that they are owned/living in a green building. The highest-ranked benefits in implementing green building in Palestine, according to the respondents were improve water conservation, reduced energy consumption, reduce operating cost (maintenance), minimize the emission of toxic substances throughout building project life cycle, protect ecosystem and biodiversity, conserve natural resources, improve marketability for buildings and preserve open spaces.

There is need to increase awareness among all the participants and information should be made more available to all players in the construction industry and communities. Training in green building practices should be introduced in higher education institutional. The professionals felt that the introduction of green building practices in the building by laws will institutionalise these practices. The built of green building show-units/demonstration can be used as a strategy to stimulate curiosity in the communities and introducing the people into green building technology. Mass media, scientific community, NGOs, and policy creators will need to operate collectively in order to generate awareness amongst public.

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