

The challenges of sustainability in construction projects sector

“Statically study in Benghazi, Libya”

Elmutaz bellah Faraj Eldagharey

Mohamed F Gumma Alareibi

Emad Salim Ahmed Altaeb.

Lecturer

Higher Institute For Technical Engineer alqwarsha

Location : Benghazi, Libya.

Abstract :

Development of economy in most countries is related to projects in the construction industry that are carried out in accordance with a variety of contractors. Currently, the objective of construction projects has been slightly changed and challenging by taking into account the development of the projects should become more sustainable. Multiple aspects such as climate changes, limited non-renewable energy sources, increasing population, etc affect our present and led to taking into account the priority of sustainability, especially in construction projects. This paper based on statically study will search to determine the concept of sustainability understands and current practices of sustainability in Libyan construction industry and the related obstacles to providing offer recommendations for these prevailing problems issues and contribute also to the knowledge body of the construction industry in Libya. This research paper will focus on the current practices of green materials in the construction industry in Benghazi, Libya. As will as look into the difficulty of utilizing green materials in the construction industry. The respondents are the contractors, client, and consultant.

**Key words: sustainability - construction project - construction industry
- climate change - non renewable energy - green material Introduction:**

Development of economy in every nation is based on construction projects that are undertaken through several types of contracts. Nowadays, the objective of construction projects are challenging to be achieved by meeting a different aspects of specifications as sustainability

Due to climate changes that affect on global energy demand, the construction of sustainable buildings are became more desirable, and that reflected on the number of researches are taken the sustainability and the utilizing of green material into their consideration (Alam, Zain and Kaish, 2012).

Utilizing a green material in constructions sector, drive to establishing a good opportunity for sustainability and energy efficient structures to be applied, which can be achieved by an integrated design to reduce the negative effect of the building construction towards the environment (Ali and Nsairat, 2009).

Also using a green material, updated and expanded the traditional concept of buildings design, which emphasizes a building's economy, usability, durability, and comfort, (Akadiri, 2011).

(Ali and Nsairat, 2009) defined sustainable buildings as buildings that known to become more Energy-efficient, durable, extensive, and non-toxic. Additionally, it uses a lot of recycled materials and practices high levels of water conservation.

Researchers are now concerned with the changes in frequency, intensity, and duration of these climatic events and the extent of human involvement in and contribution to these changes (Esteban *et al.*, 2009; Ibararan *et al.*, 2009), also (Ortiz, Castells and Sonnemann, 2009) confirmed that and goes further by asking how to apply sustainable construction in order to enhance the economic, social and environment in order to become more common.

(Chun, 2007), mentioned that an evaluation of the sustainable building discipline as a whole should begin with an understanding of the field. According to that, there are many indicators for sustainable building design. These include;

- Identifying opportunities to generate on-site renewable electricity, i.e. like Building-Integrating Photovoltaic (BIPV).
- Minimizing the use of fossil-based energy embodied in the material, transport and construction process and energy used during the lifetime of the building.
- Ensuring that building management systems are simple to use and not overly complex.
- Making best use of passive (or active) solar energy while employing heating and cooling systems which are fine tuned to the needs of the occupants with air-conditioning used only in exceptional.

Problem Statement:

With increasing density of population across the world and especially in Libya, Moreover the influence of the war has made number of structural problems in the infrastructure which generate some issues such as electricity and water distrubtion.etc, which led to ask

“How might sustainable buildings and green material being useable in current practice construction projects?”

“What are the main obstacles to using green materials in Benghazi' s construction industry?”

Aims and Objectives of this paper:

This paper's major goal is to investigate and verify the impediments to the development of sustainable buildings as determined by statically study.

Main view :

Characteristics of Green Materials:

The various ways that the phrase "green building" is used share two common characteristics. A green building might be one that is more environmentally friendly than the norm. Second, a green building might incorporate the integration of several aspects rather than just one, such as energy use. According to Carrie and Danielle (2009), green materials have the following characteristics;

- not harmful
- Material not able to deteriorate
- A high shock and force absorbent rate
- Totally formed from recycled materials
- Trim, cut, drill, and plane easily
- Multi-purpose materials
- Fit for both indoors and outdoors
- Moth/mildew, water, and rust resistant
- Easy to transport around and use for construction

The environmentally friendly materials come from renewable resources, recycled metal, recycled stone, or any other

materials that are entirely recyclable and reused and are not toxic in any manner when used. This explains the rationale for the market's current surge in demand for sustainable building materials to protect the environment for future generations (Carrie and Denielle 2009). Recycled materials, natural materials, and renewable materials make up the three categories of green building materials (Alnaser and Flanagan, 2005).

Obstacles of using Green Construction Materials:

In order to change the design of buildings and the construction process, the construction industry is presently using a number of green materials and tools. (Li Yuanyuan, 2012).

According to (Li Yuanyuan, 2012) the barriers affecting green construction are:

- A contested concept of sustainability
- Delay between understanding cause and effect
- Lack of policy or legislation
- Lack of knowledge
- Complexity and fragmentation in labor
- Lack of awareness

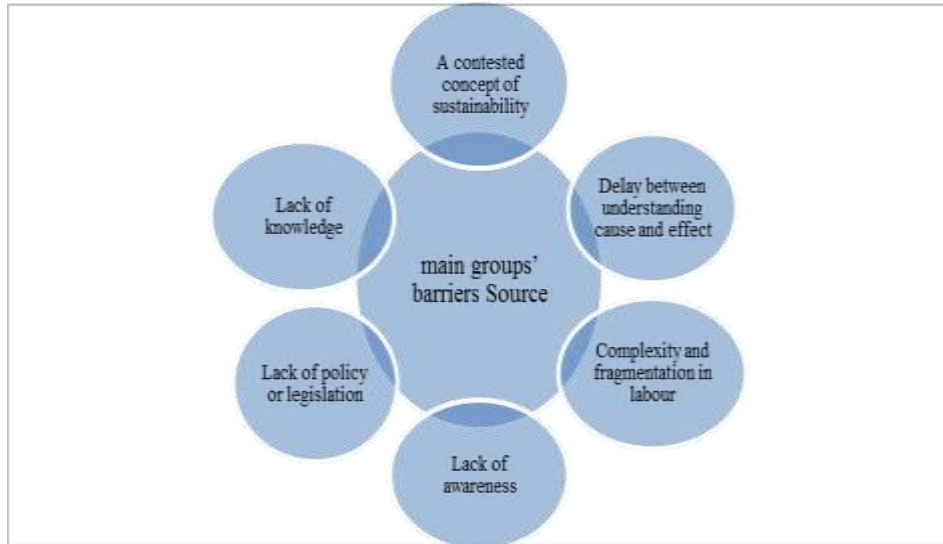


Figure 1: main groups' barriers Source: (Li Yuanyuan, 2012)

On the other hand, Choi (2009) mentioned five barriers as shown in Figure 2. These are

- Knowledge Gap in Green Development
- Communication Shortfalls regarding the benefits associated with such projects
- Ownership Structure and Operating Cost Responsibility
- Funding Issues
- Risk and Process Issues because the lack of expertise and resources

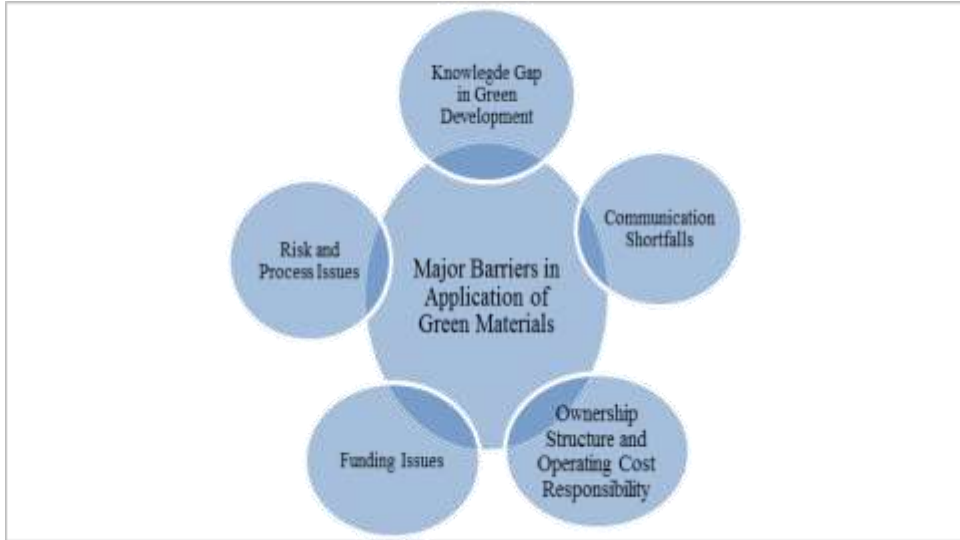


Figure.2: Five main groups' barriers Source: (Choi, 2009)

Research Methodology:

The goal at this point is the following approach for finding the answers to research questions, as listed as:

- i. Create a query
- ii. Assemble information to provide a response
- iii. Offer a response to the query

The research questions are based on an inductive approach to the Benghazi construction industry and the obstacles to the use of green building materials in Libya. Moreover, it aims to discover the present usage of green building materials in Benghazi and look into any obstacles to their adoption in the country's construction sector.

Response Rate:

Questionnaires Administered	Questionnaires Returned	Returned (%)
80	51	64%

Table 1: shows response rates appropriately

There were 80 surveys distributed in total to the targeted responder. But only 51 surveys (or 64%) were returned, so further analysis was done to try to find the answers to the research questions.

Descriptive analysis:

Descriptive analysis presents the characteristics of respondents. The results are presented in tables in the following sections.

Respondent's Qualification and Working Experience:

Certificates	1 - 5 years	6 - 10 years	11 - 15 years	16 - 20 years	21 years and above	Percentage	Total
Degree	1	3	10	7	7	59.37%	28
Master	0	7	3	2	1	25%	13
PhD	0	2	0	1	0	6.25%	3
Diploma	0	2	3	2	0	9.37%	7
Total	1	14	16	12	8	100%	51

Table 2: Level of education and experience of respondents

Type of organization:

Organization	Frequency	Percentage
Client	16	31.37%
Contractor	28	54.90%
Consultant	7	13.73%
Total	51	100%

Table 3: Type of Organization

Types of Clients:

Client Project	Frequency	Percentage
Government	3	5.9%
Private	38	74.5%
Joint Venture	10	19.6%
Total	51	100%

Table 4: Types of Client

Activities Undertaken by Respondents

Size by Libyan Dinar	Frequency	Percentage
Less than 1 Million	25	49.01%
1-5 Million	18	35.30%
6-10 Million	7	13.73%
10-50 Million	1	1.96%
Above 50 Million	0	0%
Total	51	100%

Table 5: Size of Projects

Respondent's career;

Job	Frequency	Percentage
Architect	18	35.20%
Engineer	23	45.10%
Quantity Surveyor	8	15.70%
Others	2	4.00%
Total	51	100%

Table 6: Respondent's career

Current practices of green materials in construction project:

Factor	Mean	Ranking
Impact materials	4.23	8
Adequate Knowledge Consultant	3.98	7
Adequate Knowledge Contractor	3.97	6
Availability materials	3.94	5
Importance materials	3.84	4
Application recyclable	3.78	3
Adequate Knowledge Client	3.41	2
Application Renewable	2.28	1

Table7: Mean Values for green material current practices

Adequate knowledge on green materials by the client:

Figure3 shows the respondents' frequency ratings on the attribute adequate client knowledge of green products as a key influencing the use of green materials in the Benghazi building sector. The respondents agreed that for the practice to be successful, clients must have sufficient knowledge about green materials. Only 9% of the respondents gave a "high" rating of 34%. This might be because acceptance of green products depends on the client's familiarity with them.

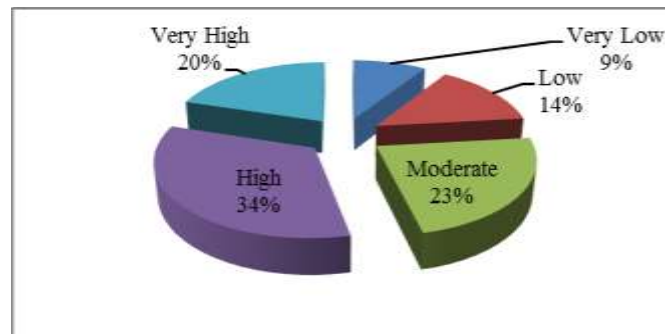


Figure3. Adequate knowledge on green materials by the client

Adequate knowledge on green materials by the consultant

In construction projects, consultants are vital to both the client and the contractor. To ensure that the code of practice is observed, a consultant must be present. The need of having experts with sufficient understanding in using green materials in construction projects was brought to the respondents' attention in figure 4. As a result, 34% and 37% were evaluated as high and very high correspondingly, leaving only 9% with a very poor rating. This means that it is imperative to inform consultants of the necessity for green materials in all construction projects in Benghazi.

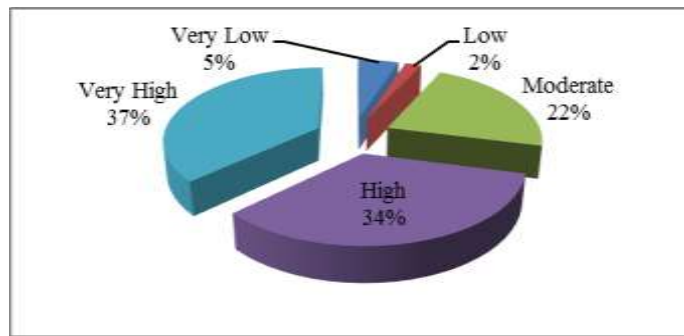


Figure4. Adequate knowledge on green materials by the consultant

Adequate knowledge on green materials by the contractor:

The contractor is the individual or business in charge of actually carrying out the building project. This organization serves a very important role. Because of this, it's essential to raise contractors' level of awareness of green building methods. In figure 5, the respondents collectively rate this variable as high or very high up to 75%.

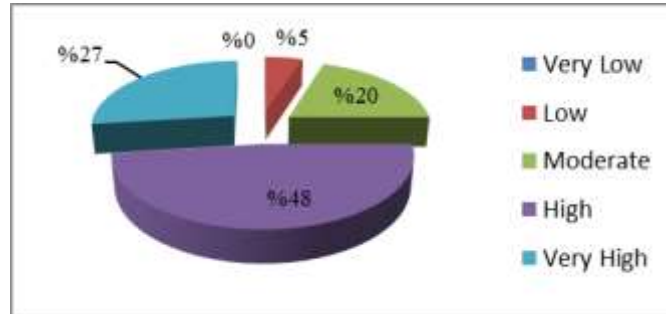


Figure5. Adequate knowledge on green materials by the contractor

This can be because of the contractor's function in construction projects. This may be a sign of the poor use of green building materials in construction projects in Benghazi. Due to the limitation of the appropriate knowledge and experience, the profession cannot be successful.

Application of renewable materials in construction project:

As seen in figure 6, the respondents gave the renewable materials low and extremely low ratings 31% and 40% respectively suggest that relatively little renewable material is used. This is possible since it requires a technical lead in the construction process to be aware of it (client, consultant, and contractor) .Materials are needed to raise the application level or, failing that, lower it. There is a need to have adequate knowledge of those that are to apply it since renewable materials do not apply themselves.

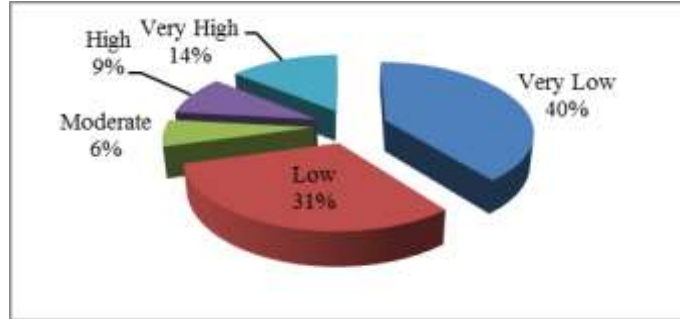


Figure6. Application of renewable materials in construction project

Application of recyclable materials in construction project

The respondent's perception of the use of recyclable materials in construction projects is shown in Figure 7. The outcome demonstrates the requirement for recyclable materials in the projects in order to properly implement green materials. Only 6% of the respondents gave the variable that influences the use of green materials a rating of extremely low, while 53% gave it a high rating.

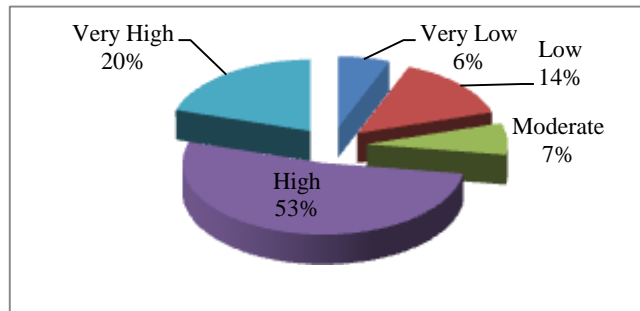


Figure7. Application of recyclable materials in construction project

Impact of green materials application in construction project:

Figure 8 depicts how respondents felt about the use of green building materials in construction projects. This shows that while 34% is a strong response, 48% is a very high response. The respondents agreed that the building industry is impacted by green materials. It is demonstrating the critical need for using green building materials in construction projects.

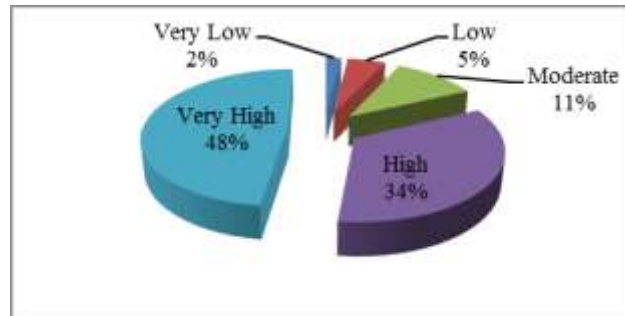


Figure8. Impact of green materials application in construction project

Importance of green materials in construction project:

The respondents' perceptions of the significance of green materials in the building sector were represented in figure 9. According to the graph, 56% of survey respondents stated that it was extremely important to use green products. Surprisingly, none of the survey participants received a poor rating. This further demonstrated the necessity of using green building materials in construction projects.

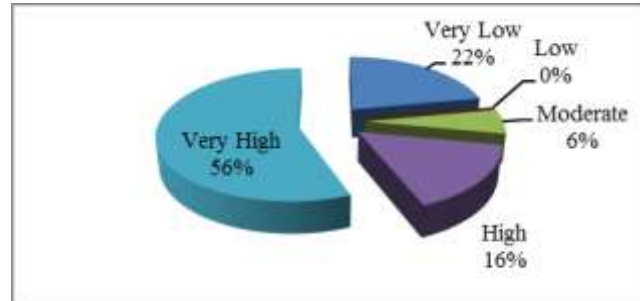


Figure9. Importance of green materials in construction project

Availability of green materials manufacturers:

The most important aspect of the practice is the accessibility of green materials. The majority of the green components are imported, thus their availability on the market could compromise the effectiveness of the procedure. In figure 10, 63% of the respondents gave the element a very high rating. Due to several issues, Libyan construction projects in general could be hampered by a lack of materials.

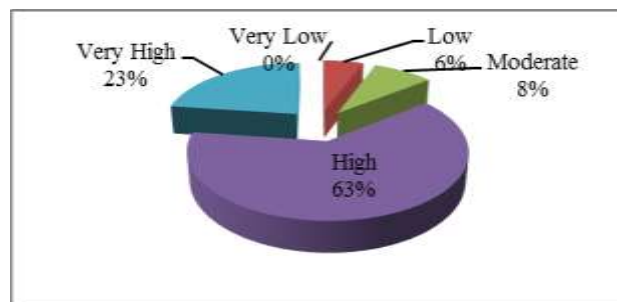


Figure10. Availability of green materials manufacturer

The major barriers of using green material in construction projects

Variables	Mean	Ranking
Government unawareness	4.66	8
Lack of finance	4.20	7
Client knowledge	3.83	6
Lack of materials	3.77	5
Lack of ability	3.36	4
High cost	3.06	3
Lack of skill	2.95	2
Lack of interest	2.36	1

Table 8: Mean Ranking

Government unawareness about the importance of green materials:

The result in Figure 11 showed that 74% of respondents said that government ignorance was the biggest obstacle to using green building materials in Libyan construction projects. The government is successful in reaching a number of goals because it is aware of the challenges.

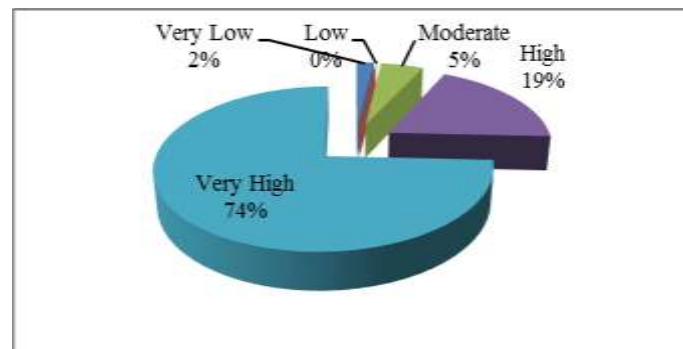


Figure11. Government unawareness about the importance of green materials

Lack of Commitment of finance to ensure that building is green:

The respondents' view of a lack of financial commitment is depicted as moderate in Figure 12. It is stating that financial commitment to the use of green products must be done with responsibility. In terms of using green materials, the respondents view the situation as moderate.

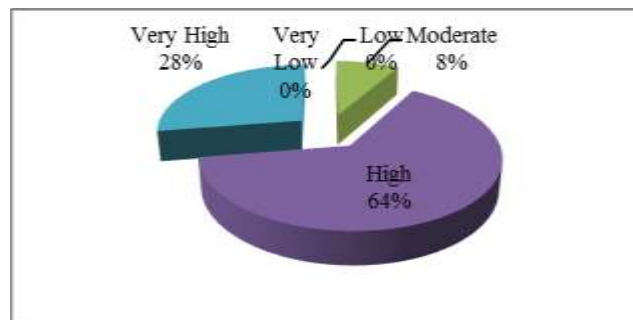


Figure12. Lack of Commitment of finance to ensure that building is green

Client knowledge on green materials:

Client experience with green products, according to Figure 13, is unlikely to be a serious barrier to the use of green products. Regardless of the position they hold, clients in construction projects need advice from a consultant before acting. As a result, according to the respondents, this aspect has a minimal or negligible impact on the use of sustainable products.

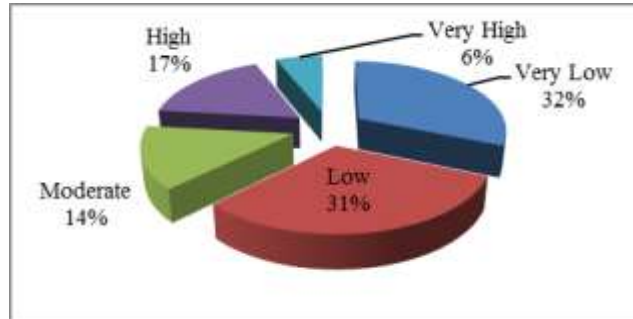


Figure13. Client knowledge on green materials is low

Lack of Green material in marketing:

The lack of green building materials on the market is the biggest obstacle to using them in construction projects in Libya. If the supplies are available on the market, it is anticipated

that an effort will be made to apply the practice. This may be the cause of the barrier receiving a high rating from 60% of respondents. Furthermore, 17% assessed the barrier in figure 14 as extremely high. According to the findings, this barrier must have important that this barrier has a substantial impact on Libya's green material practices not only in Benghazi.

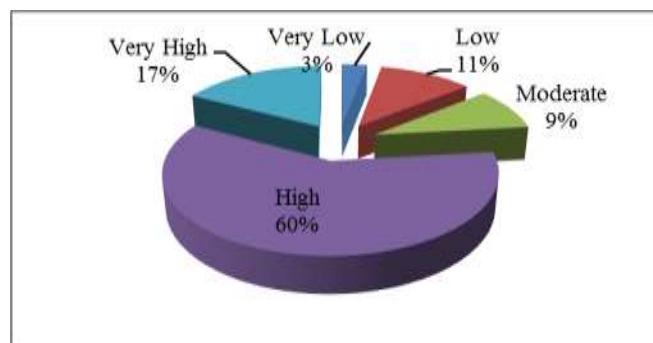


Figure14. Lack of Green material in marketing

Lack of Client ability to coordinate the green materials :

During building, it is important to coordinate the materials. If a client has the experience, they could do this. However, during the operation of the construction project, the contractor is the only one who coordinates materials. This might be the cause of the respondents' preference to evaluate this obstacle neutrally, as shown in figure 15. This barrier received a mediocre rating from 65 responders. The meaning of that the rating is neither high nor low but is in the middle.

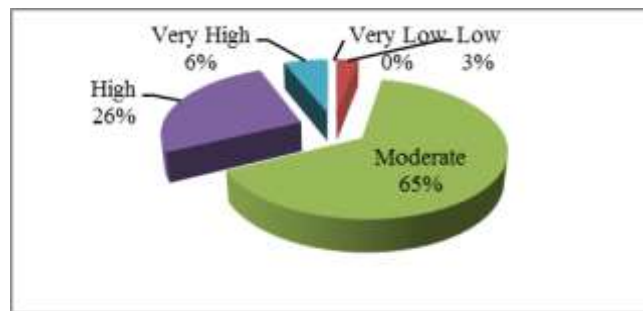


Figure15. Lack of Client ability to coordinate the green materials

High cost of green materials in the market

Figure 16 highlights that the high cost of the materials is viewed as a moderate barrier to the use of green materials in Libya by 79% of the respondents. This is achievable as a result of the resource shortage and the participants' low level of interest, which result in the item's high price.

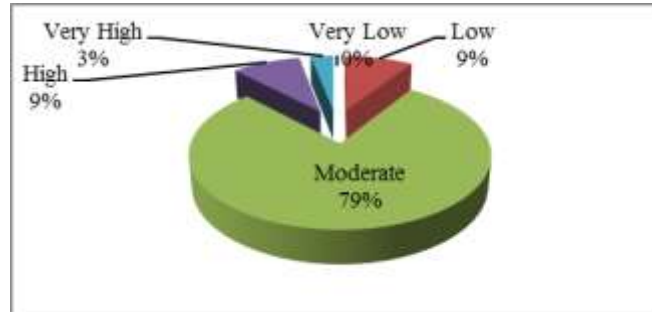


Figure16. High cost of green materials in the market

Lack of Skilled labor in using green material:

Figure 17 show that 90% of the respondents changed their opinions on the availability of skilled workers. Since the green materials are ordered from a manufacturer who may have enough staff to install and assemble the materials, the labor employees in the products shouldn't be an issue. As a result, the barrier barely affects the use of environmentally friendly materials in Libyan construction projects.

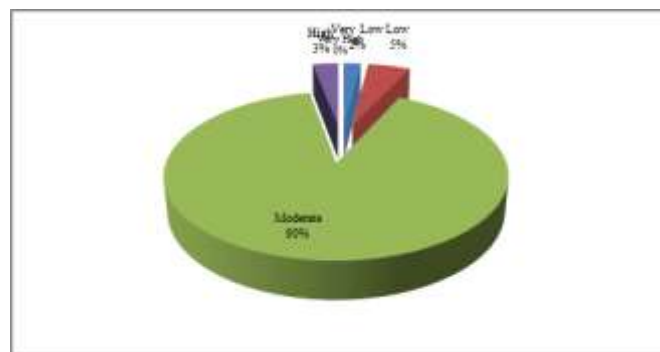


Figure17. Lack of Skilled labor in using green material

Lack of interest by the Government to promote green material:

According to the examples in figure 18, 83% of the respondents assessed the barrier as high. The importance of the government taking an interest in the use of techniques or methods cannot be overstated. The government's interest in green materials is crucial to their success. According to the respondents, the government's lack of interest is an important factor.

However, the price will decrease if the material is easily accessible. The respondents might have thought that the resources ought to be accessible and that the problem with the high price might be resolved.

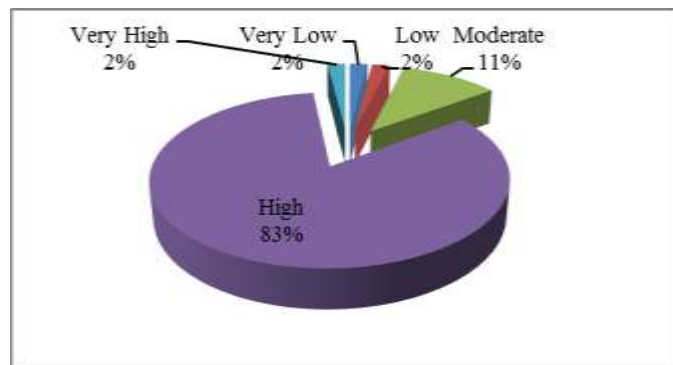


Figure18. Lack of interest by the Government to promote green material

Conclusion:

The goal was accomplished through survey using questionnaire that allowed for the identification of the level of use of green materials, which was previously unavailable.

On the other hand, impact materials, application natural, a knowledgeable consultant, and a knowledgeable contractor represent the majority of the other common components. These elements demonstrate how green material practices are practically nonexistent.

Impact material is a significant aspect that discusses the effects of using these sustainable and ecological building materials. It is challenging to utilize, especially in developing nations, because of its heaviness and requirement for a specialized skill before it could be handled.

Recommendations:

These recommendations are based on the findings of the results obtained. Available recommendations were given regarding the major barriers effects of using green materials in construction projects in Benghazi.

- The government must play a part in encouraging the use of green building materials in the project by enforcing the law and providing incentives.
- Construction firms, in particular decision-makers, must be dedicated to employing green products to earn the benefits.

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