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## **Chapter 3 Methodology**

### **3.1 Introduction**

Research methodology involves explaining the details steps of how the research carried out to answer the research question or title (Bryman, 2015). The following section explains the details of the methodology included to answer the research title on sustainable development in construction in UK and why such sustainable development is not observed in developing countries such as Nigeria. It includes the research question, aims, objectives, research design, sample, setting, data collection, data analysis, ethical consideration. Finally, this section ends with the conclusion. The writer used the qualitative descriptive study to achieve the proposed aim of the study. The interview guide was developed to achieve the aim of this study.

### **3.2 Research Design**

The research design explains about the overall process of the research (Cormack, 2006). The research design is a set of the planning process to achieve the aim of the study (Kumar, 2014). It is also known as a blueprint for the entire process of the research study (Burns & Grove, 2013). There are two types of research design available in research such as quantitative design and qualitative design. The quantitative research is defined as “a formal, objective, systematic process in which numerical data are utilized to obtain information about the world” (Burns & Grove, 2013). The main priority of this type of research is collecting numerical and statistical data.

On the contrary, in Qualitative approach researcher collect data directly from the participants using an interview guide (Creswell, 2012). The face to face interaction in collecting

data is one of the important characteristics of the qualitative research. It uses the multiple sources of data as field notes, observation, interviewing, etc. In qualitative research, researcher reviews all the data and understands them and organizes them into categories or themes to identify them from the data source (Creswell, 2012).

### **3.2.1 Qualitative Methodology**

The chosen methodology for this study is the qualitative descriptive methodology to discuss the issue of sustainable development in construction in UK. While for researching the sustainable development in developing countries, this research uses the case study methodology and analyses the case of Nigeria.

Qualitative descriptive studies are used to summarise factual information about human experiences with more attention to the feel of data's subjective content than that tends to be found in quantitative description (Melnyk&Overholt, 2015). Qualitative research is helpful to understand human experiences (Burns &Grove, 2013). In spite of using quantitative method to answer the research question, researcher used the qualitative descriptive design which helped to elicit stroke survivor experiences on quality of life and also helpful to communicate the findings of the study using descriptive manner.

However, the sample size was smaller for the qualitative study compared to the quantitative study that required a larger sample. Despite having a smaller sample in qualitative research which allowed the researcher to obtain in-depth details of the sustainable development in construction in UK and sustainable development in Nigeria (Polit& Beck, 2008- p-17).

### **3.3 Case Study Methodology**

In recent years we can see a marked increase in the use of case studies in different fields of social sciences, such as anthropology, psychology, economics, sociology or pedagogy. Increasingly they proliferate more case studies, but in proportion to it, are still few studies dealing with systematize the characteristics, properties and characteristics of this method of research requirements. In fact, there are hardly any books for theorizing about the same, the most quoted and most comprehensive of Yin (2003) and Grandon (2011) work on the international scene, laying the theoretical foundations and practices method. They have also made significant contributions to this method, in terms of methodology, other works produced internationally as Merriam (2008) and Bassey (2010).

All previous research and dissemination of case studies indicate that this is not a new method of investigation. However, it has not lost interest, or effect; on the contrary, social scientists increasingly become case studies. Given the expansion experienced by leading case studies in examination it appears to represent its delimitation, also segregates not generally what it is. Although they share some normal components, here we allude to the case studies as exploration procedure, not as an apparatus of examination or conclusion before lawful mediation, clinical or instructive (Crespo 2005) or as a showing device in the administration of dynamic learning. It is an approach connected to traditional humanism through creators, for example, Spencer, Weber and Merton and has its crest in the Chicago School.

From outline to the presentation of its outcomes, the case technique is firmly identified with the hypothesis. Research cases are particularly significant on the grounds that they permit the investigation of causality and exemplified in a hypothesis. Each great outline fuses a hypothesis which serves as a general foundation of exploration, inquiry information and their understanding. As the case creates, rises a more develop hypothesis, which solidifies (however

not as a matter of course with flawlessness) until the case finishes up. For a few creators, its potential lies in its capacity to produce theoretical premises and guide basic leadership (Yin, 2003). Their actual force lies in its capacity to produce speculations and revelations, to centre its enthusiasm for an individual occasion or organization and in its adaptability and relevance to normal circumstances.

The sign of the case studies is understanding the truth under study. The contextual analysis is the investigation of the disposition and many-sided quality of a specific case, to achieve understanding its movement in vital circumstances. From an interpretative viewpoint, the fundamental target is to comprehend the significance of an affair. The learning of the specific, from the particular, without overlooking its setting, it appears that is available on the goals of the examination taking into account contextual investigations. Scholars, for example, Yin (2003) underscore contextualization of the examination article, to comprehend that a case study is an experimental exploration went for researching a contemporary wonder inside its genuine setting for the outlandish possibility of isolating the study variables of connection. Walker (2003) strengthens this dynamic thought when indicating a contextual analysis is analysing a case in real life. The contextual investigation procedure connected to social research unavoidably alludes to ethnography.

Often it stressed in the distinct and all-encompassing procedure that portrays this methodology, tending to the comprehensive comprehension of a social framework in real life (Feagin et al., 2001). Case Study is an escalated portrayal, all-encompassing and examination of a solitary substance, wonder or social unit. The case studies are particularistic, clear and heuristic and in light of inductive thinking to handle numerous sources Data. The force and research legitimization for a contextual investigation depends on the presumption that the worldwide is

reflected in the local (Hamel et al., 2003), i.e., in the holographic way of reality, depicting any procedure unit life in their different associations with its social scene.

It is an overview of the phenomenon studied what sucks a case study. It is not a particular technique for data but a way to organize. Their contribution to the study of educational phenomena is based on three features:

- Emphasis on long-term observations based more on that in pre-established categories descriptive reports;
- Interest describes the observed behavior within the framework of the surrounding facts;
- One concern about the prospect of the participants about the facts, that is, how they build their social reality

Case study is a method that encompasses a variety of sources and data collection techniques. By this method, collected descriptively different types of qualitative information, which are not reflected in numbers if not in words. The essence of this approach is to highlight key incidents in descriptive terms, using interviews, notes field observations, video recordings, documents. Considering the contributions of different authors and also from the research experience, we can highlight a set of basic features of the case studies, which, taken together, they Unlike other methods of research:

- Perform a contextualized description of the object of study. The main value of a case study is to reveal the relationship between a particular situation and context;
- They are holistic studies. The investigator must try to look at reality with a deep insight and also must try to offer a complete view of the phenomenon under study, reflecting the complexity;

- They reflect the peculiarity and uniqueness of every reality / situation through a dense and accurate description of the phenomenon investigated;
- They are heuristic. The case studies try to enlighten the reader's understanding of social phenomena under study;
- Its approach is not hypothetical. It is observed, conclusions are drawn and reported them;
- Focus on the relationships and interactions and, therefore, require the involvement of the researcher in the course of the case;
- Contemporary phenomena studied analysing an aspect of interest to them, demanding the researcher a prolonged stay in the field;
- Negotiation processes occur between the researcher and participants permanently;
- Case studies incorporate multiple sources of data and their analysis has to be done in a comprehensive and interrelated way;
- The reasoning is inductive. The premises and the expansion of the results to other cases arise mainly fieldwork, requiring a detailed description of the research process followed

### **3.4 Why Use Qualitative Methodology**

Qualitative methodology is utilized to accumulate data about the inspirations, values, and attitudes. Qualitative methodology gives a more profound comprehension of the procedures encourage the distinguishing proof of examples and utilization propensities, make it conceivable to decide the reason for a given response. Qualitative methods are viably connected in situations where it is essential:

- To pick up a profound comprehension of utilization examples Sample's propensities and inclinations;

- To investigate the way toward settling on obtaining choices;
- To survey the level of fulfillment with existing items (Creswell, 2012)

Qualitative Methodology is the imaginative improvement. To this course is the utilization of Qualitative Methodology on the phase of vital advancement of the idea. Qualitative Methodology remembers the human part of the person. It is contended that quantitative information has a tendency to be shallow and overlooks the social connection in which a given conduct happens. In any case, given that mental exploration is what is especially inspired by what happens in a social connection, objectivity appears to hold little esteem in the realm of psychology.

Qualitative Methodology gives data that is rich in complex printed depictions about how individuals encounter a given issue. It gives data about the human side of issue. This can frequently offer ascent to conflicting practices, conclusions, convictions, feelings, and connections of people. Another advantage of qualitative methodology is its capacity to help in distinguishing components that are viewed as impalpable, which can incorporate gender roles, religion, ethnicity, financial status, and social standards. At the point when utilized with quantitative examination, it can translate and advance comprehend the perplexing reality of a given circumstance.

### **3.5 Why Use Case Study Methodology**

Cebreiro&Fernández (2004) say that one ought to build up a case study when the item to be examine is diffuse, it is mind boggling, slippery and disputable. That is, to examine those issues or circumstances including various variables and which are firmly connected the setting in which they create. Cases are especially legitimate when displayed questions like "how" and

"why" when the specialist has little control over occasions as the issue to be contemplated is growing. Moreover, the choice of a case study can be based on three reasons:

- The critical nature, that is, to the extent that the case can confirm, change, modify or extend the knowledge about the object of study;
- Its extreme character or uniqueness, as part of a situation that has a specific and unique character. A case study when one has a special interest in itself;
- Finally, the revealing nature of the case allows to observe and analyse a phenomenon particular fact or relatively unknown in educational research and on which contributions can be made highly relevant.

The success of the case studies is closely related to compliance with certain requirements or conditions as the interest and involvement of research subjects in the study to be performed, good relations between researchers and research subjects, the likelihood of innovation or transform the initial situation with the investigation or the undoubted advantage of having supports (advisers) in educational change processes.

### **3.6 Sampling**

Sampling is the way toward selecting a segment of the populace to speak to the whole populace so that inductions about the populace can be made. The purposive sampling method is implied for this research study. In this method, the researcher selects the informants who are able to provide more information about the research question (Melnyk&Overholt, 2015).

This is one of the non-probability sampling methods known as judgmental sampling. In this type of sampling, the researcher selects the potential participants who provide detailed information for the purposes of the research study (Kumar, 2014; Polit& Beck, 2008,). As per Creswell, (2012) purposive sampling method is a suitable method in qualitative research.

### **3.7 Sampling recruitment process**

The researcher initially approved permission and informed the nature of the study to the participants. The researcher explained the study procedure to all participants and also clarified the doubt that was not clear to them. The information leaflet was provided to all patients. The investigator also obtained the written consent from all the participants. The researcher makes sure all participants are aware that they had a right to withdraw from the study without the further consequences.

#### **3.7.1 Inclusion criteria**

The researcher identified to include the following inclusion criteria in this study:

- Individuals are related to the construction industry;
- Participants must have some knowledge and awareness regarding sustainable development in construction because the nature of the study is to get the information about sustainable development in construction in UK;
- Able to communicate in English

#### **3.7.2 Exclusion Criteria**

- Individuals who do have general knowledge about sustainable development but had no idea about sustainable development in construction in UK because it affects their ability to participate in the focus interview to share their experience and knowledge;
- Excluded the people who are not able to communicate in English because they would not be able to verbalize their experience in focus group interview

### **3. 8 Data Collection Instrument**

There were two steps used in the data collection process. Firstly, the researcher used a non-validated questionnaire to obtain the socio-demographic details of the study participants. Prior to the interview, the researcher explained the purpose of the focus group interview to the participants. The main purpose of the focus group interview in this study is to identify the knowledge and awareness regarding sustainable construction in UK.

Focus Group is defined as any group discussion where the researcher is actively encouraging and attentive to group interaction (Barbour, 2011). Focus group methodology is helpful to elicit the subjective experiences. Therefore, researcher informed all the participants to discuss this with the groups. Then, the researcher used the interview guide as guidelines to lead the focus group interview.

The interview guidelines gave a direction to ask a question to elicit open-ended discussion among the group member. In addition researcher used a prompting to yield more information from the participants on the chosen topic. The open-ended questions used in the focus group interview allow ample opportunity to share their experience with the group of people (Krueger & Casey, 2009).

Qualitative research will be a flexible approach rather than having a rigid routine in the quantitative study. During the data collection process, all the information collected from the focus group interviews was recorded with the permission of the participants. The following interview guide was used in this research.

### **3.9 Data collection and analysis process**

Data collection is a step to gather important information to answer research questions (Creswell, 2012). Qualitative research involves four phases such as planning, observation, analysis and reporting (SAGE, 2013). The selected method for data collection in this study is based on focus group interview. The focus group methods are useful to explore the phenomenon being studied using open-ended questions, and also having an open discussion between the group member and researcher (Kumar, 2014). It also helps to get more information through the processes of discussion and interaction (Melnyk&Overholt, 2015).

In addition to this, these types of interview yields more information compared to one-one interview method and also need to encourage all participants to share their experience (Creswell, 2012). One of the disadvantages of the focus groups is that it is difficult to obtain information in relation to the sensitive phenomena.

The researcher will be vigilant and supportive during the course of the interview. In addition to this, debriefing the process of the interview at the end of the interview allowed the participants to ease and comfort. The data collection in the qualitative study involves active and interactive steps that are performed with the combination of the interview method, observation, fieldwork, and diary. In field work, the researcher visits the sites to identify the suitability to

conduct the research study on the particular site. Interview method is group interview where the questions is asked in a group where participants share their view about the phenomenon being studied. During the interview, a researcher might maintain a note of the interview. During the interview, the researcher observes the site and also gives an option to observe the non-verbal cues that help the study investigator to aware about how participants feel about the interview.

In qualitative research data collection and analysis occurs concurrently in the field (Polit&Beck, 2012). The qualitative researcher is interested to do the fieldwork. The data collection was performed by the combination of the observing, field work, diary, interview method. Qualitative research is active and interactive process (Polit& Beck, 2012). In data analysis, researcher must familiarise the data through reading and rereading the transcribed data, audio recording, observation, field note until the researcher has a complete understanding of the information gathered from the participants (Burn & Groves, 2013).

In the next phase, the researcher identified the themes and attached a code. The codes are symbols that are used to label the words or phrases in data. As per Polit& Beck (2012) qualitative content analysis is a suitable method for the Qualitative descriptive study. This research study is descriptive study, so grounded theory approach was not a suitable method for analysis. Robison et al (2009) used computerized software package to analyse the data. The researcher used the content analysis for this study because it is a suitable method for the qualitative descriptive study (Polit and Beck, 2012). The process of discussion and observation are loosely structured will allow the people to express their feelings and beliefs. All the data will be clustered together to identify the themes.

### **3.10 Validity and Reliability**

In qualitative analysis data collection and data analysis occur concurrently in the field. The qualitative researcher will take essential steps to maintain the trustworthiness of the data. The main features of this are that the findings are reflected in the viewpoint of the participants rather than the researcher. The researcher may go back to the field and share the findings with the participants will be helpful for the thematic analysis. Reliability and validity of the research depends upon how data was interpreted to elicit the meaning (Norwood & Leslie, 2010).

There are four criteria to maintain the trustworthiness of the data which is useful to maintain rigour in qualitative research. It includes dependability, credibility, confirmability and transferability (Gallagher, 2011). Confirmability is described about the consistency or repeatability while making decisions on the meaning of the data (Norwood & Leslie, 2010). The credibility of data is achieved by checking the accuracy of the transcription, confirm the themes with the supervisor, share the finding with the participants will helpful to access the quality of the data (Burns & Groves, 2013).

Audit trial helped to prove the quality of data. There are two types of reliability available in qualitative research inter rater and intrarater reliability. The researcher is planning to use the intra-rater reliability method for this research study (Norwood & Leslie, 2010). Therefore, researcher verifies the interpretation about the data after keeping them for a while in separate form. There are no definite steps to explain about the reliability and validity for qualitative research (Parahoo, 2014). These steps are called as accuracy; truth and credibility, there were number of steps used to prove the validity of the qualitative research such as reflexivity and validation of the findings by the participants (Parahoo, 2014). In reflexivity,

researcher makes own assumption about the research. For the validation, researcher might speak with some participants about the findings of the study and also discuss the findings with the supervisor (Parahoo, 2014).

### **3.11 Ethical issues and considerations**

The researcher has a responsibility to adhere all the ethical principles while conducting the research (Polit& Beck, 2012). In order to adhere to the ethical principles, the researcher has got approval from the ethics committee and the stroke support groups. The following ethical principles must be adhered while conducting the research study such as respect for human dignity and autonomy, beneficence, non-maleficence and justice.

#### **3.11.1 Principles of Respect for Human Dignity and Autonomy**

The individuals are known as autonomous beings, so they have a right to take to take decisions to participate in the research study (Polit&Beck, 2012). Prior to obtain consent, information is provided to the potential participants about the purpose and nature of the study (Kumar, 2014; Silverman, 2010). In addition to this, all participants must be aware that they have to take the voluntary decision to take part in the study. All potential participants will be given the information regarding the nature of the study, confidentiality, information concerning voluntary participation (Kumar, 2014). All the potential participants were instructed to read the information leaflet before making the decision to take part in the study.

The researcher replaced the personal identifier using numerical codes to protect the anonymity and confidentiality of the information gathered from the individual (Creswell, 2012). Furthermore, the contact detail of the researcher was provided to them to get in touch in case the

participants need more detail about the study. Confidentiality of all the records will be stored using the codes, so no way to identify the patient identifying information on the recorded, transcript (Silverman, 2010).

### **3. 11.2 Principles of Beneficence and Non- Maleficence**

Beneficence means minimising the harm and to maximise the benefits (Polit&Beck 2012). There is no significant benefit for the participants but this study hopes to increase the knowledge among construction professionals about sustainable development and regarding the situation in developing countries.

### **3.11.3 Principles of Justice**

The ethical principles must be adhered to protect the rights of the individual in the study. The individual had a right to receive fair treatment that would not be affected by not taking part of the study. All information concerned with the study participants were kept confidential using codes. The individual privacy must be respected, so the patients personal identifiers were not are revealed to show the identity of the person.

### **3.11.4 Person Bias**

Numerous moral issues saturate the work of qualitative researcher. Nevertheless, numerous circumstances are not tended to from a moral point of view but rather they come to be viewed as practical, methodological or basic techniques to embrace fundamental measures inside the exploration procedure. Subsequently the significance of analyst reflexivity is determined to recognize moral decisions to be faced and the results that infer their choices and activities.

### **3.12 Research Limitations**

Like some other exploration, this study has a few restrictions. Initially, the most noteworthy impediment to the rest level of the sample was decided for accommodation which does not permit us to sum up results. Moreover, the aim remains an irregular variable that permits us to acquire appraises pretty much right reality. There may be different other variables that have not been discussed in this present examination.

### **3.13 Summary**

This study must follow the above mentioned ethical principles in order to ensure all participants rights were protected during the course of the study. The section mentioned above described in details the research methodology that includes research design, sampling, inclusion and exclusion criteria, ethical consideration, data collection, and analysis.

## Chapter 4 Results and Analysis

### 4.1 Case Study: Sustainable Construction in UK

The UK experience in the development of indicators of sustainable development begins in 1994, when the government published the first Sustainable Development Strategy, which recognizes the need for indicators to monitor progress. This led to the formation of an interdepartmental working group that worked with 300 indicators, which were published in 1996 in the "Indicators of Sustainable Development for the United Kingdom" report edited by Environment Statistics Division Indicators (ESI), the Department for Environment, Food and Rural Affairs(Waddell, 2008).

In 1999, the UK government published "A Better Quality of Life: a strategy for Sustainable Development in the United Kingdom" which included among its objectives that social progress should recognize the needs of all, that environmental protection must be effective, that natural resources should be used wisely, and economic maintenance and high and stable employment growth was also a target. As part of the strategy, the government undertook to submit a report annually, with progress achieved to date(Waddell, 2008). Of the 300 indicators originally intended to be part of the English system, a more manageable number of 147, organized into 21 families, was selected by applying the criterion of its relevance to public policy, both in terms of themes and objectives. For each family issue, objectives were identified and from which the IDS could be used to monitor progress towards the target(Waddell, 2008).

Since then, the measurement of progress has been based on this set of indicators, which have been refined and reformulating, in reports published annually. The publication and update indicators has been in charge of the Unit for Sustainable Development currently operates within

the Ministry of Environment, Food and Rural Affairs. In addition, between 2000 and 2004 published annually reports called "Achieving a better quality of life: review of progress towards sustainable development"(Waddell, 2008). These reports consist of large documents that include the analysis of 15 headline indicators, and also cover various matters related to the Sustainable Development. The indicators are organized under the three classic dimensions of Sustainable Development (economic, environmental and social indicators) and include a results synthesis system using traffic light colours, which allows to quickly illustrate the progress made between two points in time. This system has result useful to present effectively the progress in this field, and has been subsequently adopted for many other countries(Waddell, 2008).

In parallel, they have been also developing regional reports, not necessarily the headline indicators report, but they work with the wide range of indicators selected in 1999, trying to account for the specific problems affecting each locality.

In 2004, the list of indicators is updated upon publication "Quality of life counts: update on UK Governments` 1999 strategy core indicators of sustainable development". The total list increases 190 indicators, maintaining a subgroup of 15 environmental and sustainable development indicators. Since 2004, the annual report takes fresh air, reformulated as a publication shorter and graphically attractive under the title: Sustainable development indicators in your pocket"(Waddell, 2008). These reports provide an easily manageable set of indicators covering a number of Key subjects for sustainable development. Its intention is to expand its dissemination. This includes not only the 15 headline indicators, but a selection of leading indicators, which are classified into 3 areas, also including context indicators(Waddell, 2008):

- A sustainable economy;

- Building Sustainable Communities;
- Managing the Environment and natural resources

In 2005 The UK Government publishes its new sustainable development strategy "Securing the Future - UK Government strategy for sustainable development", which reformulates the previously defined set of indicators. The strategy contains a new vision based integrated strategy 1999, with stronger international and social dimensions and four principles, focusing more explicitly on environmental limits. The Key Priorities are(Ding, 2008):

- Sustainable consumption and production;
- Climate change and energy;
- Protection of natural resources and environmental improvement;
- Creating sustainable communities and a fairer world

The new strategy also presents a new series of indicators, more focused on results, consisting of a group of 68 indicators to measure progress towards, 20 of them holders, and 48 additional indicators. These indicators were published in the "Sustainable development indicators in your pocket 2006"(Ding, 2008):. This time the indicators are organized under 15 subject areas (reformulating old based on 6 themes) structure, and each of the indicators framed within the four priorities of the strategy, or responds to more than one.

Additionally, there are 16 indicators that deliver further analysis of the relationship between social, economic and environmental. The original indicators 1999 are including a signal system, similar to the lights of a semaphore that signalled progress in the various subject areas and keeps new publications, with some modifications. However, these signals are not related to have reached or not a goal, strategy proposed by them, but comparing current values with those

presented in 1999, taking as baseline values 1999. While signs of progress, appear very useful to show results, sometimes it is difficult to classify certain progress indicator. This happens in cases where there is very little room for change in value of the indicator, or when year on year fluctuations are very pronounced. Although the interpretation depend on each indicator generally is chosen to consider that a 3% fluctuation is a considerable variation(Ding, 2008):. In addition to the individual signals, a summary of progress it is also presented by each family of indicators.

Future challenges in the UK aimed at developing indicators that have been pending in the new proposal. Some of the priorities are (Waddell, 2008):

- Develop indicators to measure environmental equity and social justice;
- Move forward in identifying indicators of well-being and quality of life, which could include the prevalence of mental illness, access to sports and culture, green spaces or quality of neighbourhoods;
- Develop indicators to estimate indirect Carbon dioxide emissions, including those issued in production processes and in transport;
- Investigating the possibility of generating indicators to measure the product impact of education in Sustainable Development;
- Analyse the possibility of including reliable aggregate indicators, examining particularly the possibility of incorporating ecological footprint index.

In Scotland they have developed their own set of indicators to monitor progress. Their first initiative was published in 2002, "Meeting the Needs: Priorities, Actions and Targets for Sustainable Development in Scotland" which includes a set of 24 indicators that consider the priorities of the nation in terms of sustainable development. Later this first set has been revised

indicators being published its latest version 2005. "Do a little, change a lot: Indicators of Sustainable Development for Scotland: Progress Report 2005". This report includes 24 indicators which have been revised in order to be compatible with the global strategy measuring the progress made by the United Kingdom.

The Welsh Assembly has also developed indicators as part of its strategy "Learning to live differently. Sustainable Development Scheme for Wales". This year has environmental and sustainable development indicators: progress and prospects for Latin America and the Caribbean published its first report includes 12 headline indicators defined above in Strategy. "Sustainable Development Indicators for Wales, 2006"(Ding, 2008):. Northern Ireland is in the process of developing its set of indicators.

The Department of Business, Enterprise and Regulatory Reform (BERR) in the UK has presented an initiative with industry in order to develop a strategy for sustainable construction in the future. The report of the initiative, entitled Strategy for Sustainable Construction which is part of the Action Plan for Sustainable Procurement 2007 the Government of the United Kingdom and in it the objectives of the alliance are exposed.

In the UK, the construction sector is a significant element of the global economy, with a turnover exceeding 100 000 million pounds, representing 8% of gross domestic product (GDP), business and hiring of approximately three million workers. In this economic activity, the public sector is an important customer, and public procurement represents more than one third of the total construction projects(Ding, 2008):. Because of its extensive work in the public and private sectors, the construction sector is not only vital to ensure the health of the country's economy, but is also a factor that strongly influences the definition of sustainability and the environment of

the country. To achieve its environmental objectives, the Government of the United Kingdom was first to see the construction sector a change was needed, and then had to run a strategic reform of the functioning of this sector, in order to improve both environmental standards as national sustainability.

The development of the strategy led to a series of phases whose coordination was given by BERR(Ding, 2008):. To facilitate an active dialogue with the sector, the initiative was developed in collaboration with the National Strategic Forum for Construction. Since the construction sector affects various government spheres, the strategic report of the initiative was the collaboration of a number of departments, including the Department of Communities and Local Government (CLG), the Department of Environment, Food and Rural Affairs (DEFRA), the Department of Innovation, Universities and Skills (IUDs), the Office of Government Commerce (OGC) and the Department of Culture, Media and Sport (DCMS).

During the drafting process it was consulted regularly with the Strategic Forum for Construction, whose contribution to the strategy was also taken into consideration. The draft strategy was presented to public consultation.

#### **4.1.1 Clarity of current policies and future**

The main objective of the strategy is to provide clarity existing policy framework and, in turn, signal the future direction of government policy. The purpose is to achieve its goals of sustainable construction through: a clearer explanation for businesses about the government's position by meeting various regulations and initiatives related to sustainability (Pitt et al., 2009); setting stricter targets aimed at achieving sustainability in specific areas, and commitment to

them; and the acquisition of specific commitments by industry and Government for the progress of sustainable construction agenda.

The strategy sets a number of target areas, to which called "means" and a set of areas where you want to improve it calls the "ends". The strategy will address the following areas: procurement, design, innovation, investment in people and better sectoral regulation, and go hand in hand with a concerted effort to stimulate development in the following areas(Pitt et al., 2009): climate change mitigation, adaptation to climate change, water use, biodiversity, waste management and rational use of materials from an environmental point of view.

#### **4.2 Results of Sustainable Construction in Nigeria**

In this part, results of the interviews taken from the participants related to the construction business in Nigeria are presented. These results show the situation of sustainable construction in Nigeria and what are the benefits of sustainable construction and what are the problems and hurdles in adopting the sustainable construction in Nigeria and other developing countries.

Participants were asked about the importance of sustainable construction, especially in case of developing countries such as Nigeria. Majority of the participants believed that countries such as Nigeria suffer from serious problems of poverty, gaps in education and health structures, dependency on the Western countries, health problems, access to water or ecological disasters which are challenges to overcome to get out of the spiral of impoverishment. In recent years, international bodies are mobilizing actively to fight against these problems and help countries to development to cope. "Millennium Development Goals" set by the UN to improve the situation provide in particular the eradication of extreme poverty and hunger, reducing by 50% the number of people without access to safe water, improved living conditions of 100 million slum

dwellers and higher rates schooling. In this context, sustainable construction is a response to the imperatives of development. For the development goals involve building hospitals, transport infrastructure and tourism, housing, etc. which will have dramatic impacts on the environment (increased emissions CO<sub>2</sub>, water consumption, deforestation, etc.) if more respectful construction techniques are not adopted. In addition, the methods currently used in Nigeria are particularly obsolete which is not accompanied by significant improvements of existing infrastructure would have serious impact on the overall development of Nigeria.

When participants were asked does sustainable construction help to achieve the goals of development and sustainability, they unanimously said that we must find a balance that allows to meet all development needs taking into account environmental considerations, on the scale of a country as that of the planet; because with the acceleration of economic development economic and demographic pressure, certain issues are likely to worsen if the environmental aspects are neglected.

When the participants were asked the major problems, Nigeria is facing in the course of development, they gave mixed answers. Some of the participants said that the rapid urbanization of the country is the root cause of many problems. They are of the opinion that wealth is poorly distributed and the poor do not have the means to access the minimum service and rich populations are too small to bear the cost of widespread use of these services. The already indebted governments cannot provide basic services to the most disadvantaged populations and living conditions of the population of the urban poor are dire. Food security is also likely to worsen due to the demographic pressure and land desertification. According to some participants the technologies used in developing countries are usually at the level of international standards: they are technologies of the older generation, highly polluting, waste generators, particularly

energy intensive and resources. Some of them think that economic development of the country is still very dependent on natural resources (export of raw materials and manufactured imports) resulting major environmental problems such as deforestation, desertification, etc. However, they all agreed that there is no alternative for sustainable construction which is essential to meet challenges of Nigeria.

When participants were asked how to create market for sustainable construction in Nigeria, they provided three possible levers to create a market in Nigeria for development, whatever the subject, and sustainable construction is not an exception. These three levers are:

- The first is related to the expectations of civil society with regard to the consideration of these issues by government and industry players. The problem is that the building has no negative impacts affecting directly and visibly to the survival of the population: it is not now a priority issue for the country;
- The second possible leverage is a regulatory framework that would impose new requirements for environmental performance. Only the priority issues by Governments include promoting today access to minimum services for all and reducing environmental impacts of construction is not yet incorporated into the current political agenda;
- Finally, there is the individual commitment of local actors; but again local businesses are not sufficiently aware of these questions. Today, only the local branches of large groups already engaged with sustainable development strategies are members of antennas of the World Business Council for Sustainable Development in Nigeria.

All this is changing, but slowly and the construction market is still very emerging and very marginal.

In response to the question regarding the barriers to adopt sustainable construction in the country, they again describe different problems. According to some participants, the recurrent financial instability in the country does not lead to an investment approach over the long term. Nigeria is heavily indebted and its monetary fluctuations are very unfavourable. Moreover, the country suffers from a lack of new generation capacity technologies and is forced to import to industrialized countries. But these equipment is expensive and monetary uncertainties related to fluctuations decrease the value of money is an additional barrier to the supply of technology assets. On the other hand, some respondents said that the lack of economic resources leads to decisions taken daily, which do not promote management with an overall cost and long term integrated approach: most actors in these countries do not have able to afford the initial overinvestment linked to sustainable construction. A second brake category is related to the lack of investment in cities and poor maintenance. Nigeria knows that rapid urbanization is not followed by sufficient investment to meet the needs of poor people living in cities. Furthermore, resources do not allow for proper maintenance of equipment and Governments invest to maintain the safety of urban areas. There are also the berries related to lack of training and access to new technologies. Nigeria does not have enough qualified people to implement techniques to reduce the environmental impact of buildings, and do not have any access to technology tools adapted to new building practices. Some respondents are of the opinion that currently, architecture schools do not form new construction solutions: training is still very traditional and marked by methods used in colonial times. Most of the actors are small businesses that do not have the means to anticipate and simply, to survive, to meet expectations of their prescribers, which does not promote staff training and the acquisition of new skills. We must realize that the industry is barely able to meet routine request. One respondent said that we should also mention the barriers

related to access to communication technologies. Lack of access to information and technology prevents Nigeria to actively participate in economic activity. Furthermore the literacy rate is lower as compared to developed countries. One participant is also of the opinion that there are the psychological barriers associated with inequality. The structure of Nigeria is based on the model of a double economy including an elite minority to similar lifestyles as those in rich countries ... and a large majority of the population living in conditions of extreme poverty. Lifestyles of the rich are often perceived as the model to follow, or they do not really show the example. Otherwise, some clean technologies such as solar panels, introduced by humanitarian and mainly used by disadvantaged communities are perceived as technologies for the poor. The majority of uninformed people therefore stop on this assumption without seeing the full usefulness of equipment.

Many of the participants agreed that traditional techniques are not used very well as promoting knowledge and local resources is virtuous in many ways (abatement CO<sub>2</sub> related to the transport of goods, decreased dependence on Western countries, development of local resources and subsidiaries etc.). Discrimination against women is also proving to be an obstacle to integration of equipment that can improve energy efficiency and indoor air quality. Men are still mostly guarantors of family income, they decide the allocation of resources within their households and their choice does not usually arise on the purchase of new equipment for the house that directly benefits women. For example, despite the a large number of homes with access to electricity, households still use charcoal for cooking, exposing women to unacceptable levels of pollution of indoor air. However, the uncertain economic environment and low levels of Urban Capital create a situation which often forces the poorest populations to find themselves solutions that can move in the direction of a more sustainable development. In parallel,

contributes to sustainable construction to meet the needs of the poor - especially through the use of clean technology, consume less and allowing independence of Energy. The use of new technologies also promotes the formation of the local workforce. The use of local materials allows both the reducing environmental impacts related to transport as economic development (revitalization of local subsidiaries resources, job creation, etc.). Attitudes are beginning to change and we see rise of awareness on the importance of the issues and opportunities of sustainable construction both for the environment but also to society and the economic development of countries.

In answer to the question regarding the role of Western countries in promoting sustainable construction practices, participants unanimously said that developed countries companies have an important role to play to improve building standards in Nigeria. According to the participants, these companies can commit to:

- Set an example for Nigeria which is still under the influence of developed countries and seek to replicate the new practices on fashion;
- Changing performance standards - by imposing the same standards to their operations in Nigeria as they must respect in industrialized countries and exporting good practices in local subsidiaries;
- Favour sustainability practices for their business and not neglect the impact on the environment or society for their decisions under the guise of promoting economic development;
- Promoting local employment - an important factor in formation of the population;
- Conduct outreach efforts to encourage the inclusion of social and environmental considerations, taking into account the local specificities;

- Communicate their commitments on the subject: demonstrate exemplary in practices, promote the sharing of experiences, disseminate good practices in magazines and conferences to publicize the subject while linking up with global issues (global warming, water and electricity consumption, etc.).

In the end when participants were asked that what effect do the self-build programs on the country market development, they replied that the impact of self-construction programs varies with the context in wherein they are set up. In general, they are designed to train some people who will be able to meet their community construction needs. In this case, the challenge is mainly to ensure that there is not too many people with this expertise not to disrupt the market supply and request. People thus formed can also sell their services to other communities and some of them create small companies. In general, the residential construction market will not bypasses classic construction companies. The market is highly compartmentalized and self-build programs do not overshadow the development of SMEs and SMIs in Nigeria.

### **4.3 Discussion**

The objective of sustainable housing is to provide improvements in aspects related to emissions of carbon dioxide and water use (Kibert, 2016), but without compromising the structural design or construction quality. From an analysis of the current situation of housing, the need to develop comprehensive construction techniques to ensure the structural safety and sustainable urban development is highlighted. To implement a plan for sustainable housing, initially must overcome several obstacles including, inter alia, to turn to the historical trend in housing construction, promote environmental and quality of life benefits associated with the adoption of techniques construction that are friendly to the environment, establish detailed

specifications for construction of new materials and construction systems, and integrate real estate developers in the country to build on these considerations.

The interest for more prominent measure of moderate lodging has prompted test new strategies for lodging development. Market passage of new materials and items is an alternative to assemble in an unexpected way, for instance, lightweight cement gives warm properties that advance vitality investment funds for the client, suitable acoustic and imperviousness to fire properties and in addition decreasing dead loads on structures (Priemus, 2005). Then again, in spite of the fact that the most usually used to strengthen solid filaments are steel strands, glass, plastic, engineered polymer, normal filaments can be acquired requiring little to no effort utilizing work locally accessible and suitable systems to get it. All inclusive, nations are examining their own particular strands: coconut in Brazil, Egypt and palm in Asia, bamboo in some Latin American nations and the group of the agave in Mexico (Priemus, 2005).

As for the structural safety, performance, low-rise housing has been notoriously poor in developing countries. The absence of appropriate regulations for the design of housing is the main cause of this trend (Gan et al., 2015). Currently, the construction of houses with concrete walls is one of the fully efficient options, that is, satisfies the requirements of earthquake resistant and can be environmentally friendly to the planet. In order to increase and improve the technological supply of affordable housing built with concrete walls, it carried out an extensive program of experimental and analytical research from which recommendations for construction, analysis and seismic design were developed.

#### **4.4 Sustainable Development**

The concept of sustainable development that arises in the document entitled: " Our Common Future ', is perhaps the most widespread and accepted internationally. In that document, sustainable development is defined as ' development that meets present needs without compromising the options for future needs, i.e., not exhaust or waste natural resources and not harm the environment or beings humans.

As is clear from this idea, it is not expected that the assets are not utilized, but rather steady utilize thereof is given. This cognizance is to accommodate monetary advancement with social and ecological needs that shape the welfare of residents (Wheeler &Beatley, 2014;Pearce et al., 2013; Griggset al., 2013). In this sense, supportable homes are ecologically well disposed houses with the planet. Such structures utilize less vitality, create less waste, ecologically are more beneficial for individuals who live and, in this manner, produce huge monetary investment funds.

#### **4.5 Benefits of Sustainable Construction**

The implementation of systems for the construction of sustainable buildings generates an important contribution to the environment and the quality of life of people that they inhabit these buildings. The challenge as a sector and country that are not only buildings, but also the great works of infrastructure, civil construction and VIS projects, which incorporate in their design, construction and operation, environmental and social concepts (Chang et al., 2015). This would be the ultimate expression of Corporate Social Responsibility (CSR).

Research (Siefert et al., 2014) shows that there are lot of unquestionable benefits to developing sustainable construction projects that favour the various involved during the life cycle of a building. Still, an issue that continues to cause controversy is whether it is possible to add financial value to the benefits of developing green buildings, representing a turning point for the community of lenders and real estate investor's data.

#### **4.5.1 Costs of sustainable design and construction**

Research shows that sustainable construction is not necessarily more expensive, especially if from the beginning are integrated into the development process economic strategies, adequate program management and environmental strategies. While there may be an additional cost associated, compared to conventional buildings projects (Coimbra & Almeida, 2013), the surcharge is usually not as high as we tend to think of the industry.

The increase in the percentage of actual construction costs for projects, reflecting a gradual trend towards reducing the additional costs over time. This situation is not too surprising, because the construction industry has been steadily improving its ability to develop green buildings, and supply chains worldwide are also maturing, which translates into lower costs and efficient development in prices of buildings.

As investors and residents understand the importance of environmental and social impacts of sustainable construction, the odds against commercialization of the greenest buildings. Studies worldwide (Coimbra & Almeida, 2013) show that sustainable construction attract more tenants and drive the rental and sale prices. In those markets where such buildings has become more common have begun to emerge so -called "coffee discounts", pointing to buildings with less sustainable features, which eventually leased or sold at a lower price.

Sustainable construction has shown that one can save money by reducing the consumption of electricity and water and operating costs and lower long - term maintenance. Energy savings of these projects usually exceeds any additional costs of design and construction, and investment is recovered in a reasonably short period. To achieve the projected utility, sustainable construction high performance must be backed by a powerful enabling or commissioning, an effective management and ongoing collaboration between owners and residents.

#### **4.5.2 Productivity and Health**

Studies (Coimbra& Almeida, 2013; Berardi, 2013) indicate that the ecological attributes in the design of buildings and indoor environments can improve productivity, health and welfare of workers, which translates into real benefits for businesses. Despite the evidence that exists in relation to their positive impact it has not been prioritized higher quality of indoor environments in terms of design and construction, and remains the leading cause financial reasons. While more studies are needed, it is clear that investing more in indoor environments can generate higher profits thanks to one of the main assets of all enterprises; your employees.

#### **4.5.3 Risk reduction**

The risks in the regulations have become increasingly clear time in many countries and cities around the world and among the most common include mandatory disclosure, building codes and laws banning inefficient buildings.

Extreme weather events and the systematic changes in weather patterns affect the insurability of real estate and cast doubt on the strength of assets. The changing preferences of tenants and risk assessments by investors can be translated into an increased risk of obsolescence for inefficient buildings.

#### **4.5.4 Summary**

In summary we can say that Sustainable construction has following benefits:

- According to information the implementation of sustainable systems generates strong lower benefits on average, 30% energy saving, 35% carbon, 30 to 50% water and 50% to 90% of disposal costs, this without having improved health and productivity of those who inhabit them;

- Reduce operating costs: The operating costs of a building are basically derived electricity, water and gas. These three aspects are significantly reduced by applying sustainable practices, not only reducing the environmental impact, but also the impact of the economy of the occupants and building operators;
- Visual comfort and thermal comfort: People, economy and planet; are the main objectives of sustainable construction. We must remember that sustainability is not only to care for the planet, and to achieve a being in people working on creating pleasant environments, which create a positive environment in society;
- Improved air quality: green buildings care welfare human being by improving indoor air quality by controlling openings to the outside of the building, allowing natural ventilation, restrictions for smoking areas, use of environmentally friendly materials, CO<sub>2</sub> monitoring, among other practices;
- Analysis lifecycles: Caring for the environment means reducing the use of natural resources, it is necessary to analyse the life cycles of resources and materials so that instead they are a chain with a beginning and end, which forces us to use new resources, reuse is promoted and recycling of resources and materials, thus increasing its life;
- Reducing energy use: Reducing energy use is not reduce comfort, however, it is achieved through practices such as energy modelling, design of electrical installations, right choice Luminaire, crystals and mechanical equipment, natural lighting, use of renewable energy, and control of these issues through the commissioning;
- Water saving: There are several ways to reduce water consumption a building, in order to reduce costs and increase quality with an environmental awareness. The choice of

efficient plumbing fixtures, the water reuse and rainwater harvesting are some practices that can be used to achieve this end;

- **Epps Materials:** The choice of construction materials has a major impact on the environment also know choose them, they can contribute to cost reduction and increased welfare occupant. The use of regional materials procurement, content recycled, rapidly renewable, among other features;
- **Reduction of waste:** In both the construction stage and in life useful building, the impact this has on the environment is cared. It reduces the volumes of waste material, sending him to places where it will be recycled or reused;
- **Labour productivity and health:** sustainable design attributes of buildings and indoor environments can improve worker productivity and health and welfare of the occupants, resulting in basic benefits of the companies;
- **Other:** The benefits of sustainable construction are numerous and substantial, that is why we make in the future of construction. Several studies show that the initial additional costs involved in "Green" buildings are more than offset during operation: no lower costs, higher value of the building and their rent, as well as a higher employment rate, resulting in a higher return on investment (In Work).

Sustainable construction becomes an opportunity for entrepreneurs of this discipline, to become visible in the field of green building and is an opportunity to enter the international network for sustainable construction. It is also an element that can increase the competitiveness of the company in the market. A sustainable building project can cost between 10% and 15% more than a traditional construction, but to the extent that the market develop suppliers, materials and trained professionals is reduced cost.

#### **4.6 Social housing and sustainable priority**

The terms of Affordable Housing and Priority Interest Housing refer to those housing units to social classes of lower income, that is, those who earn less than two minimum monthly wages and whose access to credit is reduced. This type of housing or housing solutions as they are called in, often do not take into account the environmental variables for conception, construction and subsequent use or operation, the latter being a critical aspect of face not only to the preservation of natural resources, but also sustainability of economic situation of these households, since a significant percentage of their income goes payment of utilities such as power, water and sewage, which are currently designed in a linear flow.

Considering the problems described above, since 2006 it has been developing in developing countries the concept of Sustainable Social Housing, the adjective of sustainability also applies through Sustainable Priority Interest Housing.

#### **4.7 Trends in urban planning**

The overall industry of construction is in charge of 40% of world power utilization, 30% of hazardous gasses and a high rate of waste (Levy, 2015). The primary patterns in the quest for more sustainable urban arrangements on the planet today the accompanying (Levy, 2015) are:

- The increment in densities of urban advancement for better land use and preservation of green space;
- The reusing of assets, including water, fluid and strong squanders, both natural and inorganic, and materials and construction components;

- Reducing the utilization of traditional vitality from bioclimatic configuration, vitality productivity and utilization of renewable vitality sources;
- Regulations and accreditation for sustainable homes

Toward the end of 2006, it was presented as a deliberate control in the UK "The directions for sustainable housing" since the start of 2008 was built up as directions both in the UK and the United States. The direction depicts six key components of configuration and building that effect sustainability and effectiveness, and ought to be utilized by draftsmen, manufacturers and shoppers as a strategy for backing for the arranging and plan of new homes.

The control doles out to lodging a score in light of their deliberate execution from the accompanying sustainability criteria: discharges of CO<sub>2</sub>, water releases, materials, waste, contamination, wellbeing and great looks, overseeing natural effects building and operation additionally environment. The accreditation of Leadership in Energy and Environmental Design (LEED) advances the worldwide selection of practices improvement of biological and sustainable building through the creation and acknowledgment of guidelines, devices and criteria execution all around comprehended and acknowledged. LEED assessment criteria include: vitality and water utilization effectiveness, the utilization of privately sourced materials and reusing their waste (Levy, 2015).

#### **4.8 New materials for building walls for houses**

The interest for more noteworthy measure of moderate housing has prompted test new strategies for lodging building. Market passage of new materials and items is a choice to construct in an unexpected way. In the created nations, for example, United States and UK, a great part of the building is completed with new materials, not at all like most creating nations,

for example, Nigeria, where the allotment keeps on predominant as the material with expanded interest. Here are a few materials with awesome potential for the building of social housing is portrayed.

#### **4.8.1 Fibre Reinforced Concrete**

The fundamental points of interest of lightweight cement for lodging building are (CEMEX, 2011):

- Efficient warm properties that advance vitality investment funds for the client;
- Suitable acoustic and imperviousness to fire properties;
- Reduces dead loads in structures and along these lines seismic powers are lessened;
- Its high workability favours arrangement operations and dispenses with the utilization of vibrators, along these lines lessening construction costs, diminishes porousness;
- The utilization of lightweight solid exteriors is particularly suggested for uncovered dividers confronting east and west, as this solid has low warm resistance (Madurwar et al, 2015).

Plain concrete has low elasticity and restricted formability to disappointment. Generally, to enhance this rebar conduct or pre-focusing on steel is included. Strengthening steel is constant and is situated at a particular site to enhance the execution of the structure. Rather, the filaments are intermittent and are by and large arbitrarily disseminated in the solid network. Right now, the strands are utilized alongside traditional fortification for auxiliary applications. Because of the adaptability of assembling techniques and legitimate execution bowing, Fibre - Reinforced Concrete Steel (FRCS) can be a practical and flexible for lodging construction material.

The fibres most often used to strengthen cement are steel, glass, plastic, manufactured and polymer filaments. All have their focal points and burdens, for instance, the glass is impeded because of the alkalinity of the solid lattice, steel can consume, and plastics are inelastic etc.

There is another gathering known as regular natural fibres, which have been the subject of different studies for conceivable application in the fortification of cement. The materials fortified with characteristic strands can be acquired requiring little to no effort work utilizing locally accessible and proper for their arrangement strategies. It has made a noteworthy interest in exploration of characteristic strands to give modern application and to examine the sturdiness of cement with these fibres. Internationally nations examine their own filaments: coconut in Brazil, Egypt and Asia palm, bamboo in some Latin American nations, and the group of the agave in creating nations (Juarez et al., 2004).

#### **4.8.2 Performance of homes built with concrete walls**

The fractional or aggregate breakdown of countless amid the normal perils in nations, for example, Nigeria, has again exhibited the nonappearance of proposals and directions of productive configuration for building low-ascent lodging. Lamentably, individuals with constrained monetary assets end up being the most influenced by the event of characteristic calamities. A standout amongst the most proficient for the building of moderate lodging alternatives is the improvement of private lodging buildings with completely solid (establishments, dividers, floor pieces and roofs).

From a seismic configuration in view of execution, it is conceivable to give lodging required elements as indicated by the sort of materials utilized, the geometry of the structure and seismic interest on the components, for instance, considering the inalienable resistance structures

with solid dividers in low-ascent lodging, dividers can be utilized with low solid quality and lessened thickness. Moreover, in zones where seismic requests are not a worry in auxiliary outline, the base fortification shear stipulated in the NTC-C (2004) and ACI-318 (2008) directions, it appears to be inordinate to control splitting askew pressure on the dividers.

The exploratory project to assess the execution of customary fortifying dividers places of the main stage included 39 semi static and element trial of dividers with various viewpoint proportion and divider frameworks with openings (Madurwar et al., 2015). The study variables were gotten from the most every now and again utilized as a part of the act of outlining and building solid homes in creating nations, for example, Nigeria.

From the examination of trial and investigative data it was found that the base measures of support shear, stipulated in the directions for seismic outline of low - rise lodging are traditionalist or exceptionally preservationist, particularly for structures in a few zones of low seismic danger or moderate (Madurwar et al, 2015). Taking into account the above, Madurwar et al(2015) propose suggestions in light of limit and interest for lodging, for instance, in a few zones it was proposed to manage without or lessen the fortification web shear divider in return for use particular prerequisites for volumetric changes and/or support for basic respectability, and also particular parameters for seismic configuration.

Past test considers have shown that the solid strengthened with steel filaments expands the shear quality and distortion limit of auxiliary components. In the exploratory system of step 2 the dynamic conduct of two solid dividers of low - rise restored through a jacketed FRCS (Madurwar et al, 2015). By and large terms, the degree of restored dividers reaction was tasteful, since higher qualities and uprooting like those deliberate in the first dividers were recorded.

From the execution saw in solid bars fortified with strands, Regulation ACI-318 (2008) permits the utilization of steel filaments rather than steel least support for shear shafts, which has expectedly utilizing stirrups steel. ACI-318 permits such substitution, the length of the resistance ostensible compressive solid  $f_c$  is under 40 MPa, the profundity of the shaft is under 60 cm and shear outline is not exactly  $\Phi 0.17 \sqrt{f_c}$  cMPa.

Considering the specific qualities of the solid dividers for low - rise lodging and seismic requests in these structures, the mechanical properties of cement with filaments, particularly its elasticity and formability post-splitting, make reasonable materials for use in the building of solid dividers for lodging. In any case, it doesn't allude to the utilization of fibre - strengthened cement. In this way, in the system of test examination stage specialized and financial practicality evaluated, and the basic execution of strengthened solid dividers in the spirit utilizing just steel filaments. In this stage testing six solid dividers with angle proportion equivalent to one, that were built utilizing fortified cement with various sorts and measurements of steel filaments was performed. As indicated by the decreased thickness of the dividers and particulars, two sorts of fiber steel snare and three unique doses. The principle variables depend on the investigation of trial information, Madurwar et al, (2015) propose least measurements values fibre to supplant traditional shear support in solid dividers to low - rise lodging.

#### **4.9 Assessment of the environmental characteristics**

To take care of the demand for lodging is important to give creative arrangements that upgrade methods and building costs, accordingly offering better quality lodging to definite buyers without influencing solace and value. While the unit expense of the materials utilized as a part of the solid dividers is better than sustainable building customary, monetary funds stone work and are accomplished with the rate of building and utilization of cement with exceptional

qualities. For instance, the utilization of mechanical steel formwork frameworks and welded wire network as fortification to shear in the web guarantees diminished time and cost of lodging. The utilization of lightweight concrete and self-compacting sort additionally advances vitality funds and expands the life of the houses. Also, when the welded wire work and steel customary support steel strands is supplanted, it can diminish the expenses of work (higher rate building) and materials (decrease in thickness of the components).

As indicated, slim solid dividers can accomplish great adjustment to the atmosphere, since the thickness and limit of sun oriented reflection (light outside shading) are the principle components influencing the warm adjust of the construction. With respect to the sorts of dividers, has suggested distinctive sorts of dividers and solid sections that guarantee great thermodynamic productivity for various sorts of climate.

To enhance the aggressiveness of cement in the business sector for sustainable materials, studies were led to research the utilization of new materials and including new building advances. The as of late created techniques for building solid homes produce less CO<sub>2</sub> than some customary strategies for lodging building. Research has uncovered that amid the normal existence of a solid lodging, the commitments of CO<sub>2</sub> are lower than those created by wood - based houses or customary stone work. Despite the fact that the underlying assembling of bond is vitality serious, these divider frameworks incredible exhibitions require less vitality for warming and aerating and cooling every day, for instance, in around five to seven years, the aggregate estimation of CO<sub>2</sub> of abiding average wooden dividers starts to surpass that of a solid lodging. This natural advantage proceeds for whatever length of time that the house is utilized. Moreover, concrete adds to the quality of air inside, as new cement does not bring about spillage, as is basic with numerous other building materials.

Notwithstanding the solid has one of the more extended times of life between structures materials, its value does not end after its unique reason. In most urban regions, the greater part of the solid can be squashed and reused for use as street base and as fill. At times, the solid can be reused to serve as solid total once more. The reusing of materials is totally agreeable to the earth since it diminishes vitality utilization, lessens waste and builds the life of the materials. It is essential that the developers plan to decrease Reusable and reuse building waste. The manufacturers will understand that lose cash when they build the expenses of landfills and begin entirely apply the controls of strong waste transfer. In the event that you demonstration now, developers can likewise start to animate vital for taking care of waste materials market. Right now, these business sectors are frail or essentially do not exist (Walther, 1993). Along these lines, notwithstanding reusing applications demonstrated, exploration ought to keep concentrating on and finding new applications for reused concrete.

#### **4.10 Urbanisation and Infrastructure Problems of Nigeria**

Lagos, Nigeria has two faces, very mixed. On the one hand, "the Lagos megalomaniac" (Bouillon 2014), the economic heart of the largest GDP in Africa, the metropolis of growth where everything is possible, that of the middle class booming, creative energy where a new generation of young entrepreneurs trained abroad intends to contribute to the dynamism and the country's economic boom. In 2013, Lagos had nearly 10,000 millionaires. On the other hand, Lagos and its slums are poorly equipped, built mostly of swamps, bringing together more than 12 million inhabitants. These wetlands represent 78% of the area of Lagos State. Although often inconstructibles, they are very densely populated, counting generally more than 1200 people per hectare. The first priority is the establishment of an effective drainage system, without which no

development is possible. This is made more difficult by the lack of available spaces. Social, political, economic and environmental risks are arising from the uncontrolled expansion of these shantytowns are major and federal, state and local authorities now agree on the urgency to intervene with massive public investment. However, the enormity of the task paralyzing and modalities of intervention in these neighbourhoods still divided.

In 1983, the first business of identifying underprivileged neighbourhoods in Lagos, conducted jointly by the Government of Lagos State and UNDP, has identified 42 districts as 36 urban insecurity indicators, representing the time about one million inhabitants. This method of identification was enriched, and delineation of precarious neighbourhoods review as part of a feasibility study in 1995. The nine neighbourhoods considered the poorest in this approach have subsequently been the subject of Lagos Metropolitan Development and Governance Project, funded by the World Bank. The project, implemented from 2006 to 2013, had particular the objective of improving access to infrastructure (rehabilitation and construction of roads, street lighting, drainage channels) and service in equipment (building of schools, health centers, markets) in these nine districts. Other projects funded by various international donors, or smaller magnitude, were born in the shantytowns of Lagos, as the proposed floating school in Makoko , designed by architect KunleAdeyemi, seen as a resilient architecture prototype replicable in other areas affected by flooding.

The progressive urbanization of what was once a dense forest was done entirely on marshy land, heavily exposed to flooding and not conducive to the construction of roads, infrastructure and even habitat. The poor quality of the soil and instability make the costly and precarious urbanization and rampant construction and unframed made evacuation almost impossible water: only 38% of the population have access their homes during drive the rainy

season. In the low points of the district, part of the street was backfilled with waste to allow foot traffic while permanently blocking the drainage in the drainage network. In this part of the district, many houses, nicknamed "sinking houses" sink over the months.

The entire water drainage channel is actually blocked. Different drainage canals to evacuate water from cities, via the largest drainage channel used in wild landfill. For the expressway will make no "barrier" effect but allows, however, to better connect cities with the rest of the metropolis and thus captures some of these flows, the district must become more attractive, which will necessarily involve better service in infrastructure and equipment. Precarious neighbourhoods restructuring initiatives are subject to a very high demand on the part of the population and local authorities officiating under the aegis of Mayors.

Within the government of Lagos State, the Lagos State Urban Renewal Authority (LASURA), responsible for the restructuring of shantytowns, favours an approach in situ restructuring precarious neighbourhoods that minimize population movements. If this approach is the official doctrine of Lagos State for intervention on informal settlements, for which it has so far no official and comprehensive strategic document, it does not unanimously and is not always applied. Some makers still are promoting radical solutions to address this major problem: a clean slate, revalue the land and move people. But where and how to move 12 million people in a sprawling city that is already takes several hours to cross? Given the very high population density throughout the precarious neighbourhoods of Lagos, it would be impossible to relocate all residents of slums in the near perimeter of their original area. Such operations lead to relocate residents to tens of kilometres.

An urban renewal in situ , speaking on the creation of infrastructure, facilities and public spaces and minimizing population relocations, appears in the eyes of Lagos State as the most suitable solution, and joined in this one advocated by most donors. The goal would be to turn in a progressive and sustainable manner, these urbanized areas in neighbourhoods built with the surrounding urban fabric.

If an approach in situ seems to be the only realistic option, is however feasible? The extent of slums is gigantic, the pace of rapid urban sprawl and the price of high land. Yet the problem is not technical, Nigeria spot a large skilled labour and more and more numerous. It is not so much not financial. Lagos is the subject of huge investment in infrastructure, evidenced by the current implementation of the Badagry Expressway and the Skytrain. The Eko Atlantic project, new futuristic district built directly on the lagoon and destined to become the new financial centre of Nigeria, funded by the private sector amounting to several billion dollars, is located less than seven kilometres from 'Amukoko.

The issue is highly political and institutional. Restructuring shantytowns cannot be done without the involvement and strong portage - political and financial - from the state authorities. Despite their dynamism, communities and local officials fail to coordinate and fund only urban development initiatives of this magnitude. The few major urban projects by the public sector in slums in Lagos have faced so far by institutional difficulties such as the slow pace of procurement, operation "silo" of sectoral agencies, which do not take account the interventions of other, and more generally the dispersion and overlapping responsibilities. The record of implementation is mixed while the evaluations stress the quality of mobilized expertise and technical solutions. The challenge now for the Federal Government and the various ministries and state agencies of Lagos is not only to bring a common discourse on restructuring

shantytowns, but also to reach agreements to reorganize, strengthen and implement the human resources required within their institutions to tackle it.

In sum, the precarious settlements seem to be the only permanent part of the urban landscape changing . The challenge is immense, in Lagos and elsewhere. It seems about to be raised in some cities. One thinks the urban renewal program of the poorest neighbourhoods is often presented as a relative success. It is based on a strong political and financial commitment from the public sector.

Various designs of "development" of a country were set over the decades in the social sciences and several indicators of this offer. None of these designs is unanimous and no one indicator is not without flaws. Despite theoretical difficulties, it remains possible to affirm without controversy as the Nigerian society is in urgent need of sustainable socioeconomic development. So while the majority of so-called "least developed" are African, the largest proportion of these is located in Nigeria.

#### **4.11 Sustainable Construction in Nigeria**

It should be noted that the construction and, more generally, urbanization are at the heart of economic, social and environmental challenges of Nigeria. So it is vital to anticipate infrastructure needs and resources and limit the environmental and social damage associated with the process of urbanization, particularly in view of the long lifetime of urban constructions. Sustainable building is in this perspective and also to provide some answers to the difficulties faced by some countries in the fight against poverty and inequality, access to energy and sustainable energy supply and sober in carbon, natural resource management and adaptation to climate change.

If the development of cities of Nigeria is generally perceived as a source of growth and opportunity, the rapid urbanization of the African continent, coupled with inadequate policies of the city contributed to the strengthening of a number of socio-economic and environmental imbalances . Today, despite a decade of sustained economic growth, half the population continues to live below the poverty line (1.25 USD / day). Inequalities are especially dug in urban areas where fortified enclaves of wealth were built in the middle of disadvantaged neighbourhoods, helping to feed some form of insecurity. The spatial extension and uncontrolled urban areas has also had consequences in terms of land use, mobility and access of the population to basic services (water, energy, sanitation ...).

The poor are often unable to access decent housing. Excluded from traditional financing systems and face high real estate prices, the offer still often too limited. The proliferation of informal settlements and slums thus remains a major problem in Nigeria, home to more than 90% of the population. These homes are often characterized by overcrowding, vulnerable to expropriation, decay, to use land unsuitable for construction, distance from urban centers, social exclusion and lack of access to services basic.

The growth of the informal sector also makes it more complex the implementation of efficient policies and regulations, and may have important consequences in terms of energy consumption. In some cases, the lack of planning in the urban organization can bring an increase by a factor of 10 of the per capita energy consumption of a city. This also helps strengthen people's vulnerability to the effects of climate change (drought, flooding, extreme weather events, rising sea levels in coastal areas etc.), with a greater concentration of people increases the deficit in terms of capacities adaptation that increases.

Nigeria is faced with problems of energy supply as well as an access deficit to electricity for a large part of its population. Nearly 530 million people depend on sources of polluting and inefficient fuels (wood, coal, gas) for cooking, heating and lighting. Energy demand is expected to increase significantly with urbanization and could, for example, be increased fivefold by 2030 and by 2050 twelve countries in the Economic Cooperation of West African States (ECOWAS). The rate of access to electricity in 2030 for the entire continent would not exceed 43% despite increased electricity generation TWh 1000 between 2008 and 2030.

It must be emphasized that Nigerian economy is at present highly dependent on fossil fuels, especially oil (42% of energy consumption in 2011), gas (15%) and coal (13%), but as biomass (29%) and to a lesser extent from hydropower. Despite considerable potential, less than 1% of the energy mix is attributable to renewable energy (excluding hydro and biomass). An increase in demand will have a major impact on greenhouse gas emissions, on the exploitation of certain resources (the demand for wood for biomass in Nigeria could well increase by 150% by 2020 but also on the already high price of energy and, ultimately, the level of energy poverty for a large part of the population.

The development of the sustainable construction market must register in that context, with the implementation of policies to reduce both the needs (energy efficiency) but also to allow the development of sources of cleaner energy. The policies are all the more important that the energy efficiency of construction in Nigeria is generally very low. The standards used in the construction are often inadequate and inspired standards designed for developed countries which are subject to other climatic environments. The intensive use of air conditioning, energy-intensive, is then used to maintain a certain level of comfort, and premature wear of materials or

higher construction costs are also recognized; the mismatch with architectures and approaches to further heat gain.

Sustainable construction should remind everyone countless opportunities for action in Nigeria. Note that the first sustainable construction objective is the implementation measures to mitigate the environmental impact of the building (new or existing), notably through greater energy efficiency and better management resources, while ensuring a high level of comfort for occupants. This can take the form of design strategies called "passive" (bioclimatic architecture) strategy "active" (integration of renewable energy, use of efficient equipment ...) and interventions throughout the life cycle of the building (use of local materials, optimal waste management, etc.).

It would be possible to achieve reductions of 25 to 30% of the energy demand of buildings with reduced or negative costs, and total savings could be up to 90% in new buildings and 75% for the existing infrastructure. Waste could be reduced by 70% and water consumption by 40% compared to 2010. Combined with standard behavioural changes, synergies between active and passive strategies could thus help to stabilize emissions building GHG at their current level by 2050. Among the many other benefits of sustainable construction include: lower construction costs (8-9%) and operating and maintenance costs, improved resilience to climate change, increased created jobs, or more comfort leading to reduced health care costs and increased productivity of occupants (from 1 to 9%).

Integrating renewable energy in building design in Nigeria (photovoltaic panels and solar panels, wind roof, solar air conditioning etc.) may also be one of the answers to the problems already mentioned energy poverty, lack of access to energy, the use of polluting energy sources

or unsustainable exploitation of certain resources (biomass), without resorting to costly infrastructure investments. Promoting the use of traditional materials and design techniques (e.g. Nubian vault), generally better adapted to local conditions, can also be a way to enhance specific skills, including in the informal sector, and provide support local economies.

Involvement of local labour in the work with prior actions for capacity building, drilling and development of wells for watering green spaces, etc. . Construction costs were reduced (little use of cement), like electricity and water bills. CO<sub>2</sub> emissions were reduced by 80%, saving 12 tonnes of CO<sub>2</sub> per year compared to similar houses. The possibilities of duplication of this type of initiative is important in Nigeria, where the clay is widely available and cost, the payback periods are short and the potential for renewable energy is important.

#### **4.11.1 Example of Sustainable Construction**

Nigeria also ecologically minded in terms of urban construction. Rich countries are not the only retrieve materials to construct different objects and houses. In Europe, the ecology sector has become a business like any other. In Nigeria, the village of Yelwa, located in Kaduna State in the north, a first green house was made. Made on the basis of plastic bottles, it is built well-rounded, a popular form in northern Nigeria. Such initiatives still surprise the public and local officials, who travel to see these new buildings. The bottles are filled with sand and placed one beside the other. Mud plays the role of cement.

The housing crisis has become so bad in Nigeria, almost 16 million homes are needed to address the shortage. Most of the construction of traditional houses would be far too expensive, people have adopted the idea put forward by NGOs and two are in the process of building houses in plastic bottles. The original beauty of the house come particularly its outer wall made from

round bottles fund. But for those who are behind this project is not so much the design as the environmental benefits should be put forward. This technique was started nine years ago and developed in India, Latin and Central America, offering good value for money and an environmentally friendly alternative to conventional bricks.

The colourful houses are resistant to bullets, fire retardant and can withstand earthquakes. They also keep a comfortable temperature, produce no carbon, and are powered by solar energy and methane gas from recycled waste. This solution not only reduces the cost to build a house, but it is also beneficial to the environment. It is completely powered by solar panels and methane gas made from human waste and recycled animals.

### **Conclusion**

For housing construction in some cases techniques based on environmental criteria are used exclusively; however, all construction techniques must be comprehensive, that is, both structural and environmental performance of housing should be satisfactory. Therefore, it is recommended that the regulations establish recommendations for the analysis, design, construction and evaluation, along with specifications and test methods to verify the seismic performance, environmental performance (including the effects of moisture and durability), resistance fire and acoustic and insulation of all building systems that are used for the construction of housing properties.

These recommendations are important to provide security, economy and comfort to the end user of the housing and to meet the environmental requirements of construction.

In order to promote the construction of a sustainable and earthquake-resistant house, in this study the technical feasibility for the use of concrete walls was evaluated. From the analysis of the information available it was found that it is possible to provide concrete housing earthquake-resistant features required according to the type of materials used, the geometry of the structure and seismic demand on the walls. Although the unit cost of the materials used in the concrete walls is superior to traditional masonry walls, economic savings and sustainable building are achieved with the speed of construction that provides the use of thin walls easily adaptable to the climate, false works industrial and welded wire mesh, with the use of concrete with special characteristics (lightweight, self-compacting) and the recycling of concrete to form new materials.

We should note that the intensification of the concept of green buildings make our neighbourhoods and cities in greener areas, tend to prioritize economic large - scale initiatives, such as the fight against climate change, energy security , conservation of resources and the creation job, the long - term strength and quality of life. Therefore, housing based thin concrete walls studied here is safe to seismic events, encourages environmental conservation and promotes the reduction of construction costs, operation and maintenance.

## References

- Barbour, R., 2011. *Doing Focus Groups: The SAGE Qualitative Research Kit*. SAGE
- Bassey, M., 2010. *Case study research in educational settings*. Buckingham, Open University Press.
- Berardi, U., 2013. Sustainable Construction: Green Building Design and Delivery. *Intelligent Buildings International*, 5(1), pp.65-66.
- Bryman, A., 2015. *Social Research Methods*. Oxford University Press.
- Burns, Gray and Grove, G., 2013. *The Practice of Research: appraisal, synthesis and generation of Evidence*. Elsevier Saunders Publications, Missouri
- Cebreiro, López, B. and Fernández, Morante, M.C., 2004. Case Studies. In Salvador, F. Mata, J.L., Rodriguez, Dieguez and Bolivar, Botia, A. *Encyclopaedic Dictionary of teaching*. Malaga, Aljibe.
- Chang, Y.H., Huang, P.H., Wu, B.Y. and Chang, S.W., 2015. A study on the color change benefits of sustainable green building materials. *Construction and Building Materials*, 83, pp.1-6.
- Coimbra, J. and Almeida, M., 2013. Achieving Cost Benefits in Sustainable Cooperative Housing. *Buildings*, 3(1), pp.1-17.
- Cormack, 2006. *The Research Process in Nursing*. Blackwell Science, London
- Crespo, R.F., 2005. The Epistemological Status of Managerial Knowledge and the Case Method. ISBEE Second World Congress, *The Ethical Challenges of Globalization*. Proceedings Latin America: 210-218.
- Creswell, 2012. *Qualitative Inquiry and Research Design: Choosing among Five Approaches*. Sage publications, Thousand Oaks: London
- Ding, G.K., 2008. Sustainable construction—The role of environmental assessment tools. *Journal of environmental management*, 86(3), pp.451-464.
- Feagin, J., Orum, A. and Sjoberg, G., 2001. *A case for case study*. Chapel Hill, University of North Carolina Press.
- Gallagher, P., 2011. Becoming normal: A grounded theory study on the emotional process of stroke recovery. *Canadian Journal of Neuroscience Nursing*, 33 (3): 24-32.

- Gan, X., Zuo, J., Ye, K., Skitmore, M. and Xiong, B., 2015. Why sustainable construction? Why not? An owner's perspective. *Habitat International*, 47, pp.61-68.
- Grandon Gill's, T., 2011. *Book Informing with the Case Method*. London, Informing Science Press.
- Griggs, D., Stafford-Smith, M., Gaffney, O., Rockström, J., Öhman, M.C., Shyamsundar, P., Steffen, W., Glaser, G., Kanie, N. and Noble, I., 2013. Policy: Sustainable development goals for people and planet. *Nature*, 495(7441), pp.305-307.
- Hamel, J., Dufour, S. and Fortin, D., 2003. *Case study methods*. California, Sage Publications.
- Kibert, C.J., 2016. *Sustainable construction: green building design and delivery*. John Wiley & Sons.
- Krueger and Casey, 2009. *Focus Groups: A Practical Guide for Applied Research*. SAGE Publications Ltd, United Kingdom
- Kumar R., 2014. *Research Methodology*. SAGE Publications Ltd, London
- Levy, J.M., 2015. *Contemporary urban planning*. Routledge.
- Madurwar, M., Sakhare, V. and Ralegaonkar, R., 2015. Multi Objective Optimization of Mix Proportion for a Sustainable Construction Material. *Procedia Engineering*, 118, pp.276-283.
- Melnik, Bernadette Mazurek and Fineout, Overholt, Ellen, 2015. *Evidence- Based Practice in Nursing & Healthcare: A Guide to Best Practice*. Wolters Kluwer, Philadelphia
- Merriam, S.B., 2008. *Qualitative research and case study applications in education*. San Francisco, Jossey-Bass.
- Norwood and Leslie, Susan, 2010. *Research Essential Foundations for Evidence- Based Practice*. Pearson Education, New Jersey.
- Parahoo, K., 2014. *Nursing Research: Principles, Process and Issues*. Palgrave Macmillan, United Kingdom
- Pearce, D., Barbier, E. and Markandya, A., 2013. *Sustainable development: economics and environment in the Third World*. Routledge.
- Pitt, M., Tucker, M., Riley, M. and Longden, J., 2009. Towards sustainable construction: promotion and best practices. *Construction innovation*, 9(2), pp.201-224.

- Polit and Beck, 2012. *Nursing Research: Generating and Assessing Evidence for Nursing Practice*. Wolters Kluwer Health, Lippincott Williams & Wilkins, Philadelphia
- Priemus, H., 2005. How to make housing sustainable? The Dutch experience. *Environment and Planning B: Planning and Design*, 32(1), pp.5-19.
- Robison J., Wiles R., Ellis-Hill C., McPherson K., Hyndman D. and Ashburn A., 2009. Resuming previously valued activities post-stroke: who or what helps? *Disability & Rehabilitation*, 31 (19), 1555-1566
- SAGE Research Methods, 2013. *Focus Groups as Qualitative Research: Planning and research design for focus groups*
- Sieffert, Y., Huygen, J.M. and Daudon, D., 2014. Sustainable construction with repurposed materials in the context of a civil engineering–architecture collaboration. *Journal of Cleaner Production*, 67, pp.125-138.
- Silverman, D., 2010. *Doing Qualitative Research*. SAGE Publications Ltd, London
- Waddell, H., 2008. Sustainable construction and UK legislation and policy. *Proceedings of the Institution of Civil Engineers-Management, Procurement and Law*, 161(3), pp.127-132.
- Walker, R., 2003. The case studies in education: Ethics, theory and procedure. In Dockrell, W.B. and Hamilton, D. *New Reflections on educational research* (42-82). Madrid, Narcea.
- Wheeler, S.M. and Beatley, T., 2014. *Sustainable Urban Development Reader*. Routledge.
- Yin, R., 2003. *Case Study Research Design and Methods*. London, SAGE.