Assessing the Level of Community Involvement in Post-Disaster Housing Reconstruction and Current Green Design Practices towards Net-Zero Energy Buildings

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Abstract. The post-disaster housing reconstruction (PDHR) is a process discrete from the construction of housing when circumstances are undisturbed because sensitive measures are put in place following disasters occurrence. Most of the time, the successfulness of emergency relief efforts are usually recorded but the same cannot be said of PDHR projects because they often fail to meet sustainability factors. These days, the topic of sustainable building has become a leading concern in the academic, construction industries, and governmental agencies. Sustainability in the building sector has shifted emphasis towards a new concept called net-zero energy buildings (NZEBs). Data collection was done through a self-administration of structured questionnaires to 257 flood victims involved in the reconstruction projects. Findings indicated that community involvement in resource mobilisation and reconstruction process was insignificant due to misplacement of reconstruction priorities. This is capable of determining the failure of the project as beneficiaries’ requirements were not considered, and the construction industry is still unaware of NZEBs. This study is vital as stakeholders beginning with flood victims will have a more resilient housing, the government will be updated with robust strategies to solving resourcing and reconstruction issues, and donors will have value for their money.

1. Introduction
In recent years, the issue of the high level of energy consumption and carbon emission is the basis for the introduction of net-zero energy buildings (NZEBs) concept, and this concept has received great attention by most countries. By having an increasing concern in environmental issues, European Union Parliament are gradually working towards a regulation that encourage the improvement of energy consumption. As well as to reduce the level of carbon emission through the recast of the EU Directive on Energy Performance of Buildings (EPBD) in which all new buildings to be “nearly Zero-Energy” Buildings by 2020 Recast [1].

NZEBs concept according to the study of Satori et. al. [2], is a concept where there is a balance between weighted supply and weighted demand. The aim is to ensure that the sum of all generated energy and all delivered energy is equal in the construction project. Construction projects are depended on substantial improvements on resource management in recent times with diverse techniques, systems and paradigms discovered for various criteria of planning, purchasing, scheduling, optimisation and apportionment of resources. Nevertheless, these findings which are principally concerned with single
and non-single projects in the environment of conventional construction appear to unsatisfactorily withstand the preconditions of post-disaster housing reconstruction projects Chang et. al. [3]. From the angle of disaster situations, post-disaster environments are characterised by more complexity, volatility and dynamism in comparison with normal situations.

Reconstruction resources required for the execution of the development or project are almost difficult to obtain when the comparison is made with the conventional construction projects. Nazara et. al. [4] expressed that in the event of large scale disaster, it is likely to observe that the largest portion of local production facilities and supply systems in production industries are damaged. And the construction market seemingly becomes disordered, disputed and highly unfriendly. In a similar vein, Barenstein [5] reported that large scale reconstruction programmes regularly place great demand on natural resources for building materials, and specifically in resettlement or relocation patterns. It is in light of this observation that several known authors suggested that the combination of the authors’ observation with sensitive elements can truncate the intended purpose of reconstruction after a disaster. Combination with transportation and energy supply disruption Cho et. al. [6], and pre-existing sequential problems of the local industry Singh et. al. [7], could tangibly worsen the intricacy in obtaining building proficiency and materials Jayasuriya et. al. [8]. Therefore manifesting in project failure and maintainability issues such as project abandonment, quality deficiencies, cost overruns and delay in completion date Boen [9], Steinberg [10]. However, these resourcing issues surfacing in the wake of a disaster can be curbed through proactivity.

Recognising housing reconstruction as an essential element of post-disaster recovery initiatives in developing countries, and thus, the need arises to understand what makes it effective and what does not. According to Chang et. al. [3], reconstruction planners and building practitioners are accordingly needed to unceasingly adapt themselves to the emerging resource circumstances after a disaster. Giving adequate attention to key factors or components in resource mobilisation regarding housing reconstruction after a disaster will be an appropriate strive in the right direction as calls for such undertaking have been made in recent times. The acknowledgement of Chang et. al. [3] revealed that regardless of the relationship existing between resource mobilisation and reconstruction performance, insufficient efforts have been made research wise on resourcing interconnected issues after a disaster or even proposal methods to enhance the management of resources for reconstruction projects.

This brings to bear the imperativeness to study the resource mobilisation strategy adopted in post-disaster housing reconstruction projects in relation to community level of involvement with the view of proffering adequate measures to minimize the unpleasant scene faced by flood victims in the study area. Thereby providing strategies to achieve a positive result oriented environment in future disaster recovery interventions.

To make this a reality, following the 2012 flooding in Kogi State-Nigeria, a survey was conducted on the flood affected community in 2018 to identify the level of community involvement in resource mobilisation and reconstruction process in the PDHR projects embarked upon by the Kogi State government in 2013. Although this study draws on the perceptions and experience of the beneficiaries in the housing reconstruction intervention done in the study area (Lokoja, Nigeria).

2. Resource Mobilisation for Post Disaster Housing Reconstruction

Post-disaster housing reconstruction that is not appropriately planned and instigated has the potentials to create more exposures in the disaster-stricken community. This stresses a warning that the importance of resource mobilisation for post-disaster housing reconstruction cannot be overemphasised.

As stated in the introductory section of this study, some possible consequences of inappropriate resource management in reconstruction projects motivated scholars to further elucidate on the prominent roles it plays in the cycle of disaster reconstruction and recovery process.

Several researchers have recognised resource mobilisation as a driving force needed for a successful reconstruction. Manavazhi et. al. [11] emphasised that material suspensions, especially long-lead items, are notable factors responsible for delays in construction and can initiate other relevant matters relating to resources also. Furthermore, it was identified that the unavailability of adequate plants or equipment reduces the proficiency of physical construction Yeo et. al. [12].
In the post-disaster reconstruction conditions, the mobilisation of resources is influenced by certain factors. In the submission of Singh [13], the five factors influencing resource mobilisation in reconstruction are the ranking order of works or tasks, the capacity to pool resources, the prime period of procurement, the prevailing contractual rapport and transportation in and out of the region affected by the disaster. In a related development, Singh et. al. [7] added that the mobilisation of resources is determined by the governance policies and strategies laid down by the decision makers or professionals responsible for the reconstruction.

Furthermore, the integration of renewable energy system into green buildings is crucial in reducing the demand for a non-renewable energy source. Reconciliation of materials with local desires for rebuilding houses is paramount. Barakat [14] and O’Brien et. al. [15] said the consideration of economic and environmental repercussions of several types of materials used for buildings is significant. Several humanitarian organisations including Non-governmental organisations, International non-governmental organisations like International Federation of Red Cross [16] and agencies of the United Nations such as UNISDR [17], UNISDR [18] stressed on the worth of mobilisation of resource in reconstruction projects of post-Indian Ocean tsunami. There exist a range of role facsimiles that proved that practitioners of post-disaster reconstruction gained by engaging pre-emptive resourcing schemes and planning Mitchel [19] and taking cognisance of potentials weaknesses and bottlenecks while sourcing resources Singh et. al. [7]. In spite of this, the added significance of integrating resourcing actions and policies into the post-disaster reconstruction context or field has not been proven, perhaps for three prominent motives:

i. Complications in transforming proficiencies and lessons learnt from disaster-impacted nations into other definite contexts and actions.

ii. Restricted understanding together with the nonexistence of tools in connecting mobilisation of resources with native (community or local) economic, social and environmental context.

iii. Construction professionals fail to see resource mobilisation for post-disaster reconstruction as a fundamental point in disaster recovery but often consider it as procurement obligation.

Considering the salient role of resource mobilisation in housing reconstruction and recovery intervention, this study deems it fit to explore the issues responsible for the unpleasant conditions of the flood victims on the general process of the intervention. This is systematically achieved by following the steps explained under research method of this study.

3. Study Area

Lokoja is the capital of Kogi State since 1991, the town and its suburbs constitute Kogi Local Government Area (LGA). The town and its suburb share a land boundary with 3 LGAs (Ajaokuta, Adavi and Koton-Karfi) respectively. It lies on latitude 7049’ N and longitude 6044’ E at an altitude of 45-125m, on the western bank of the Niger River, close to its confluence with the Benue River. The annual rainfall is about 1150 mm which usually begins in March and reaches its peak from June to September, while the dry season begins at about November Richard et. al. [20]. Being the State capital and LGA headquarter, the majority of residents are civil servants at various levels of government (Federal, State and Local).

4. Research Method

A quantitative approach was adopted for this study. The survey tool used was a structured questionnaire that was designed based on the factors derived from the literature. To adequately improve the questionnaire, both pre-test and pilot study was conducted with 3 consulting experts and 7 professionals in the built environment, and a small sample of the flood victims respectively involved in post-disaster housing reconstruction. It indicates that the respondents understand the questionnaire contents they are given, and there is face validity. The questionnaires were administered by self to the respondents who are the beneficiaries of the housing reconstruction development for field survey. The respondents were asked to rank their level of involvement in resource mobilisation and reconstruction process of the housing reconstruction from their perspective on a five-point Likert scale from 1 to 5, where 1 symbolises ‘very Less’ and 5 represents ‘very high’. Statistical analysis was used to determine the key parameters in resource mobilisation and reconstruction process as it affects the respondents. One sample
The 2nd Global Congress on Construction, Material and Structural Engineering
IOP Conf. Series: Materials Science and Engineering 713 (2020) 012044
doi:10.1088/1757-899X/713/1/012044

A t-test of the mean was conducted using SPSS, based on the sample’s ratings. This was to check if the factors identified within the questionnaire were important in affecting community level of involvement in post-disaster reconstruction situations. By using SPSS descriptive statistics, a ranking of the parameters as perceived by respondents was carried out to identify major factors which significantly affected resource mobilisation of reconstruction projects after the flood as relates to community involvement.

5. Research Findings and Discussion
The questionnaire was administered and retrieved in one week time as in Chacon [21]. The 400 sets of questionnaires were administered to flood victims in the study area. A total number of 301 questionnaires constituting 75% were retrieved from the respondents. Some forty-four (44) questionnaires were discarded due to incomplete response. Therefore, a total of 257 constituting 64% response rate were used in the analyses after removing incomplete cases, and data screening for outliers (table 1).

| Questionnaires      | Number | Percent |
|---------------------|--------|---------|
| Administered        | 400    |         |
| Collected           | 301    | 75%     |
| Screened            | 257    | 64%     |

5.1. To identify the level of community involvement in resource mobilisation.
A mean ranking was conducted to assess the level of community involvement in resource mobilisation in the PDHR, as observed by the respondents in the study area and presented in table 2 below. It was observed that resource mobilisation through public financial assistance with 3.32 mean was ranked 1st as the most commonly used among the mobilisation methods, followed by resource mobilisation through international donors with 3.15 mean which was ranked 2nd. Next was gradual disbursement of bulky sums of reconstruction funding with 3.11 mean and ranked 3rd. The resource mobilisation through monetary donations from the private sector has 2.89 mean and was ranked 4th, while resource mobilisation through households’ funding resources was ranked 5th. The ranking for Management of available reconstruction materials was 6th with a mean of 2.34. However, initiation of construction materials and skills that are suitable for the environment has a mean of 2.25 and ranked 7th. Supervision and coordination of dispersal of reconstruction resources were ranked 8th with a mean of 2.17, then choosing of skilled workers whether they suit local conditions ranked 9th with a mean of 2.11, where the risk assessment involving the gathering of data and the preparation of the loss estimates has 1.94 mean and ranked 10th. The least mobilisation method identified was interaction and decision making between many groups and institution, including households with 1.80 mean and ranked 11th in table 2. This is an indication that community affected were not involved in the resource mobilisation strategy for the housing reconstruction that was meant specifically for them. This result has faulted the recommendations of previous researches. The first decision to be embraced in post-disaster housing reconstruction is to fully comprehend the local context of the affected community (beneficiaries) through proper or effective or holistic needs assessment and surveys to provide correct assistance to satisfy the beneficiaries Lloyd-Jones [22], Khasalamwa [23], Mannakkara et. al. [24]. It is required that the reconstruction and recovery guidelines should then be designed based on local conditions to shape, support and preserve the culture and heritage of the affected people (beneficiaries). Other supporting researches of non-involvement of beneficiaries in housing reconstruction projects after a disaster are eminent. According to Davidson et. al. [25] and Andrew et. al. [26], it is difficult to integrate the community in the preliminaries and management of the PDHR interventions. Similarly, the findings reconcile with previous studies that community engagement in post-disaster reconstruction including...
resources mobilisation was not observed in the initial stages of the British Red Cross Society (BRCS) Maldives post-tsunami recovery program Lawther [27].

Table 2. Level of community involvement in resource mobilisation in PDHR.

| SN | Variables                                                                 | Mean | Std. Deviation | Rank |
|----|---------------------------------------------------------------------------|------|----------------|------|
| 1  | Resource mobilisation through public financial assistance                | 3.32 | 1.454          | 1    |
| 2  | Resource mobilisation through international donors                       | 3.15 | 1.497          | 2    |
| 3  | Gradual disbursement of bulky sums of reconstruction funding            | 3.11 | 1.357          | 3    |
| 4  | Resource mobilisation through monetary donations from the private sector | 2.89 | 1.231          | 4    |
| 5  | Resource mobilisation through households’ personal funding resources     | 2.37 | 1.116          | 5    |
| 6  | Management of available reconstruction materials                         | 2.34 | 1.050          | 6    |
| 7  | Initiation of construction materials and skills that are suitable for the environment | 2.25 | .992           | 7    |
| 8  | Supervision and coordination of dispersal of reconstruction resources    | 2.17 | .829           | 8    |
| 9  | Choosing of skilled workers suits local conditions                       | 2.11 | .865           | 9    |
| 10 | Risk assessment involving the gathering of data and the preparation of the loss estimates | 1.94 | .905           | 10   |
| 11 | Interaction and decision making between many groups and institution including households | 1.80 | .994           | 11   |

5.2. To identify the level of community involvement in the reconstruction process.

A mean ranking was conducted on the general reconstruction process used for the PDHR as observed by the respondents in the study area. With regards to table 3, it was observed that Technology-driven housing reconstruction approaches with a lower mean of 2.40 were ranked 1st as the major reconstruction process used. Followed by Procedures of requiring construction approvals with 2.28 mean and was ranked 2nd. Next was Decisions on whether to repair, replace or abandon affected houses with 2.21 mean and was ranked 3rd. The Compliance to building code with 2.14 mean which was ranked 4th. Whereas, Lead agency establishment of a working environment in which local, national, and international agencies effectively coordinate reconstruction process with 2.12 mean was ranked 5th and the Lead agency coordination of reconstruction policy decisions with 2.08 mean was ranked 6th. It was revealed that Level of gathering information to understand the impact of the flooding on the environment with 2.07 mean ranked 7th and Building consent application with 2.06 mean was ranked 8th. Then Level of gathering information to understand the housing need of individuals ranked 9th with a mean of 1.95 where the Consultation and planning among all stakeholders during the reconstruction process with 1.82 mean was ranked 10th. Furthermore, the Use of community leaders in charge of reconstruction with 1.75 mean was ranked 11th. The least reconstruction process identified was Use of housing owners in charge of reconstruction with 1.72 mean and was ranked 12th in table 3. This clearly shows that priorities were shifted from the most important stakeholders who are the beneficiaries. The result obtained under this section is similar to the previously discussed results above. It shows that community engagement is far low beyond expectation and also showing complete dominance over the approach of reconstruction by the donors who happen to be the State government. The result obtained under here is in line with previous research that the Nigerian government embraced a contractor driven-approach for the construction of new buildings for flood victims due to the need for quick delivery Bilau et. al. [28]. Holding to the fact that, this method side-lined owners or beneficiaries of housing reconstruction projects, thus denying them reasonable and personal inputs into the housing and other infrastructural provisions meant for them and their family members. The result gained supports from previous researches that top-bottom reconstruction approach is completely controlled or operated by the donor agencies where affected families were only donated houses as witnessed in Sri Lankan government specifications in a new location Ratnayake et. al. [29], Andrew et. al. [26]. Though, there are no precisely definite approaches, suggesting that applied methodologies have to be tailored to the particular post-
disaster context is imperative Barakat [14]. However, housing reconstruction is an intricate process and if not approached correctly can weaken State institutions and develop forms of economic and social marginalisation. Richard et. al. [20] recommended that beneficiaries should be involved in Post-disaster housing reconstruction process to enable them to tailor the design and construction of the housing facility to meet their specifications and desires. This opportunity to participate in the housing reconstruction process will ensure satisfaction as well as sustainability of the project. Furthermore, it provides a more complete and structurally integrated solution to PDHR and at the end, produces a more satisfied and empowered homeowner. Thiruppugazh [30] stated that even though the owner-driven model cannot be relied upon in terms of performance in reducing future vulnerability, it is better than the donor-driven model as witnessed in the study area. Abuzayan et. al. [31] promoted the involvement of beneficiaries in the reconstruction efforts so that their needs could be taking into consideration. It is hence not surprising that Vahanvati et. al. [32] advocated the owner-driven model when compared with the donor-driven model. In making a justification for community-driven model, Shafique et. al. [33] established that non-involvement of communities in developing countries contributed to the failure often experienced in post-disaster housing reconstruction and that community participation usually increases the success rate. Based on this, this study joins voice to the established references and call for an all-inclusiveness of the end-users into reconstruction activities as this has to do with their existence and socio-economic, cultural and spiritual livelihoods.

Table 3. Community involvement in reconstruction processes in PDHR.

| SN | Variables                                                                 | Mean | Std. Deviation | Rank |
|----|---------------------------------------------------------------------------|------|----------------|------|
| 1  | Technology-driven housing reconstruction approaches                       | 2.40 | .848           | 1    |
| 2  | Procedures of requiring construction approvals                            | 2.28 | .919           | 2    |
| 3  | Decisions on whether to repair, replace or abandon affected houses       | 2.21 | .786           | 3    |
| 4  | Compliance to building code                                              | 2.14 | 1.141          | 4    |
| 5  | Lead agency establishment of a working environment in which local, national, and international agencies effectively coordinate the reconstruction process | 2.12 | .787           | 5    |
| 6  | Lead agency coordination of reconstruction policy decisions              | 2.08 | .730           | 6    |
| 7  | Level of gathering information to understand the impact of the flooding to the environment | 2.07 | .786           | 7    |
| 8  | Building consent application                                             | 2.06 | .748           | 8    |
| 9  | Level of gathering information to understand the housing needs of individuals | 1.95 | .777           | 9    |
| 10 | Consultation and planning among all stakeholders during reconstruction process | 1.82 | .911           | 10   |
| 11 | Use of community leaders in charge of reconstruction                     | 1.75 | .863           | 11   |
| 12 | Use of housing owners in charge of reconstruction                        | 1.72 | .884           | 12   |

6. Conclusion
Since renewable energy system is crucial towards green healthcare building and there is a lot of benefits that can be gained through these systems, the renewable energy systems should be utilised properly when designing post-disaster housing reconstruction. Therefore, the application of renewable energy technologies to support green building can reduce the dependency on non-renewable energy and thus, a greener environment can be achieved. There was a misplaced of priority in the housing reconstruction process and resource mobilisation strategies adopted in the study area. The results reflected the misappropriation of priorities through non-involvement of the beneficiaries which, on the long run tends to truncate the success of the project. Beneficiaries’ satisfaction which is the prerequisite to the sustainability of post-disaster housing reconstruction, is not in sight as reported in this study. Therefore, this project may be close to failure or can be seen as a colossal failure since the users’ requirements were not adequately taken into consideration as required by the World Bank guidelines for housing reconstruction Jha et. al. [34]; the New Sendai Framework for Disaster Risk Reduction 2015-2030, and the “Build Back Better” principles Mannakkara et. al. [24]. Hence, this study suggests the disaster reconstruction and recovery processes that comply with the guidelines mentioned above. Whose aim is
making the beneficiaries the central focus of the planning, procuring, scheduling, monitoring and allocation of resources mobilisation and reconstruction process. It should be noted that reconstruction is beyond physical housing provision for the affected community but should be seen as an opportunity to incorporate risk reduction measures and increase the resilience of the community to future hazards and climate change effects.

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Acknowledgments
The authors would like to thank Ministry of Education (MOE), Pejabat Pendaftar UTHM, Office of Research, Innovation, Commercialisation and RMC UTHM Grant Research (Code H104:TIER 1 and GPSS H042) and FPTP UTHM. Furthermore, our sincere appreciation for the Department of Building Technology, Kogi State Polytechnic, Lokoja-Nigeria to participate in this project.