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The influence of labelled green building materials on the performance of green construction projects

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Abstract. Green buildings depend on the application of environmental protection standards and the preservation of natural resources. The need for environmentally friendly materials that rationalize electricity and water consumption, reduce pollution and use clean energy sources and recycled materials significantly arises. It raises the importance of developing and promoting green materials and the need to label them as green building materials. This paper discusses the important role of labelled green building materials in the construction industry in supporting the sustainable performance of in the construction sector and defining their standards and specifications when selected by stakeholders in the construction sector. A research method consisting of a review of the literature was applied in order to collect opinions and inputs related to green materials. Then a questionnaire was designed consisting of two lists, the first related to the demographic information of the participants in the questionnaire, while the second list related to the impact of sustainable materials on sustainable performance in green building projects, the list consists of 13 questions was distributed to study the impact of the availability of labelled green materials on the green construction project team and in rising the sustainable performance in the construction sector as well as its environmental, economic and social benefits. The results of the study showed the importance of the abundance of labelled green building materials in raising sustainable performance in green construction projects, which calls for manufacturers and suppliers to move towards supporting the construction market with labelled green products that achieve an abundance of this type of products in the market and support the green supply chain.

1. Introduction

Green construction has become a global trend to mitigate the destructive influences of the environment. The use and dissemination of green materials are encouraging in the construction market to support the green trend in the construction sector. These materials have great environmental, economic, and social benefits that continue throughout the life cycle of the building [11]. They also provide great comfort and improve the quality of life for the people who occupy these buildings. It is necessary to strengthen the green trend in the construction industries and make them compete with traditional materials in the market. The presence of labelled green material is vital to educate the customers and help them choose the optimal material in the market. At the same time, these materials enhance the dissemination of knowledge among the construction team in green construction projects. In addition, it enhances the progress of work programs in these types of projects. The customer normally selects the building materials based on operational, technical, and economic necessities. Meanwhile, sustainability has become a significant concern in the past periods. The construction region degrades an important segment of the environment every year. The obligation of contribution to sustainable development tends to find environment-friendly ways of building and constructing. In response to the problem of sustainability, new substantial usage, and reconditioning, sustainable production of merchandise or green assets are used [20]. In addition to these solution trends, carefully selecting environmentally sustainable materials might be the efficient approach for constructors to initiate incorporating sustainable project models into their constructions. The aim of this study is to show the importance of an abundance of labelled green materials in the

construction market to support the achievement of sustainable performance and the progress of work programs in green construction projects.

2. **Literature Review**

2.1. Green building definition

The Federal Environmental Management Office defined the term green building as the usage of the site, water, energy, and materials to increase the efficacy of buildings while decreasing the impact of building on the human health environment. It uses better design, site identification, and construction in addition to operation, maintenance, and disposal during the entire lifespan of the building [10]. The environmental protection agency (EPA) identified green buildings as constructing structures using environmentally responsible processes. At the same time, resource-effective during the lifetime of a building, from site structure, design, operation, maintenance, and renovation to decommissioning. In broader terms, the idea of green building is to construct a building, operate, and maintain it by considering the objective of the health protection of residents. It diminishes the effect of the environment, improves worker efficiency, and intelligently uses natural assets. In each construction phase, the process focuses environmental effect on the building [20]. This process considers the efficacy of the design and development, water, energy, and resource efficacy, quality of the interior environment, and construction maintenance. It is noticed that green building design starts with the choice and usage of environmentally effective resources with relevant or better characteristics than conventional construction materials.

2.2. Green building assessment tools

The green building assessment is important in the construction sector to encourage sustainable development [15]. Green building assessment tools are used to evaluate buildings that meet certain standards and requirements, often voluntarily. They reward and recognize institutions and companies that build and operate greener buildings to motivate and encourage them to push the boundaries of sustainability. This encouragement leads to market-setting standards that raise the ambition of government-building regulations, laws, corporate strategies, and workforce training. The evaluation tools are of several types applied to design, planning, construction, renovation, maintenance, and the final stages of demolishing the green building. The evaluation tools differ according to the type of building. For instance, tools used for specific subgroups vary for different commercial buildings, homes, or entire neighbourhoods [23]. In order to estimate the effectiveness of the performance of green buildings, specific tools and systems have been developed to evaluate this type of building. There are many green building classification systems in developed and developing countries, including (BREEAM) in the United Kingdom, (LEED) in America, (Green Star) in Australia, (SAGRS) in the Kingdom of Saudi Arabia, (GRIHA) in India, and (ESTIDAMA) in the UAE [2]. These systems focus mainly on sustainability, the environment, and energy.

2.3. Green buildings characteristics

Green buildings include several characteristics. These are efficient and environment-friendly practices during construction activities. Its focus is on climate-responsive architectural design and the comfort, health, and safety of the people who occupy these buildings. The additional features are renewable energy sources usage, the advantages of passive design, cooling and heating technologies, and day lighting and ventilation [15]. While [20] has identified many green building features, including:

1. Negligible disturbance to landscaping and surroundings.
2. Usage of renewable energy and energy-efficient air conditioning and light systems.
3. Reducing building footprints to reduce environmental impact.
4. Improve internal air quality for human comfort and safety.
5. Provide daylight for vision.
6. Verification and measurement plan to save water and energy.
7. Practice recycled and environmentally effective materials.
8. Effective use of water recycling.
9. Rapid use of renewable materials.

2.4. Green Building Materials Characteristics

Green building materials normally consist of environment-friendly, renewable, and non-renewable resources since their influence is considered over the product's lifespan. Using green materials reduces the

building's replacement and maintenance lifespan costs. The material can be selected by evaluating characteristics such as zero or low radiations, negligible toxicity, reuse, recycled content, sustainable and fast renewable resources, durability, good recyclability, and native fabrication. At the same time, have features of improving productivity, the health of the resident, and energy conservation [10]. Green products can help recover lost profits by mitigating potential liabilities and reducing waste, and they increase market demand for non-toxic, energy-saving, and earth-friendly products [21]. While [14] discussed that green material, it is the material that operates concurrently with the least, fits more harmoniously with ecosystem processes, helps eliminate the use of other materials and energy, and contributes to a service-based economy.

2.5. Green Product Certifications

Green product certification denotes that the product meets the specified standards. ISO terms certification as an action primarily directly or indirectly concerned with ensuring that the relevant needs are satisfied. Green product certifications aim to illustrate and verify that a product has encountered a specific requirement and provides an environmentally friendly benefit. Several product brands and certificate plans authenticate products based on lifecycle parameters, becoming multi-attribute plans. This parameter includes reprocessed content, energy usage, water and air emanations from manufacturing, dumping, and usage. Others emphasize a particular trait, such as energy, water, or biochemical discharges, directly affecting the indoor environmental quality (IEQ). Green product certification becomes extra valuable when an independent third party is liable for analysis and certification. This autonomous party is not dependent on the product's designer, manufacturer, or contractor. Third-party labelling and green product certification schemes help to assess the characteristics of green products since they can verify that the product fulfills particular industry criteria. They can also provide consumers, designers, selectors, and others with greater assurance that a product's advertising assertions precisely replicate its green characteristics. Some product certifications are also acknowledged by broad green building classification systems, such as Green Earth, LEED, and National Green Building Standards. Therefore, green product certification is increasing with changing market conditions and claims for eco-friendly [10]. Table 1 shown the three types of ISO green product certification labels.

Table 1. types of ISO green product certification labels adopted from WBDG, (2019)

Type	ISO Number	Description
Type 1	ISO 14024	Stamp of certification for multi-characteristics standards
Type 2	ISO 14021	Confirmable single-characteristic of environmentally friendly assertions for energy consumption radiations or recycled content. These can be producer's claims, but many producers are pursuing third-party certification of these assertions in response to manufacturing needs
Type 3	ISO>14021	General environmental merchandise confession and thorough merchandise facts related to an environmental product declaration (EPD)

2.6. The impact of sustainable materials

Many researchers have argued that the lack of sustainable green materials is one of the obstacles to the adoption and implementation of sustainable buildings, where [12] discussed that the unavailability of sustainable building materials, uncertainties in quality, and change orders for materials are the highest possible impact on project outcome. The higher costs of sustainable materials and equipment are a high potential and negative impact on future projects that embrace sustainability. [1] identified the limited availability of sustainable materials on the market, sustainable construction material selection method as obstacle to sustainable constriction. While [18] identified lack of sustainable materials as obstacle to sustainable construction. [19] discussed that the lack of sufficient information related to green building materials / products and the lack of testing / certification of green materials in addition to the high cost of green technologies and materials are obstacles to the implementation of green building projects. While [24] discussed that Lack of mature green technology and Immature green material market, Hinders the development of green buildings.

2.7. The significance of eco-labelling materials

Setting up eco-friendly labelling has a smart, cost-effective ratio and is one of the more efficient ways to reduce greenhouse gas emissions in developing countries [4] . Concerning enhancing customers' abilities to consider and understand the environmental background of products, green communication tools such as environmental labels aim to communicate with potential customers, whether medium or final, that manufacturers care about understanding the external environmental factors caused by the products. Environmental labels are tools intended to communicate to potential clients how manufacturers are involved in understanding the externalities caused by the production and usage of products. These products depend on a market approach. Since eco-labels contain information about environmental performance, they can help market players achieve their goals. Eco-label tools assist customers in selecting environmental efficiency and economical options [6]. Environmental labeling programs provide guidance and create awareness among stakeholders to help them choose green products and services. Environmental labelling of products is an efficient way to inform consumers of the green effect of these products on the described environment [8]. [8] discussed that the use of sustainable and recyclable building materials leads to the promotion of overall sustainability to achieve cleaner and safer structures. Sustainable building methods and materials are extremely important in successful sustainable construction. Sustainable building materials are more efficient in recycling, and require less energy and efforts in the recycling process.

2.8. Selection of green building materials

[1] discussed that there are many vital factors that must be taken into consideration when selecting appropriate green materials, including resource efficiency, environmental impacts, life cycle cost, performance efficiency, waste minimization, and social welfare. The process of selecting building materials and equipment used in buildings is a complex process during the implementation of green buildings, which requires great effort and knowledge to determine the specifications of materials and equipment accurately to ensure compliance with the conditions and considerations required for green building laws, whether these laws and conditions are local or global. The technical data sheet for the materials does not provide enough information to define the product as an environmentally friendly product that conforms to green specifications. As labelled green materials are the ones that confirm that they are environmentally friendly materials and comply with the green specification, in some cases, laboratory experiments are conducted for unlabelled construction materials to ensure that they comply with the required green specifications. For the choice of green construction materials, it is done by evaluating the characteristics of these materials, such as sustainably, rapidly renewable, zero or low toxicity, zero or low harmful gas emissions, reuse, recycled content, high recyclability, harvested materials, local production, durability, and longevity [17]. [13] discussed that the selection of material should be based on impacts (economic, social and environmental aspects of impact) as well as structural stability. Industrial by-products and recycled building materials provide a way to reduce the pressure on natural resource extraction that is currently necessary to meet the growing demand of the construction sector, however the local sourcing of these materials is important to reduce spillover effects of cross-border commercial traffic on the building project. The process of selecting green products has become very complex; many innovative products and various green product standards, metrics, and certifications can be accessed. Product selection for green products requires the selector to navigate through all this data to find the most useful information. Defining the product selection process for performance criteria is critical to managing the vast data [21]. Fig 1 shows the green building materials criteria recommended by [9]. [9] has recommended the following eco-friendly material standards for use in a green building or system Assessment and Evaluation:

1. Low toxicity: Substances that the producers have proven to have less toxicity or non-toxic and escape carcinogenic components.
2. Minimum emissions: Products produce few to no explosive organic compounds and avoid using chlorofluorocarbons.
3. Low VOC assembly: Materials with low VOC-producing or VOC bonding processes that pose little hazard.
4. Recycled content: Material made from recycled items.
5. Resource Efficiency: Merchandise produced employing resource-efficient procedures, such as lower fuel consumption, waste, and emissions of greenhouse gases.
6. Recyclable: Materials are ably recycled after their usage.

7. Reusable: Materials that may be salvaged or reused.
8. Sustainable: Natural resources that are renewable and collected from certified sustainable sources, ideally with independent certification.
9. Durable: Resources that have a longer lifespan than traditional ones.
10. Moisture: Items and processes that suppress humidity or inhibit biological particles from growing in structures.
11. Energy Efficiency: The products, items, and schemes that assist structures and facilities in consuming less energy.
12. Water Conservation: Items and frameworks that offer assistance to diminish water utilization in buildings and preserve them in arranged areas.
13. Healthfully maintained: Compounds of resources or frameworks that require, as it were, basic, non-toxic, or low-concentration cleaning methods.
14. Local or regional product: Materials components and frameworks that spare vitality and assets in transportation to the venture site.
15. Affordable: Item life cycle charges compared to traditional materials or as entire surveying, the required rate of green building materials can be separated into three stages counting investigation, assessment, and selection.

Fig 1 Green building material criteria [6].

3. Research Methodology

The research objectives are to determine the influence of labelled green building materials on the performance of green construction projects. This study adopted the exploratory research method, followed by the Delphi method for three rounds. [16] argue that the Delphi method is well suited as a consensus-building method using a series of questionnaires to collect data from a panel of selected experts. The goal of most Delphi studies is to explore ideas or produce sustainable information for decision making. The Delphi method is a structured process of gathering and extracting knowledge from a team of experts through questionnaires with controlled opinions and observations., where a questionnaire consisting of 13 questions was designed by conducting an exploratory study to determine the impact of green materials marked on the sustainable performance of green construction projects through conducting direct interviews with a panel of experts including 12 engineers with extensive experience in the implementation of green buildings for more than 10 years, where 6 engineers working in consulting companies were invited, two of them are project managers, one civil engineer, one design engineer, one electrical engineer, one mechanical engineer, and four work in contracting companies, one of whom is a project manager, two are construction managers, one civil engineer, and two work in a Real estate development

company, one of whom is a project manager and the other an architect, and after the parameters of the questionnaire were determined, the researcher collected data through a structured questionnaire that was distributed to a panel of experts from stakeholders, including contractors, consultants and owners in green building projects in the United Arab Emirates with the aim of collecting opinions and the inputs with regard to the labelled green materials, where the expert panel consisted of 20 experts who agreed to participate in three rounds, as it took one round to collect and analyse the questionnaire answers, then re-sent them to the expert panel for three weeks for each round, and in the third round, the highest percentage of agreement was reached in opinions among experts.
Likert scale was applied in this research as it is a widely-used instrument in measuring the opinion of participants which found to be the most used instrument by the majority of previous studies. The Likert scale of five-point scale was used in the design of questionnaires, in order to define the importance of each parameter. The Likert scale format is utilized to designate the opinion level in the questionnaires on five-point from 'strongly disagree' to 'Strongly agree were 1. not important, 2. less important, 3. neutral, 4. important, 5. very important. The questionnaire was designed and distributed among expert participants it is consists of two lists, the first is related to demographic information, and the second consists of 13 questions related to the influence of labelled green building materials on the performance of green construction projects. The data was analysed through the statistical package for social sciences (SPSS), estimated Likert Point Mean, Mean Rank and Corresponding Weight (cvi).

4. Demographic Data of experts

A sample of 20 expert respondents, engineers with experience in green buildings, who are able to provide accurate and valuable answers, was selected was selected to participate in this survey. According to [5] the sample size for the Delphi approach varying from 6 to 50 of participating experts. Table. 2 shows the general summary of Demographic Data of experts. The majority of company type and size were consultant with 60%, and the majority of company size were Medium with 55%. The most job designation was Civil engineer (30%) with 11-20 years' total experience (55%). Moreover, the most Type of Construction Project was Residential (85%) and Most Building size was High building (Over G+7) (95%). Table 2 shows the general summary of Demographic Data of experts.

Table 2. general summary of Demographic Data of experts

Demographic Data of experts		**Freq.**	**%**
Company Type	Consultant	12	60%
	Contractor	6	30%
	Developer	2	10%
Company Size	Large (>251 Employee)	7	35%
	Medium (51–250 Employee)	11	55%
	Small (1–50 Employee)	2	10%
	Civil Engineer	6	30%
Job Designation	Designer / Architect	3	15%
	Electric Engineer	2	10%
	Green Consultant Engineer	2	10%
	Mechanical Engineer	2	10%
	Planning Engineer	1	5%
	project Manager	1	5%
	Project Manager	1	5%
	Resident Engineer	2	10%
Total experience in construction sector	11-20 Years	11	55%
	21+ Years	9	45%
Type of Construction Project	Commercial	3	15%
	Residential	17	85%
Building size of building working in	High building (Over G+7)	19	95%
	Medium Building (G+6)	1	5%
Total		20	100%

5. Results and analysis of the three rounds of Delphi

5.1. Delphi round one analysis

Examining the results in Table 3 reveals that the parameters ranked one to 13 were considered significant, where the mean score of each parameter was higher than 3.0. These were, thus selected for consideration in Delphi round two. Based on the ranks achieved, six parameters resulting from Delphi round one obtained Likert point mean values equal or above 4. These six parameters were B1, B4, B2, B12, B7, and B11. The Likert point mean (Lvi) for these six parameters were 4.35, 4.30, 4.20, 4.15, 4.05, and 4.00, respectively. The remaining seven parameters that achieved Likert point mean values above 3.00, and which were thus B6, B9, B3, B10, B13, B8, and B5, which achieved Likert mean values (Lvi) of 3.95, 3.95, 3.90, 3.85, 3.85, 3.80 and 3.75, respectively. Examination of the results reveals that the parameters were considered significant, with Likert point mean values (Lvi) for each parameter above 3.0. They were thus selected for consideration in the Delphi second round.

Table 3. Results of the Delphi Round one

	Parameters	Rank	Likert Point Mean	Mean Rank	Corresponding Weight (cvi)	%
B1	Labeled green building material provides the required product information to stakeholders in the construction sector	1	4.35	9.13	0.0114	87
B4	The accessibility of labeled green construction materials supports the achievement of work programs targeted at green construction projects	2	4.3	8.5	0.0116	86
B2	Labeled green building materials enhance the selection of materials conforming to green building specifications	3	4.2	8.18	0.0119	84
B12	Labeled green building materials enhance the environmental performance during the operation stage	4	4.15	7.73	0.012	83
B7	Labeled green material enhances the green supply chain in the construction sector	5	4.05	7.23	0.0123	81
B11	Labeled green building materials contribute to preserving natural resources and the environment	6	4	6.98	0.0125	80
B6	The accessibility of labeled green construction materials enhances the dissemination of knowledge among the management and staff of the green construction project	7	3.95	6.7	0.0126	79
B9	Labeled green building material enhances the competitiveness of green construction materials in the construction market	8	3.95	6.73	0.0126	79
B3	The accessibility of labeled green construction materials in the construction market enhances green building design	9	3.9	6.25	0.0128	78
B10	The abundance of green construction materials enhances the green trend in the construction sector	10	3.85	6.08	0.0129	77
B13	Labeled green building materials Improving the health of green building occupants	11	3.85	5.9	0.0129	77
B8	Labeled green building material enhances and improves the environmental performance in construction industries	12	3.8	5.93	0.0131	76
B5	The accessibility of labeled green construction materials supports and	13	3.75	5.7	0.0133	75

improves the project team's sustainable performance in green construction projects	
Average Likert Mean	4.007
Number of parameters	13
No. of respondents	20

5.2. Delphi round two analysis

Examining the results in Table 4 for the second round of Delphi reveals that all parameters were considered significant, where the mean score of each parameter was higher than 3.0. These were, thus selected for consideration in Delphi round three. Based on the ranks achieved, twelve parameters resulting from Delphi round two obtained Likert point mean values equal or above 4. These twelve parameters were B1, B2, B12, B4, B6, B3, B8, B11, B7, B9, B5 and B10. The Likert point mean (Lvi) for these twelve parameters were 4.65, 4.45, 4.45, 4.35, 4.2,4.2,4.2,4.2,4.15,4.15,4.1 and 4.0, respectively.

Examination of the results reveals that the parameters were considered significant, with Likert point mean values (Lvi) for each parameter above 3.0. They were thus selected for consideration in the Delphi third round.

Table 4. results of Delphi Round two

	Parameters	Rank	Likert Point Mean	Mean Rank	Corresponding Weight (cvi)	%
B1	Labeled green building material provides the required product information to stakeholders in the construction sector	1	4.65	9.68	0.0107	93
B2	Labeled green building materials enhance the selection of materials conforming to green building specifications	2	4.45	8.4	0.0112	89
B12	Labeled green building materials enhance the environmental performance during the operation stage	3	4.45	8.4	0.0112	89
B4	The accessibility of labeled green construction materials supports the achievement of work programs targeted at green construction projects	4	4.35	7.73	0.0114	87
B6	The accessibility of labeled green construction materials enhances the dissemination of knowledge among the management and staff of the green construction project	5	4.2	6.78	0.0119	84
B3	The accessibility of labeled green construction materials in the construction market enhances green building design	6	4.2	6.78	0.0119	84
B8	Labeled green building material enhances and improves the environmental performance in construction industries	7	4.2	6.78	0.0119	84
B11	Labeled green building materials contribute to preserving natural resources and the environment	8	4.2	6.78	0.0119	84
B7	Labeled green material enhances the green supply chain in the construction sector	9	4.15	6.45	0.012	83
B9	Labeled green building material enhances the competitiveness of green construction materials in the construction market	10	4.15	6.43	0.012	83
B5	The accessibility of labeled green construction materials supports and improves the project team's sustainable	11	4.1	6.13	0.0121	82

	performance in green construction projects					
B10	The abundance of green construction materials enhances the green trend in the construction sector	12	4	5.53	0.0125	80
B13	Labeled green building materials Improving the health of green building occupants	13	3.95	5.18	0.0126	79
Average of Likert Mean		4.234				
Number of parameters		13				
No. of respondent		20				
Kendall's Coefficient of Concordance		0.708				

The results shown in Table 5 indicate that some expert participants had re- evaluated their opinions in Delphi round two in comparison with the previous round. It should be noted that although in this round the Likert point mean values increased, the number of significant parameters remained similar without adding or omitting any parameters. However, the level of agreement had to be confirmed, given the potential increase in agreement, which required a third round of the Delphi approach.

Table 5. Comparison between Ranks from Delphi Rounds One and Two

Parameters	Rank Delphi Round one	Rank Delphi Round two
B1	1	1
B4	2	4
B2	3	2
B12	4	3
B7	5	9
B11	6	8
B6	7	5
B9	8	10
B3	9	6
B10	10	12
B13	11	13

5.3. Delphi round three analysis

Examining the results in Table 6 and the figure 2 for the third round of Delphi reveals that all parameters were considered significant by panel, where the mean score of each parameter was higher than 3.0. These were, thus selected for consideration in Delphi round three. Based on the ranks achieved, six parameters resulting from Delphi round one obtained Likert point mean values equal or above 4. These ten parameters were B1, B4, B12, B2, B11, B7, B9, B6, B8 and B13. The Likert point mean (Lvi) for these ten parameters were 4.45,4.35,4.3,4.3,4.15,4.1,4.1,4.05,4 and 4, respectively. The remaining three parameters that achieved Likert point mean values above 3.00, and which were thus B3, B5 and B10 which achieved Likert mean values (Lvi) of 3.95, 3.90 and 3.85 respectively. Examination of the results reveals that the parameters were considered significant, with Likert point mean values (Lvi) for each parameter above 3.0.

Table 6. results of Delphi Round three

	Parameters	Rank	Likert Point Mean	Mean Rank	Corresponding Weight (cvi)	%
B1	Labeled green building material provides the required product information to stakeholders in the construction sector	1	4.45	9.1	0.0112	89
B4	The accessibility of labeled green construction materials supports the achievement of work programs targeted at green construction projects	2	4.35	8.33	0.0114	87

B12	Labeled green building materials enhance the environmental performance during the operation stage	3	4.3	8.15	0.0116	86
B2	Labeled green building materials enhance the selection of materials conforming to green building specifications	4	4.3	8.2	0.0116	86
B11	Labeled green building materials contribute to preserving natural resources and the environment	5	4.15	7.23	0.012	83
B7	Labeled green material enhances the green supply chain in the construction sector	6	4.1	6.85	0.0121	82
B9	Labeled green building material enhances the competitiveness of green construction materials in the construction market	7	4.1	6.9	0.0121	82
B6	The accessibility of labeled green construction materials enhances the dissemination of knowledge among the management and staff of the green construction project	8	4.05	6.58	0.0123	81
B8	Labeled green building material enhances and improves the environmental performance in construction industries	9	4	6.38	0.0125	80
B13	Labeled green building materials Improving the health of green building occupants	10	4	6.23	0.0125	80
B3	The accessibility of labeled green construction materials in the construction market enhances green building design	11	3.95	5.95	0.0126	79
B5	The accessibility of labeled green construction materials supports and improves the project team's sustainable performance in green construction projects	12	3.9	5.75	0.0128	78
B10	The abundance of green construction materials enhances the green trend in the construction sector	13	3.85	5.38	0.0129	77
Average of Likert Mean		4.115				
Number of parameters		13				
No. of respondent		20				
Kendall's Coefficient of Concordance		0.828				

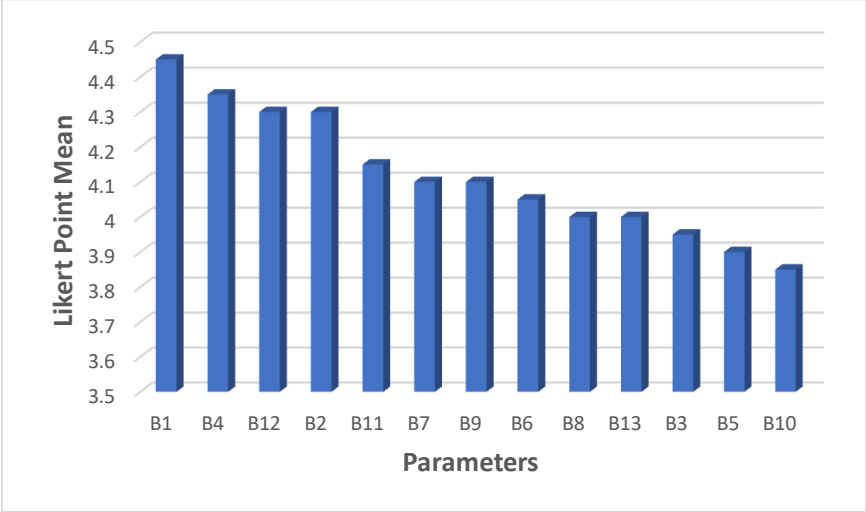

Figure 2 Results of Delphi Round Three.

5.4. Total Delphi rounds analysis

Through the Delphi method, all participants expressed their opinions about the significance of these 13 parameters and its impact on performance of green construction projects. Examination of the results of the three Delphi rounds indicated that all parameters in the questionnaire achieved mean similar point values (Lvi) above 3.00. Kendall's Coefficient of Concordance (W) was used to determine the agreement among the experts. After performing a nonparametric test of Kendall's Coefficient of Concordance (W) using the SPSS, the results of the calculation revealed that the Kendall's Coefficient of Concordance (W) was 0.708 for the second round and 0.828 for the third round, which is considered a strong consistency among expert participants. Paré et al, (2013) [16] discussed that a Kendall's W coefficient greater than 0.7 (strong), W between 0.5 and 0.7 (moderate) and a W less than 0.5 (weak). Table 7 shown the comparison between level of agreement among participants as per the results of Kendall's Coefficient of Concordance (W) for the second and third round of Delphi.

Table 7. Comparison between Level of agreement among participants Round 2 and Round 3

Kendall coefficient of concordance (*W*)	**Round 2**	**Round 3**
Level of agreement among participants	0.708	0.828
P-value (Sig.)	<0.0001 (HS)	<0.0001 (HS)

6. Discussion

The research results are consistent with the results of a number of researches conducted in terms of the impact of labelled green materials on performance in the construction of sustainable construction projects in terms of providing sufficient parameters about the green product, which greatly contribute to facilitating the selection of materials that are appropriate for the design of sustainable buildings and meet sustainable specifications and standards. This is in addition to its economic, social and environmental benefits, and the lack of these green materials in the market hinders work programs in sustainable construction projects, as many researchers have discussed that the lack of sustainable green materials is one of the barriers to adopting and implementing sustainable buildings, [12] arguing that the unavailability of sustainable building materials, uncertainty in quality, and change orders for materials are the highest potential impact on project outcomes. High costs of sustainable materials and equipment represent a significant potential and negative impact on future projects that embrace sustainability. [1] Identify the limited availability of sustainable materials in the market, and the method of selecting sustainable building materials as a barrier to sustainable construction. While [18] identified the lack of

sustainable materials as a barrier to sustainable construction. [19] Discussed that the lack of sufficient information related to green building materials/products and the lack of testing/certification of green materials in addition to the high cost of green technologies and materials are obstacles to the implementation of green building projects. While [24] discussed that the lack of mature green technology and immature green materials market, hinders the development of green buildings. While [1] discussed that the process of selecting building materials and equipment used in buildings is a complex process during the implementation of green buildings, and requires great effort and knowledge to accurately determine the specifications of materials and equipment to ensure that they comply with the conditions and considerations required for green building laws, whether these laws and conditions are local or international. The material technical data sheet does not provide enough information to define the product as environmentally friendly and green. As it is the green materials that confirm that they are environmentally friendly materials and their conformity with the green specifications, and in some cases, laboratory tests are conducted for unlabelled building materials to ensure that they comply with the required green specifications. Where [8] Discussed that the use of sustainable and recyclable building materials leads to the promotion of overall sustainability to achieve cleaner and safer structures. Sustainable building methods and materials are extremely important to successful sustainable construction. Sustainable building materials are more efficient in recycling, and require less energy and efforts in the recycling process. He also indicated that environmental labeling programs guide and create awareness among stakeholders to help them choose green products and services. Environmental labeling of products is an effective way to inform consumers of the green impact of these products on the environment described. Since environmental labels contain information about environmental performance, they can help market players achieve their goals. Eco-labelling tools help customers make environmentally efficient and economical choices [6].

7. Conclusion

This paper reveals the extent of the benefits provided by the promotion and encouragement of labeled green building materials in the construction sector. As it was concluded from the results of the questionnaires that the benefits and the positive impact of these materials in raising sustainable performance in the construction sector, enhances the green trend in the construction sector, facilitating the process of selecting green building materials in green construction projects without any obstacles or delays, enhances green building design, improves the project team's sustainable performance in green construction projects, enhances the dissemination of knowledge among the management and staff of the green construction project, enhances the green supply chain in the construction sector, enhances and improves the environmental performance in construction industries, enhances the competitiveness of green construction materials in the construction market, enhance the environmental performance during the operation stage, contribute to preserving natural resources and environment, Improving the health of green building occupants, supports the achievement of work programs targeted at green construction projects, provides the required product information to the stakeholders in the construction sector. This paper proposes to support manufacturers in the construction sector to labelling their products as green building materials in addition to supporting the green supply chain in this sector with the aim of raising and improve sustainable performance and supporting designers in implementing sustainable designs while supporting contractors in obtaining these green building materials to implement sustainable projects in addition to the environmental, economic and social benefits that can be achieved from the availability of such materials in the construction market.

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