
Assessment of Awareness of Architects on Sustainable Building Materials in Minna, Nigeria

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Abstract: Sustainability is so important that both the MDGs and SDGs as United Nations development initiatives have listed it as a vital component. Non-sustainable practices lead to depletion and destruction of the environment with consequences that are still being understood. This could even get worst if professionals in the Building industry do not key into the sustainability initiative. Architects, as professionals in the built environment, take the most important decisions as far as the design and construction of buildings are concerned. Their awareness and knowledge of sustainable building materials is very important in solving this emerging problem. This study is aimed at evaluating the level of awareness of Architects on sustainable Building Materials. This is measured by looking at the knowledge, specification and application of sustainable building materials. The study was qualitative hence; data was obtained through a six-item structured schedule of interview. A total of 18 registered Architects were purposively selected for the study. The results obtained showed that as we get close to two decades since international attention has been drawn to sustainability, there is still a low level of awareness and knowledge of sustainable building materials among Architects. The study also revealed that Architects sometimes do not like pushing boundaries out of their comfort zones as far as specification writing is involved. In conclusion, the study recommended the updating of building bye-laws of the state, intending to make the Architects update their knowledge of sustainable Building Materials as a result of the more regular application in their designs.

Keywords: Architects, Awareness, Building, Materials, Sustainable

1. Introduction

The role of an Architect goes beyond the design of buildings. Their role covers the three main phases of the evolution of a building project, which are; design, documentation and construction. The Architect leads the team of professionals that are involved in all three phases and ensures public safety while overseeing the project. [21].

[3] Stated that an Architect has the responsibility of creating designs, and maintaining a built environment that is resilient, and has the flexibility to adapt and recover from different types of disasters.

The United Nations conference on environment and development, and the Bonn agreement of 2001 drew attention to the fact that professionals in the built environment should

rethink their role on the issues of the environment and sustainability. Despite increased concern on how human activities affect the environment, professionals and developers seem not to be bothered by the development and the responsibility they have in reshaping the sustainability of the environment [5].

This can be better achieved with adequate awareness and deployment of sustainable building materials in building projects. [15] Stated that sustainable building materials are materials that are effectively used for different forms of construction in the present, without depleting or compromising the availability of such materials for use by future generations.

The problem with lack of awareness on sustainable construction materials was highlighted in the study by [12],

which revealed that many Architects are not sufficiently aware of sustainability; the few that are aware are more concerned about issues that involve energy and passive gains in design than they do about building materials. Also, construction material awareness is very important because construction consumes a huge amount of raw material; the industry is responsible for 35% to 40% of global carbon emissions. The sheer volume of raw material resources consumed if not sustainable could destroy the environment especially through climate change [10].

Many sustainable building materials are available in the market but the challenge is the selection as sustainability means different thing to different people. No material is 100% sustainable but some materials are better than others. Examples of some at the top of the list are; “Bamboo, Cork, recycled wood and metals, pre-cast concrete and sheep wool insulation” [17].

2. Research Questions

The following research questions served as the framework for the design of data collection instruments within the study area of Minna, Nigeria. And they are as follows:

- i. Are the architects in Minna aware of suitable building materials?
- ii. Do architects in Minna specify sustainable building materials in their design?
- iii. Are their specifications implemented during the construction stage of the building project?

Therefore this study is aimed at finding answers to the research questions posed above. This is for better awareness and knowledge of sustainable Building Materials by Architects which can help in carrying out efficient and effective material selection right from the design stage. This, in turn, will have a positive multiplier effect on the Environment in general.

3. Objectives of the Study

The following objectives served as the framework for the design of data collection instruments within the study area of Minna which will examine the following:

- i. The level of awareness of sustainable building materials by Architects in Minna
- ii. The level of use of sustainable building materials by Architects in Minna.
- iii. The latest sustainable building materials popularised in the last 3 years.
- iv. The benefits of specification and use of sustainable

building materials in building projects.

4. Literature Review

Architects have a vital role in producing building designs to translate the dream of a client into reality. This role is further broken down into many other more complex roles which include; preparation of detailed working drawings and specifications, consult and advise the employer on tendering procedures, supplying builders with detailed drawings alongside specifications and performing other duties to the employer as stated in the signed contract [4].

[13] Revealed that in the design stage of a building project, the Architect’s knowledge of Building materials is very vital because this is the moment that decisions on the main materials that will bring the Architects dream to reality are taken, this is why the Architect is increasingly getting more involved in the construction process.

Production and manufacture of building materials is a very high energy exercise. Contemporary building materials like concrete, steel and glass consume a high amount of energy to produce. The selection of building materials is a very important process that is a huge determinant in the life circle assessment of a building. The importance of proper material selection does not just affect the embodied energy of the building during production, but it also affection the operational energy of the building [22].

4.1. Sustainable Architecture

This is the design technique that is done with the environment in mind, it results in environmentally friendly energy-efficient, and high-performance buildings. The popularity of how the environmental resources of the planet are used is increasing; this is fuelling more interest of the public and researchers because of its friendliness to the eco-system and providing efficient heating, cooling and water supply. Knowledge of Sustainable architecture is growing as a result of cutting edge science and innovative approach to design [20].

4.2. Sustainable Building Materials

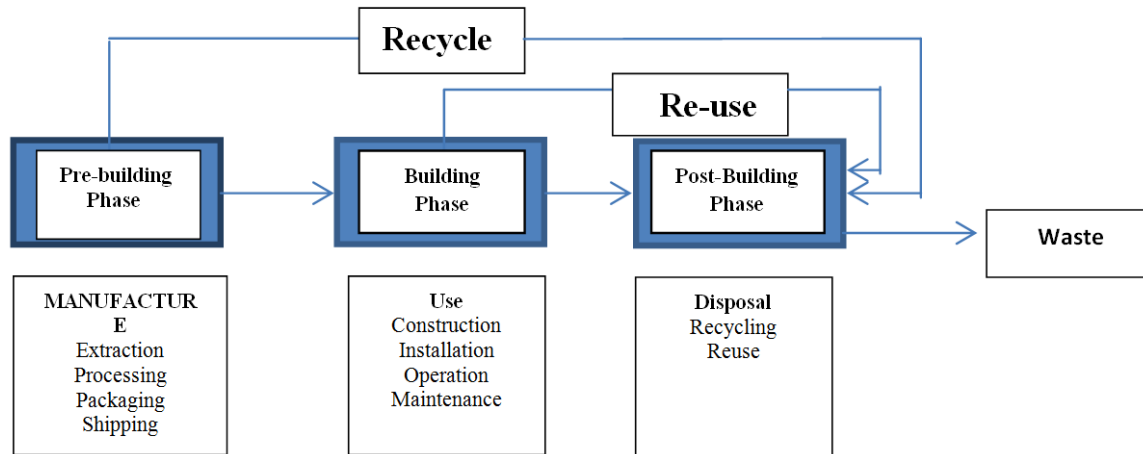
According to [7], sustainable building materials does not deplete natural and non-renewable resources, this means that that the materials do not negatively impact the environment.

The selection and utilization of sustainable building materials have a huge positive impact on the wellbeing of the occupants and the environment in general. These building materials also improve the performance of buildings [23].

Table 1. Component of Sustainable Building Materials.

Component of Sustainable Green Materials		
Manufacturing Process (MP)	Building Operations (BO)	Waste Mgmt. (WM)
Waste Reduction (WR) Pollution Prevention (P2)	Energy Efficiency (EE) Water Treatment & Conservation	Biodegradable (B) Recyclable
Recycled (RC) Embodies Energy Reduction (EER)	(WTC) Nontoxic (NT) Renewable Energy Sources (RES)	(R) Reusable (RU)
Natural Materials (NM)	Longer Life (LL)	Others (O)

Source: [23].



Source: Sustainable Architecture Module

Figure 1. Three Phases of Building Material Life Circle.

4.3. Architects and Building Materials

Building materials are very vital components of Architectural Design. The selection of Building Materials to meet the aesthetic and technical requirement of an Architect is guided by its visual and tangible characteristics [25]. [16] revealed that Material is what clearly defines a building; this is because its most defining characteristics is very much dependent on the nature of the material selected by the Architect. Examples of such include;

- i. The appearance of the building
- ii. Safety and Durability
- iii. Textures and Colours

The ability of the Architect to effectively select and put the materials together determines the quality of the building presented or designed. A lot of tact must be put into this process as the integrity of the Architect depends on it. These days, the role of the Architect in construction is becoming more pronounced that their contact with Building Materials will naturally be a must. Gone are the days that Architects remain in the world of computers and studios without much care for how their design is being implemented [9].

4.4. Knowledge of Sustainable Building Materials

The knowledge and understanding of Building material are very vital in the design and construction of buildings that are safe efficient and durable [24]. Knowledge of Building Materials is also very important to other professionals within the built environment; this is to come up with Buildings that have a less negative impact on the environment [19].

[19], further argued that sometimes the knowledge of sustainable building materials depends on personal effort, quest and commitment to learning about it. That is why in some situations professionals with lesser years of experience are more aware than others with more years of experience. [14], shows what inhibits the development of green buildings in Nigeria, and they are as follows;

- i. Lack of information on green products
- ii. Human resources and client knowledge

iii. Low-level of expertise

iv. Low level of awareness on sustainability issues

v. Lack of institutional policies and guidelines

Most of the points listed above have something to do with knowledge and awareness; this is to show how important it is to sustainability.

4.5. Problems of Inadequate Knowledge of Sustainable Building Materials

[11] Stated that lack of knowledge and understanding of sustainable building materials is a big stumbling block to the development and construction of sustainable Buildings. The lack of knowledge by professionals on sustainability has also extended to the client. This because the Architect should advise and educate the client on the importance of sustainability [6]. [8] The demand for building materials is expected to grow, with a huge impact on the sustainability of the environment. Therefore building designers must be aware and understand the complexity of Building Materials and their impact on sustainable development. This is why more research should be encouraged to discover better opportunities in the use of green and sustainable building materials.

5. Research Methods

The method adopted for this research is qualitative; therefore a survey was carried out among registered Architects in Minna.

The selected architects were divided into three groups for the collection of data. The groups are;

- i. Architects in academics
- ii. Architects in private practice
- iii. Architects in Government /civil service

The first set of results showed the data for the entire architects selected while the second set of results presents the data for each group of architects selected.

The data collection technique was primarily through a structured schedule of interview. The instruments were structured in such a way that they will effectively fulfil the

objectives of the study. The instrument consists of a total of 6 questions.

- i. A total of 18 Architects were purposively selected for the study. Their selection was based on the following criteria:
- ii. The architects selected must be registered with ARCON
- iii. The architects selected must be domiciled in Minna
- iv. The architects selected must be balanced in numbers to reflect the grouping stated earlier
- v. A minimum of 5 years post-registration experience was also criteria for selection

The raw qualitative data were analysed through the method of content analyses for the diligent presentation of results.

6. Results

From the results obtained on the first variable, Table one shows two (11%) of the 18 architects interviewed has an excellent understanding of sustainable building materials while one respondent (6%) says not at all (0). In between the result shows eight (44%) and seven (39%) respondents saying to some extents (below average) and a good extent (above average) respectively. This means that 50% of the architects surveyed have from below average to no knowledge of what sustainable materials are all about.

Table 2. Level of awareness, specification and implementation of sustainable building materials.

Sn	Variables	Not At All (0)	To Some Extent Below Average (Below average)	To A Good Extent (Above Average)	To A Very Good Extent (Above Average)	Total Number & PERCENTAGE (%)
1	level of awareness of sustainable building materials	1 (6%)	8 (44%)	7 (39%)	2 (11%)	18 (100%)
2	Level of specification of sustainable building materials in designs in the last ten years	7 (39%)	4 (22%)	7 (39%)	0 (0%)	18 (100%)
3	Level of implementation of the design without change during construction	8 (44%)	4 (22%)	5 (28%)	1 (6%)	18 (100%)

Source: Fieldwork, 2019

On the second variable, table one shows 7 (39%) and 4 (22%) Architects out of 18 architects interviewed have zero and to some extent (below average) respectively as far as specifying sustainable building materials in their design are concerned. On the other hand, 7 (39%) respondents have to a good extent (above average) specified sustainable building materials in their designs in the last 10 years. None of the respondents to a very good extent (excellent) specified sustainable building materials in the last ten years.

For a design to be complete, it must be implemented in strict accordance with specifications laid down by the Architect. Some projects can have certain specifications in design but for several reasons, changes are made in the construction stage. This research tried to look at this phenomenon. Variable 3 in table one shows, eight respondents (44%) said not at all while only one (6%) respondent agreed that the design was implemented without change to the design specifications of sustainable building material. In between four (22%) and five (28%), respondents reported that the level of implementation of sustainable building materials specifications is to some

extent (below average) and a good extent (above average) respectively.

For an individual to understand the benefits of sustainable building materials, one must have an appreciable knowledge of them. This is what convinces Architects and other professionals in the built environment of the need for more use of sustainable Building Materials. From the results shown in variable one table two, (11%) respondents said not at all, nine (50%) said to some extent (below average), four (22%) said to a good extent (above average) and (17%) said to a very good extent (excellent).

Due to continuous research and study more sustainable building materials are being developed. Sustainability is such a fast-developing field that Architects have to continuously update themselves in other to keep up. A close look at variable two in table two shows, six (33%) respondents saying not at all (0), six (33%) respondents saying to some extent (below average), three (17%) respondents saying to a good extent(above average) and the final three (17%) respondents saying to a very good extent (excellent).

Table 3. level of awareness on the benefit and specification of sustainable building materials popularized in the last 3 to 5 years.

Sn	Variables	Not At All (0)	To Some Extent Below Average (Below Average)	To A Good Extent (Above Average)	To A Very Good Extent (Above Average)	Total Number & Percentage (%)
1	Level of awareness of the benefit of sustainable building materials.	2 (11%)	9 (50%)	4 (22%)	3 (17%)	18 (100%)
2	Level of knowledge of sustainable building materials popularized in the last three to five years.	6 (33%)	6 (33%)	3 (17%)	3 (17%)	18 (100%)
3	Level of specification of sustainable building materials popularized in the last 3-5years in design in past 10 years	9 (50%)	4 (22%)	5 (28%)	0 (0%)	18 (100%)

Source: Fieldwork, 2019

Variable 3 in table two tries to look at the extent to which the interviewees worked with the latest sustainable building materials by specifying them in their design. The results show that nine (50%) and four (22%) of the respondents said not at all (0) and to some extent (below average) respectively. The result further showed 5 (28%) and 0 (0%) respondents said to a good extent (above average) and a very good extent (excellent) respectively.

As stated earlier the respondents interviewed were divided

into three groups. The collected data were analysed to reflect these three groups which gave the results more clarity. The results are expressed in tables 3 to 5. Table three shows the data for Architects in academics. The results show that architects in academics fared better than the other two groups as far as the awareness and knowledge of sustainable building materials are concerned. This is not unconnected with the fact that architects in academics carry out regular researches for scholarly publications and conferences.

Table 4. Analysed data for Architects in academics.

Sn	Variables	Not at all (0)	To some extent (below average)	To a good extent (above average)	To a very good extent (excellent)
1	Level of awareness of sustainable building materials	0	0	4	2
2	Level of specifying sustainable building in the last ten years	1	0	5	0
3	Level of implementation of specifications sustainable building materials in design without change	1	0	4	1
4	Level of awareness of the benefits of sustainable building materials	0	1	2	3
5	Level of knowledge of sustainable building materials popularized in the last 3-5 years	0	1	2	3
6	Level of specification of sustainable building materials popularized in the last 3-5years in design in the past ten years	1	1	4	0
	Total	3	3	21	9

Source: Fieldwork, 2019

Table 5. Analysed data for Architects in private practice.

Sn	Variables	Not at all (0)	To some extent (below average)	To a good extent (above average)	To a very good extent (excellent)
1	Level of awareness of sustainable building materials	0	4	2	0
2	Level of specifying sustainable building in the last ten years	0	4	2	0
3	Level of implementation of specifications sustainable building materials in design without change	1	4	1	0
4	Level of awareness of the benefits of sustainable building materials	0	4	2	0
5	Level of knowledge of sustainable building materials popularized in the last 3-5 years	0	5	1	0
6	Level of specification of sustainable building materials popularized in the last 3-5years in design in the past ten years	2	3	1	0
	Total	3	24	9	0

Source: Fieldwork, 2019

The data for table four showed Architects in private practice fared better than architects in civil service as far as the awareness and knowledge of sustainable building materials are concerned. This is a point of concern because these two groups of Architects are major drivers of development in the

built environment. Architects in private practice are in most cases commissioned to produce the design of building while architects in civil service interpret, regulate and enforce government policies, building codes and bye-laws.

Table 6. Analysed data for Architects in civil service.

Sn	Variable	Not at all (0)	To some extent (below average)	To a good extent (above average)	To a very good extent (excellent)
1	Level of awareness of sustainable building materials	1	4	1	0
2	Level of specifying sustainable building in the last ten years	6	0	0	0
3	Level of implementation of specifications sustainable building materials in design without change	6	0	0	0
4	Level of awareness of the benefits of sustainable building materials	2	4	0	0
5	Level of knowledge of sustainable building materials popularized in the last 3-5 years	6	0	0	0
6	Level of specification of sustainable building materials popularized in the last 3-5years in design in the past ten years	6	0	0	0

Total	27	8	1	0
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Source: Fieldwork, 2019

The data for table 6 brings together the totals of all figures for all variables. This table is very important because it sums up the entire work in a nutshell. It also gives better clarity to

the results discussed earlier. Even though more is expected of all the three groups, Architects in academics fared better than the rest while Architects in civil service ranked the least.

Table 7. Total combined data of all three tables.

Sn	Group	Not at all (0) (Total)	To some extent (below average) (Total)	To a good extent (above average) (Total)	To a very good extent (excellent) (Total)
1	Architects in academics	3	3	21	9
2	Architects in private practice	3	24	9	0
3	Architects in government/ civil service	27	8	1	0

Source: Fieldwork, 2019

7. Recommendation

While the importance of sustainability for the future of planet earth cannot be overemphasised, a good number of architects are still lagging behind. The results above clearly revealed that awareness of sustainable building materials among Architects in Minna is inadequate. Though some group fared better than others, as a whole there is an urgent need for better awareness of sustainable building materials.

With the vital role Architects play in the built environment as the lead designers of buildings and specification writers, this makes adequate knowledge of sustainable building materials a must. The quantity of raw materials consumed by the Building industry is reason enough for humanity to rethink how planets resources are extracted and used. As done in many developed countries the force of policy might be required to enforce the culture of sustainability. This can be done by a regular update of the nation's building codes and states building bye-laws. This is because sustainability as a field is in continuous change. Enforcing these updated laws will provide a better incentive for Architects to familiarize themselves with sustainable building materials as lack of such knowledge will make practice more difficult if not impossible in a modern world. This is the way to go for posterity to be appreciative.

8. Conclusion

For planet earth and its inhabitants to have a safe and sustainable future, sustainability is vital. As human population continue to grow, the stress on the environment and its resources are also on the increase, that if nothing is done the results can be catastrophic.

In answering to the rallying call to confront the challenge, the biggest resources guzzling and greenhouse gas emitting activities needs to be targeted. While challenges to our environment is a global problem, some part of the solutions are local, hence the aim to examine the awareness of sustainable building materials in Minna, Nigeria.

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