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The Management of Post-Disaster Housing Reconstruction Programmes in Developing Countries

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Declaration:
Hereby I declare that this doctoral thesis, my original investigation and achievement, submitted for the doctoral degree at Tallinn University of Technology has not been submitted for doctoral or equivalent academic degree.

Abdulquadri Ade Bilau

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Katastroofijärgne elamute rekonstrueerimise korraldus arengumaades

ABDULQUADRI ADE BILAU

To God and for the benefit of Mankind

...and to Titilola and our beautiful girls - Omolade and Omotola for the great sacrifices

Contents

List of Publications

This thesis is based on the following five (5) articles. The author of the thesis is the first author of all the articles

I Bilau, A. A. & Witt, E. 2016. An Analysis of Issues for the Management of Post-Disaster Housing Reconstruction. International Journal of Strategic Property Management, 20, 265-276.
(journal paper: ETIS Classification 1.1)

II Bilau, A. A., Witt, E., Lill, I. & Bustani, S. A. 2016. Housing Reconstruction following the 2012 Nigerian Floods: Was It Built Back Better? In Prins, M., et al (Eds) Proceedings of the CIB World Building Congress 2016: Volume II May 30 - June 3, 2016, Tampere, 165-176.
(conference paper: ETIS Classification 3.4)

III Bilau, A. A., Witt, E. & Lill, I. 2018. Research methodology for the development of a framework for the management of post-disaster housing reconstruction in developing countries. Procedia Engineering, 212, 598-605.
(conference paper: ETIS classification 3.1)

IV Bilau, A. A., Witt, E. & Lill, I., 2017. Analysis of Measures for Managing Issues in Post-Disaster Housing Reconstruction. Buildings, 2017, 7(2), 29.
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V Bilau, A. A., Witt, E. & Lill, I. 2018. Practice Framework for the Management of Post-Disaster Housing Reconstruction Programmes. Sustainability, 2018, 10(11), 3929.
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Other Articles and Conference Proceeding of Doctoral Studies

VI Bilau, A. A., Witt, E. & Lill, I. 2015. A Framework for Managing Post-disaster Housing Reconstruction. Procedia Economics and Finance, 21, 313-320.
(conference paper: ETIS Classification 3.1)

VII Witt, E., Lill, I., Bilau, A. A., Vorobiova, A. 2016. Disaster Impacts on the Built Environment: A Systems Perspective. In Proceedings of the 6th International Conference on Building Resilience held at Auckland, New Zealand 7th - 9th September 2016 Pp 319-328.
(conference paper: ETIS Classification 3.4)

VIII Bilau, A. A., Witt, E., Malalgoda, C., Lill, I. & Amaratunga, D. 2018. Integrated measures for managing permanent housing reconstruction. Procedia Engineering, 212, 403-410.
(conference paper: ETIS Classification 3.1)

Author's Contribution to the Publications

Contribution to the papers in this thesis are:

I **An Analysis of Issues for the Management of Post-Disaster Housing Reconstruction**
The overall research concept was developed in consultation and discussion with the main supervisor Assoc. Prof. Witt. The article was drafted by the author, improved upon and edited by the co-author.

II **Housing Reconstruction following the 2012 Nigerian Floods: Was It Built Back Better?**
The concept of the study was developed in consultation with all the co-authors. The article was drafted by the author, Assoc. Prof. Witt restructured and edited the draft. The last co-author Dr. Bustani assisted in collecting data for the study.

III **Research methodology for the development of a framework for the managenent of post-disaster housing reconstruction in developing countries**
The main author in consultation and disussion with Assoc. Prof. Witt developed the overall logic and structure of the article. The main author drafted the article and Assoc. Prof. Witt edited the manuscript. Prof. Lill facilitated the research and the publication of this paper.

IV **Analysis of Measures for Managing Issues in Post-Disaster Housing Reconstruction**
Abdulquadri Ade Bilau was the main author, Assoc. Prof. Witt assisted in developing the overall logic and structure of the article, writing some of the text and editing the manuscript. Prof. Lill facilitated the research and the publication of this paper.

V **Practice Framework for the Management of Post-Disaster Housing Reconstruction Programmes**
The following contributions were made by each author: Abdulquadri Ade Bilau - conceptualization, methodology, analysis, writing (original draft preparation). Assoc. Prof. Witt - writing (review and editing), supervision, visualization. Prof. Lill - visualization, supervision, project administration, funding acquisition.

Introduction

Background

A disaster is defined as "a serious disruption of the functioning of a community or a society at any scale due to hazardous events interacting with conditions of exposure, vulnerability and capacity, leading to one or more of the following: human, material, economic and environmental losses and impacts" (UNISDR 2014). With the increasing occurrence of disasters, the enormous damage incurred globally every year (Guha-Sapir et al. 2012, CRED 2018), and the severe consequences for communities, disasters have become a central topic in global development discourse (UNDP 2004). Although disasters in themselves are disruptive events, they occur as a result of the existence of "triggering agents", emerging from either the natural environment or activities of man or both and the existence of vulnerabilities in the presence of these agents exacerbate disasters (McEntire 2000a).

A hazard is a dangerous phenomenon, activity or condition that may lead to injury or fatality, property damage, socio-economic disruption or environmental degradation or damage (UNISDR 2009). Hazards may be categorised as natural (physical) or man-made/human induced (technological). They have been further classified as: geophysical or geological hazards, hydrometeorological hazards, environmental hazards, biological hazards and technological hazards (UNISDR 2017).

Twigg (2004) identifies vulnerability as the human aspect of disaster. Vulnerability is multi-dimensional and arises from factors that may be social (e.g. social cohesion, class, caste), economic (e.g. distribution of wealth, inequality, poverty), physical (e.g. inadequate designs and poor building construction, unregulated development of the built environment), environmental (e.g. climate change, poor management of the environment, indiscriminate use of natural resources), institutional (e.g. weak governance), political (e.g. political tensions). Studies have attributed the rise in global disasters due to the impacts of natural hazards on the built environment to rising vulnerability (Quarantelli 1987, Wisner et al. 2004, Guha-Sapir et al. 2004). For example, the impact of flooding on poorly constructed houses, built on a flood plain may result in the collapse of the building and that may impact the users of the building. In this case, the vulnerability associated with the poor quality and unsafe positioning of the building is key to the consequences for its users. This particular scenario may not only result in economic losses but also in injury and/or loss of life. As seismologists say, "Earthquakes (hazards) don't kill people, collapsed buildings do!"(Jo da Silva as quoted in Reliefweb, June 2013).

Over the last few decades, the number and damage of documented global disasters has been on the rise (see Figure 1 and Figure 2). This is due to the increasing complexity and vulnerability of the built environment and communities' exposure to hazards (Guha-Sapir et al. 2012, CRED 2018). The impacts of natural hazards on the built environment range from physical to social and economic effects and are felt not only by the communities directly affected but also have repercussions for surrounding communities.

The impact of disasters on the built environment is counted in terms of deaths, injuries, displacement of communities and extensive damage and destruction of assets (see Table 1). About 80% of the damage in major disasters relates to housing (Barenstein and Pittet 2007). Housing is often the most valuable social and economic asset (Ahmed and Charlesworth 2014, Ingirige et al. 2010). It is a significant loss component in disasters

and, particularly in developing countries (Schilderman 2004, Lyons 2009, Ahmed 2011, Lindell 2013), its loss results in affected communities becoming susceptible to homelessness and severe humanitarian conditions.

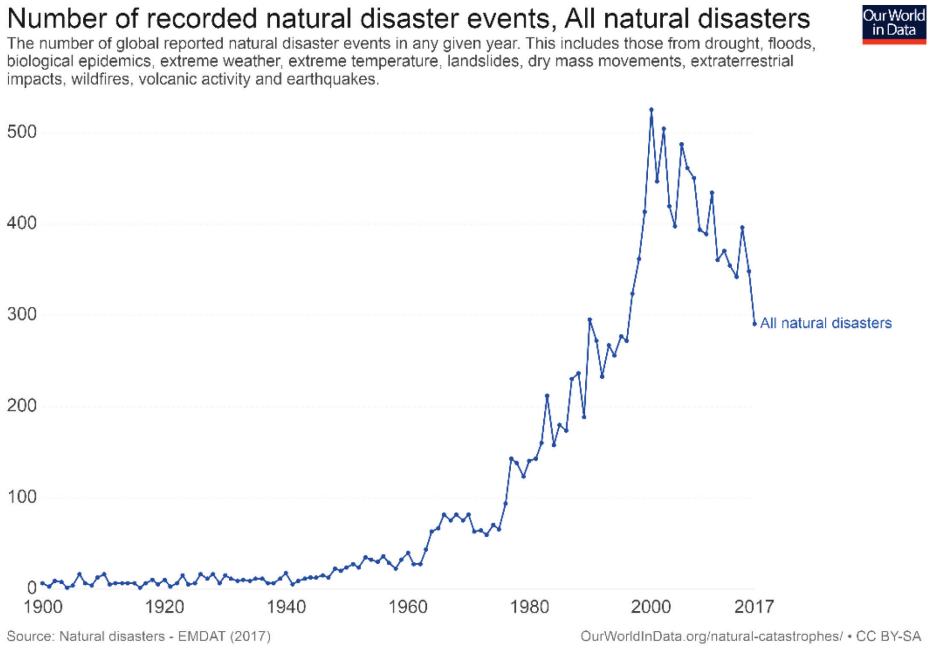

Figure 1. Total number of recorded nature-induced disaster events

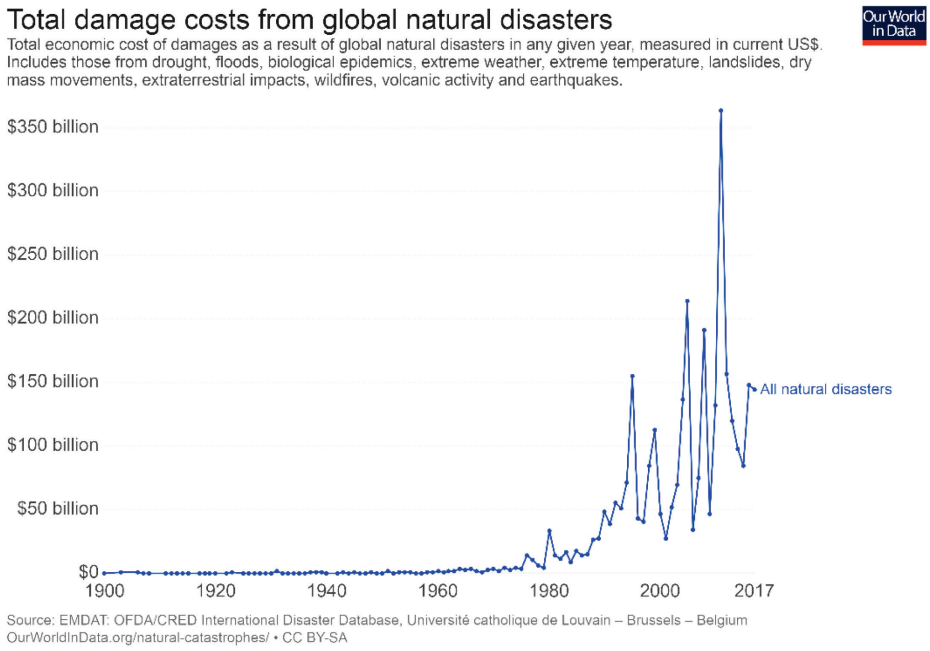

Figure 2. Total damage costs from recorded nature-induced disaster events

Table 1. Some disaster events and their impact statistics from 2000-2015.

Disaster		Fatalities in thousands	Displaced persons in thousands	Injuries in thousands	Housing affected in thousands	Economic loss in million USD (estimate)
Gorkha earthquake, Nepal, 2015		8,9 [1)]	3 500,0 [1)]	22,3 [1)]	900,0 [1)]	19 921,0
Typhoon Haiyan, Philippines, 2013		6,3	4 100,0	Not specified	1 130,0	2 860,0
Tōhoku earthquake and tsunami, Japan, 2011		19,9	Not specified	6,2	1 148,1	210 000,0
Haiti Earthquake, 2010		222,6 [2)]	2 300,0 [2)]	300,6 [2)]	293,4 [2)]	7 800,0 [2)]
Kashmir earthquake, Pakistan, 2005		73,3	3 500,0 [3)]	69,4 [3)]	600,0 [3)]	5 200,0
Hurricane Katrina, 2005		1,8	600,0 [4)]	Not specified	134,0 (New Orleans) [4)]	135 000,0 [4)]
Yogyakarta earthquake, 2006, Indonesia		5,9	Not specified	40,0	578,0	3 100,0
2004 Indian Ocean tsunami	**India**	16,3	650,0	6,9	100,0	2 100,0
	Indonesia	16,4	532,9	Not specified	190,0 (Aceh)[5)]	4 451,6
	Maldives	0,1	13,0	Not specified	Not specified	470,1
	Sri Lanka	35,4	480,0	Not specified	114,1	1 316,5
	Thailand	8,3	Not specified	8,5	4,8	405,2
Bam earthquake, Iran, 2003		26,8	45,0 -75,0	30,0	40,0 (rural & urban areas)	500,0
Gujarat earthquake, India, 2001		20,0	1 790,0	166,8	1 400,0	2 623,0
Marmara earthquake, Turkey, 1999		17,1	1 000,0	44,0	170,0	20 000,0

(Source: EM-DAT, [1)] Nepal Disaster Report 2015, [2)]OSSGSA, [3)]ERRA 2005-2006, [4)]The Data Center 2016, [5)]SUPPASRI et al. 2012).

Statement of the research problem

Post-disaster reconstruction offers an opportunity to reduce vulnerabilities to hazards (Mitchell 1999, Lewis 2003) and global stakeholders provide substantial resources for the reconstruction and recovery of disaster ravaged communities (Fengler et al. 2008, Hayles 2010). A significant portion of reconstruction funds is usually allocated to permanent housing reconstruction (PHR) (Freeman 2007, Lyons 2009, Daly 2011) because it is a visible investment choice (Freeman, 2007), a major component of the losses inflicted by disasters (CERA 2012, Chang-Richards et al. 2013) and is considered an effective means of providing appropriate humanitarian assistance. PHR can reduce the suffering of displaced persons, improve safety, security, livelihood conditions and restore dignity to affected communities (Quarantelli 1982, Sphere Project 2011). It can help mitigate risks and minimise future losses to disasters (Palliyaguru et al. 2006, Kennedy et al. 2008). PHR enables local capacity building to facilitate the redevelopment of resilient physical and social environments (Lyons 2009, Ahmed 2011, Berke et al. 2012). It enables the re-establishment of existing and the provision of new or alternative sources of livelihood (Kennedy et al. 2008, Niazi and Anand 2010) that are sustainable (Lane 2005, Hayles

2010) and it contributes towards the revitalisation of the affected economy and recovery of affected communities (Barenstein 2006, Barenstein and Pittet 2007, Haigh and Amaratunga 2010, Lyons 2009, Seneviratne et al. 2013, Ahmed 2011).

Regardless of stakeholders' reasons for supporting PHR programmes, Bradshaw (2002) and Quarantelli (2005) note that these opportunities for affected communities to develop resilience to disasters have often been inadequately exploited or missed. Evaluation reports such as (ALNAP 2002, 2003) identify housing reconstruction as one of the least successful humanitarian sectoral interventions and studies including Lloyd-Jones (2006) and Lyons (2009) acknowledge the ineffectiveness and or failure of PHR programmes. Although stakeholders expect PHR programmes to achieve their stated objectives, housing interventions for vulnerable communities especially in developing countries have rather reproduced or even exacerbated vulnerabilities by rebuilding damaged structures in a similar way as they were before disasters (Kennedy et al. 2008, Lyons 2009). They have also generally failed to enable effective recovery or a “bounce-forward” effect (Blaikie 2002, DNS and PASA 2006, Seneviratne et al. 2010; Pathirage et al. 2010)

Numerous studies (Lloyd-Jones 2006, Lyons 2009, Liu and Liu 2014) have identified ineffective management of PHR programmes as a key factor contributing to these failures and Johnson et al. (2006), Johnson (2007) and Ahmed (2011) have identified that successful achievement of PHR programmes' intended outcomes (disaster risk reduction, etc.) is dependent upon the effective organisation and management of the PHR process.

Aim and scope of the research

It has been over three years since the Third World Conference on Disaster Risk Reduction, held in Sendai, Japan from 14 to 18 March 2015 and where global stakeholders adopted the Sendai Framework for Disaster Risk Reduction 2015-2013 (SFDRR). One of the four priorities for action set by the SFDRR is: "*Enhancing disaster preparedness for effective response, and to "Build Back Better" in recovery, rehabilitation and reconstruction*". Build Back Better (BBB) advocates the effective management of reconstruction processes to enable systematic integration of risk reduction measures and to facilitate the recovery of affected communities in order to strengthen the communities’ resilience to disasters (Kennedy et al. 2008, Lyons 2009).

To enable preparedness, effective risk reduction and to facilitate the effective recovery of communities following reconstruction, the aim of this dissertation is:

To develop a framework for the management of post-disaster housing reconstruction programmes in order to build (communities) back better following disasters.

To achieve this aim, the following objectives were adopted:

- To identify the challenges affecting the effective management of post-disaster PHR programmes.
- To evaluate stakeholders' responses towards effective PHR and community recovery.
- To determine measures for the effective management of Post-disaster housing reconstruction.
- To develop a framework for the management of PHR programmes.

The following research questions (RQ) were formulated:

- RQ1: What are the management issues that affect post-disaster housing reconstruction effectiveness?
- RQ2: How should stakeholders respond to ensure effective housing reconstruction and recovery of affected communities?
- RQ3: What are the measures that can be applied to overcome the identified issues affecting the management of PHR programmes?
- RQ4: How can PHR programmes be managed to ensure effectiveness and the achievement of the intended outcomes?

A pragmatic "what works" approach was adopted to investigate these research questions.

The scope of this research is limited to the reconstruction phase of the disaster management cycle with a particular emphasis on the management of large-scale, permanent housing reconstruction processes in developing country contexts. The study considers the management of PHR interventions at multiple scales and thus involving multiple stakeholders including national and external agencies, donors and implementing agencies and the beneficiary communities among others. It does not consider the details of housing recovery phases before permanent housing.

Research significance and contribution

Despite the significant funding invested in post-disaster reconstruction and community recovery globally, reconstruction programmes have often proven ineffective or failed to achieve stakeholders' expectations. This has led to reconstructed permanent housing which has not been suitable for habitation nor sustainable and affected communities that have not been left better off after PHR programmes. It is thus of major concern to global stakeholders and policy makers (Schwab et al. 1998, Levine 2007).

The ineffective management of PHR processes has been identified as a major cause of PHR programme failure and led to calls for further research towards achieving community resilience to disasters (Liu and Liu 2014). This study aims to develop a framework for the management of post-disaster housing reconstruction programmes to improve the management of PHR programmes and thus enable disaster resilience and development of communities affected by disasters. Specifically, the scientific contribution of this research is that it compiles, extends and up-dates current knowledge regarding the management of housing reconstruction programmes and provides evidence-based, practical guidance for policy makers and practitioners.

Outline of the dissertation

This dissertation consists of six chapters and is based on five (5) published papers.

The introduction provides an overview of disasters and post-disaster housing reconstruction. It outlines the purpose of the research, the research questions and scope of the study.

Chapter 1 gives an overview of the research subject from the perspective of the extant literature and presents the conceptual framework upon which the research approach is based.

The research methodology is explained in Chapter 2.

Chapters 3 to 5 present the results of data collection in terms of the issues affecting the management of PHR programmes, the outcome goals of PHR programmes and the

management measures, which have proven successful in overcoming the identified issues and achieving the intended outcomes.

The proposed framework for the management of post-disaster housing reconstruction programmes is presented in Chapter 5 and the conclusions of the research are presented with recommendations for future research In Chapter 6.

Abbreviations

PHR	Permanent housing reconstruction
DRR	Disaster Risk Reduction
SFDRR	Sendai Framework for Disaster Risk Reduction
BBB	Build Back Better

1 Literature review

1.1 Housing, disasters and reconstruction

Housing is a complex, multidimensional concept that is dependent on the context of consideration. For example, housing can be thought of as a product (Low and Chambers 1989), a process (Tuner 1976, Agbola 1998), a human right (Nuuter et al. 2014). Whatever the specific perspective, there is a general consensus around its great importance to people's well-being. For housing to be acceptable, it must satisfy multiple criteria including physical and structural quality, location, socio-economic, cultural, psychological and neighbourhood requirements (Bourne 1981, Rapoport 2001, Aluko 2012).

A major consequence of most disasters, in addition to large numbers of deaths and socio-economic losses, is the widespread devastation of housing (Barenstein and Pittet 2007). The location, structural integrity and state of repair of housing coupled with the provision of associated infrastructure and services all contribute to its vulnerability to hazards and its ability to resist them (Neilson 2004). Affected communities face homelessness as the provision of housing is significantly reduced and housing demand increases substantially. In many developing countries, even in the absence of disasters and despite government investment in housing provision, housing deficits are a chronic problem (Onibokun 1990). When exacerbated by disasters, the severe increase in housing demand places enormous pressures on local and national government (Rotimi et al. 2009). This situation could be substantially improved by building appropriate housing and associated infrastructure more quickly, efficiently and sustainably. The need for providing better housing has been the subject of considerable research (Hirayama 2000, Monday 2002, Cernea 2005).

In the aftermath of disasters, there is a clear need for more sustainable housing reconstruction. In particular, housing provision is expected to aid affected families providing them with adequate space and enable their continued socio-economic development (Niazi and Anand 2010). This calls for an appropriate and immediate construction sector response (Amaratunga et al. 2010) and, particularly, the integration of future hazard mitigation measures into the reconstruction process (Karunasena and Rameezdeen 2010).

1.2 The reconstruction phase within post-disaster recovery

Post-disaster recovery efforts are typically classified in three sequential phases (UNDRO 1982, Stephenson 1991, Amaratunga and Haigh 2011) which are described below with a focus on housing:

1. The emergency response phase: This phase commences immediately after an event and its objective is to save lives and satisfy the basic needs of affected populations. At this stage, victims are evacuated and rescued, first aid is administered and temporary shelters provided. The impacts of the disaster on properties are assessed and recorded (Stephenson 1991, Pérez-Fructuoso 2007).
2. The rehabilitation and recovery (transition) phase: In this phase, measures are taken to restore normality to affected communities. Activities at this stage include repairing and rehabilitating damaged buildings, provision of temporary and transitional shelter and settlements for displaced persons, restoring basic

infrastructure and services and providing psychosocial support to affected communities (Stephenson 1991, Pérez-Fructuoso 2007).

3. The reconstruction phase: The intention at this stage is to reorganise and rebuild the affected community to a better state than it was in before the disaster event. Housing and infrastructure are reconstructed so as to minimise their exposure to risk and with a view to reducing community vulnerability by addressing social and economic problems within the affected community to enable an effective recovery (Stephenson 1991, Pérez-Fructuoso 2007, Amaratunga and Haigh 2011).

Housing recovery, specifically, can be thought of in terms of the following sequence of activities:

- Emergency shelter provision (time scale: hours or days after the disaster event);
- Temporary shelter provision (time scale: days after the disaster event);
- Temporary housing provision (time scale: weeks to months after the disaster event);
- Reconstruction of permanent housing (time scale: months and years after the disaster event). (Quarantelli 1982, 1995, Mukherji 2017).

1.3 The post-disaster housing reconstruction context

The post-disaster housing reconstruction context is markedly different from that pertaining to routine construction. For example, the reconstruction environment is chaotic and dynamic (Davidson et al. 2007, Steinberg 2007), access is disrupted (Chang et al. 2011; Tas et al. 2011), the availability of resources is limited (Oxfam 2006, Steinberg 2007, Zuo et al. 2008, Chang et al. 2011) and there is particularly high exposure to health and safety hazards (Davidson et al. 2007, Kennedy et al. 2008).

1.3.1 Challenges in managing housing reconstruction programmes

Several management challenges arise from the characteristics of the post-disaster reconstruction context which affect intervention effectiveness. These include access, logistical challenges, health and safety issues and inadequate resources (Davidson et al. 2007, Ophiyandri et al. 2013). These challenges continue to affect all PHR programmes and failure to adequately manage them leads to beneficiary and donor dissatisfaction, and it affects the acceptability of the reconstructed housing and the success of programme delivery (Ahmed 2011). It is therefore important that these issues are first comprehensively identified and then effectively managed (Delany and Shrader 2000, Barakat 2003).

1.3.2 The aims of housing reconstruction programmes

Different PHR programme stakeholders have divergent roles and interests and these lead to various implications and expectations from PHR (Barakat 2003, Siriwardena and Haigh 2011, Barakat and Zyck 2011). One obvious, common objective is the provision of permanent housing for the affected communities. However, PHR does more than just provide dwellings. It also opens a window of opportunity which can be leveraged to solve underlying vulnerabilities within the affected community and to mitigate future disaster impacts by creating a more resilient built environment (Amaratunga and Haigh 2011). In addition, it is concerned with improving the health and psychosocial well-being of affected communities (Mukherji 2017, Barakat and Zyck 2011).

The literature review indicated some generally applicable outcome expectations for PHR programmes including the provision of dwellings, reducing vulnerability to hazards, reestablishment of permanent community, socio-economic recovery of communities and community sustainability. The Sendai Framework for Disaster Risk Reduction 2015–2030 (SFDRR), however, largely encapsulates these in committing to a "Build Back Better" (BBB) approach (UNISDR 2015). BBB is one of the priority areas for action within the SFDRR and it calls for the effective management of reconstruction to ensure identification of underlying and new disaster risk factors, the systematic integration of risk reduction measures and recovery of affected communities so that vulnerable communities develop resilience to disasters. BBB also emphasises the need for beneficiary communities to engage in the reconstruction process creating livelihood support and opportunities to facilitate long-term resilience (Lyons 2009). Several earlier reconstruction guidelines including FEMA (2000) and Clinton (2006) referred to BBB but they did not present a consistent approach. This led to BBB being reconceptualised by Mannakkara and Wilkinson (2013, 2014) who produced a comprehensive BBB framework that considers the physical, social and economic conditions of communities in post-disaster reconstruction and recovery.

1.3.3 Good practices examples

The extant literature also gives insights into historical reconstruction successes. For example, the high speed of permanent housing delivery achieved after the 1999 Marmara earthquake in Turkey which was made possible by resettling communities to safer zones under new legislation, adopting a contractor-driven approach to reconstruction on the basis of turnkey, lump-sum contracts and design and construction guidelines focusing on simplicity, structural stability and integrity, time and cost (Tas et al. 2011). Good practices in terms of planning, institutional development and beneficiary participation following the Bam earthquake in Iran (Gharaati 2007, Ghafory-Ashtiany and Hosseini 2008). The adoption of a range of alternative management approaches to implementation according to local conditions in Gujarat (Barenstein 2006). The establishment of construction guidelines and approvals and certification procedures to ensure safe building construction in Sri Lanka following the 2004 tsunami (Ahmed and McEvoy 2010).

1.4 Housing reconstruction delivery strategies

Studies including (Barakat 2003, Barenstein 2006, Jha et al. 2010) identify several housing reconstruction delivery strategies that can be applied. Selection of an appropriate strategy depends on several contextual factors such as resource availability, capacities and experience within the affected community, speed and efficiency preferences as well as technological, social, economic and cultural considerations (Barenstein 2006, Davidson et al. 2006, Hayles 2010, da Silva 2010, Chang et al. 2011). Barakat (2003) noted that no one strategy fits all situations and practical approaches have to be tailored to the specific post-disaster context.

For further, specific discussion of delivery strategies, they have been associated with two distinct poles differentiated according to stakeholders' roles - top-down / donor-driven (or contractor-driven) reconstruction approaches on the one hand and bottom-up / owner-driven or (beneficiary community-led) approaches on the other (Barakat 2003, Jha et al. 2010, Karunasena and Rameezdeen 2010).

1.4.1 Donor-driven (or contractor-driven) approaches

In applying the donor-driven approach, housing reconstruction is contracted to expert construction actors who plan, design and rebuild houses either in-situ (in the same location as the damage or destroyed houses) or ex-nihilo (at a new site) (Barakat 2003, Barenstein 2006, Karunasena and Rameezdeen 2010, Vahanvati and Beza 2015). The merits of adopting this reconstruction approach include speed of reconstruction, a skilled workforce, technical expertise and capacity to ensure quality and it enables the efficient provision and effective management of resources (Barenstein 2006, Felix et al. 2013). Problems include inadequate beneficiary engagement where the contractors lack experience or interest or a clear mandate to engage the beneficiary community and lack of consideration for beneficiaries' needs. This can lead to the construction of houses that are inappropriate and, thus, negatively impacts the acceptability, maintainability and sustainability of housing reconstruction programmes (Barenstein 2006, Shaw and Ahmed 2010, Vahanvati and Beza 2015).

1.4.2 Owner-driven (or community-led) approaches

The importance of beneficiary community engagement to the success of housing reconstruction programmes is emphasised in the literature (Ganapati and Ganapati 2008, Lawther 2009). Owner-driven reconstruction approaches exist in various forms, e.g.:

- owner-driven without implementing agency;
- owner-driven with implementing agency; and,
- participatory approach (Barenstein 2006; Barenstein and Iyengar 2010; Vahanvati 2018).

Adopting owner-driven or community-led approaches does not necessarily imply that the beneficiary community is directly involved in the reconstruction itself, but it does imply that the beneficiary community is placed at the centre of the decision-making process throughout the PHR programme and that beneficiaries are provided adequate and appropriate support (e.g., in the form of building materials, training, financial, technical services, supervision, etc.) by external agencies and local authorities to ensure programme success (Barakat 2003, Barenstein 2006, Jha et al. 2010, Chang et al. 2011).

Owner or community-led approaches have become increasingly popular with donor agencies and, when effectively used, have delivered fast, cost effective, high quality and culturally appropriate houses, employment and livelihood benefits. They have helped in restoring dignity, overcoming psychological trauma, community empowerment and capacity development and led to early occupation of housing units and better long-term maintenance prospects (Barakat 2003, Barenstein 2006, Gharaati 2006, Fallahi 2007, Schilderman and Lyons 2011, Vahanvati 2018). However, owner-driven approaches are no panacea and their success depends on factors including other project stakeholders, management processes and resource availability. Their appropriateness can also be limited by the technical complexity and scale of reconstruction (Barakat 2003, Barenstein 2006, Lizarralde and Massyn 2008, Lawther 2009).

1.5 Conceptual framework for the management of post-disaster housing reconstruction programmes

On the basis of the aims of the research and the results of reviewing the extant literature, a conceptual framework was proposed which framed the research problem in terms of the management issues arising from the post-disaster context and the management

measures (initially referred to as management strategy elements) necessary to mitigate these issues and achieve the desired outcome goals of housing reconstruction. The conceptual framework is illustrated in Figure 3.

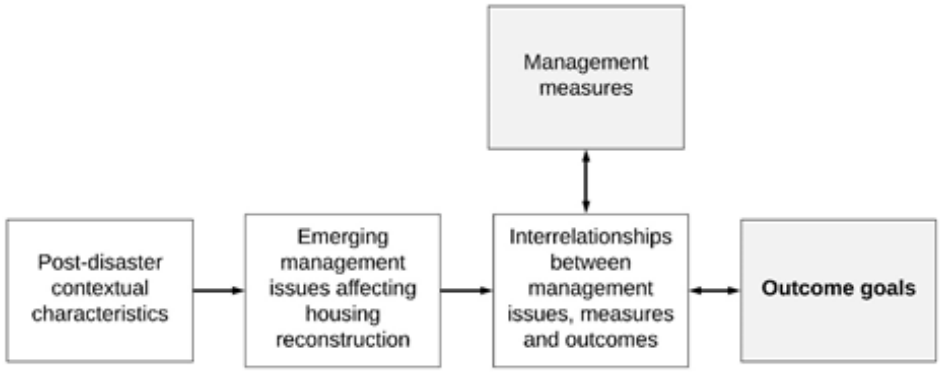

Figure 3. Conceptual framework for the management of post-disaster housing reconstruction.

Publication I: An analysis of issues for the management of post- disaster housing reconstruction and **Publication III**: Analysis of Measures for Managing Issues in Post- Disaster Housing Reconstruction report the detailed results of the literature reviews that were carried out during the course of this research. **Publication I** also describes the conceptual framework and its derivation in greater detail.

2 Research methodology

2.1 Philosophical position

A research study should be founded on a philosophical view-point (Amaratunga and Baldry 2001). This philosophical view establishes the source and nature of knowledge development (Bajpai 2011) and helps to determine appropriate methods by which a research study can be conducted (Kulatunga et al. 2007). Since this research aims to develop a practically useful framework for managing post-disaster housing reconstruction, it is deemed suitable to approach the study from a pragmatic stance of "what works" in order to find effective answers to the research questions. It is accepted that, for some of the research objectives, the researcher's background plays a significant role in the study. Similarly, the study results are largely determined by the backgrounds, experiences and values of the research participants i.e. the article authors and expert interviewees from whom data were collected.

Research philosophy may be considered in terms of its ontology, epistemology and axiology. Ontology is "the study of being" (Crotty 1998) and is concerned with the nature of reality and the assumptions we make about reality (Easterby-Smith 2008). It is associated with "how things really are" and "how things really work"(Denzin and Lincoln 1998) - suggesting realism and idealism as two polar ontological assumptions. Epistemology concerns the requirements for approaching a research study to yield acceptable and valid knowledge (Saunders et al. 2009) - it may be objective or subjective (Eriksson and Kovalainen 2008). Axiology concerns the nature of values and the basis for value judgments (Sexton, 2003). The researcher's personal values, beliefs and experiences may either be accepted to influence the research giving rise to (value-laden) interpretivist research or the researcher may attempt to be unbiased regarding values (positivist, value-neutral research) (Saunders et al. 2009).

Consideration of the research objectives led to the appreciation that knowledge would be derived from both existing social phenomena (suggesting an idealist ontology) as well as being drawn from outside the social phenomena (suggesting realism). Data are largely qualitative, collected through content analysis of the academic and grey literature and from interviews - implying interpretivism and subjective epistemology. Axiologically, the study appears primarily value-laden in terms of its relationship with the researcher but aspiring to a value-free result in the form of an effective management framework where its effectiveness is independent of the researcher. The pragmatist position allows these inconsistencies and the development of knowledge without commitment to a particular interpretation of reality. It accepts that research occurs in varying historical, social and political contexts and allows for the application of different research approaches to data collection and analysis for knowledge development (Creswell 2013, Dainty 2008). Pragmatists are primarily concerned with the utility of the adopted approaches to understanding and solving the research problem (Rossman and Wilson 1985).

2.2 Research design

The research process (Figure 4) commenced with an initial review of the case study literature on post-disaster permanent housing reconstruction (PHR) in order to gain an understanding of the factors and challenges affecting PHR management. This was followed by a systematic review of literature upon which the conceptual framework

(illustrated in Figure 3 in the preceding Chapter) was derived. In accordance with the conceptual framework, initial lists of PHR management issues, outcomes and measures were developed on the basis of an evidence focused review of the 'grey' (practitioner) and the academic literature. A parallel case study served to elaborate the build back better (BBB) principles with respect to the desired outcome goals of PHR interventions. A survey of experts' opinions was then conducted to clarify and finalise the management issues of PHR and appropriate measures to mitigate them. All the identified measures were subsequently synthesised into a framework for PHR management.

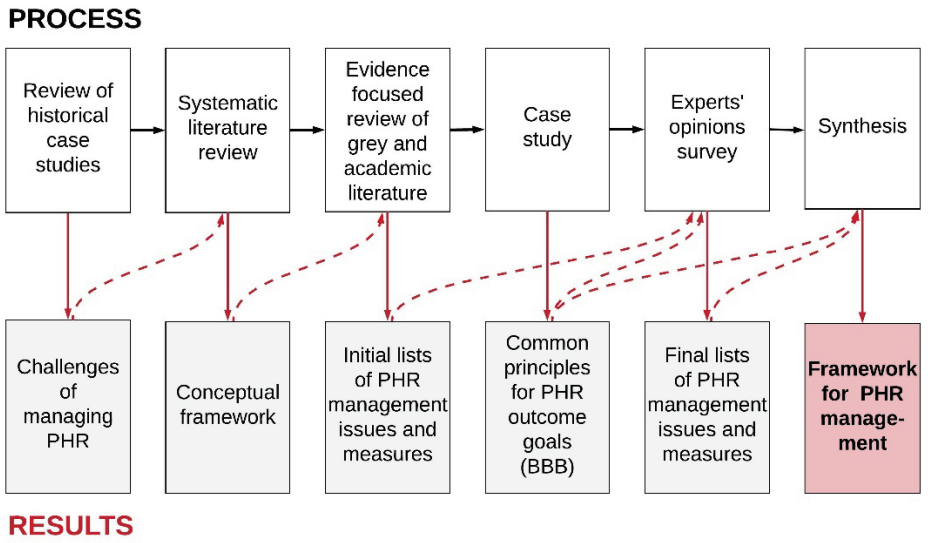

Figure 4. Research Process

2.2.1 Review of historical case studies

Historical case studies reported in the academic literature were first reviewed to identify successes and failures of past PHR programmes and understand the management challenges they faced. This led to the identification of PHR management successes and good practice examples as well as failures and poor practice examples and, from these, an initial list of issues that influence reconstruction effectiveness was derived (Bilau et al. 2015).

2.2.2 Systematic literature review

A systematic literature review was then performed to identify:

- the characteristics of the PHR context;
- successes failures and issues of past PHR initiatives;
- existing approaches to PHR management; and,
- the outcome goals of PHR.

The literature search was carried out in January 2015. It involved keyword searches of six databases selected for their comprehensive coverage of peer reviewed journal articles and conference proceedings (Web of Science, EBSCO Host, Scopus, Science Direct, Proquest Science (Journals), and Emerald Insight). The articles returned as search results were then individually screened by their titles and abstracts for relevance before being exported into an EndNote library and using the EndNote software to eliminate duplicates. 141 papers were thus identified as relevant and they formed the body of

literature from which data were collected, findings drawn and a conceptual framework for PHR management was derived (Bilau and Witt 2016).

2.2.3 Evidence focused review

The conceptual framework led to an "evidence focused" review of academic and grey literature to identify measures for effectively dealing with the PHR management issues already established. Evidence focused reviews are widely used within the international development and humanitarian sectors where evidence and insights are drawn from case studies, opinion surveys, project reports, etc. In this case, a flexible evidence focused review method was adopted from Hagen-Zanker and Mallett (2013) as shown in Figure 5.

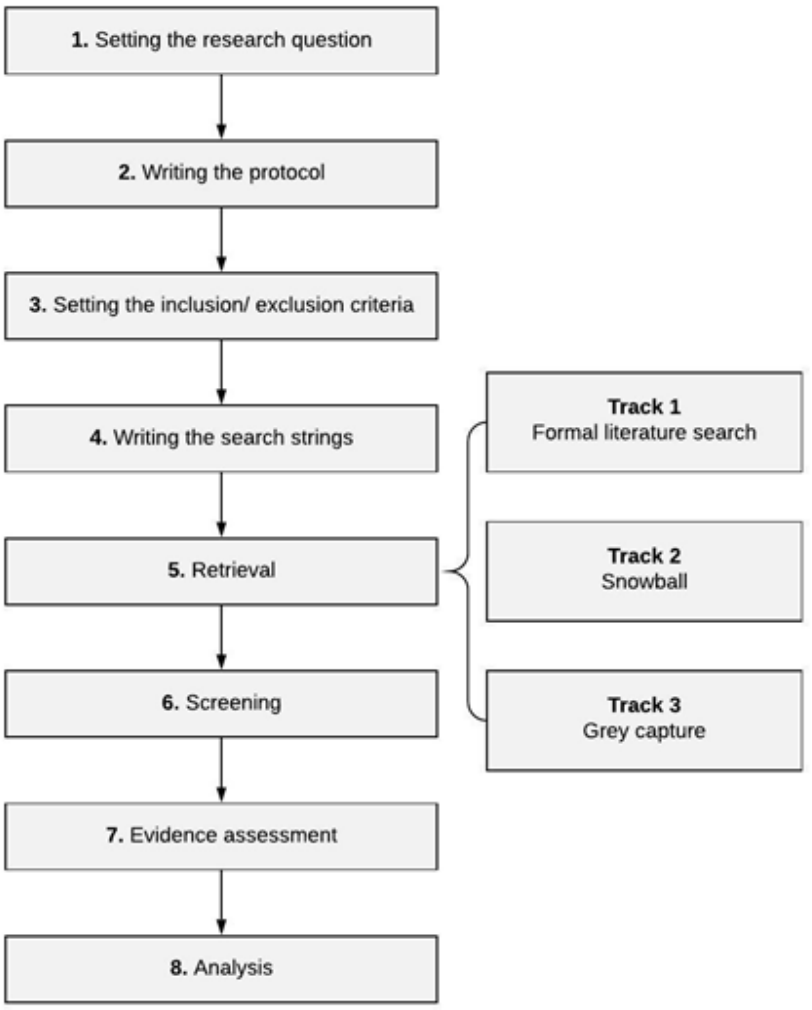

Figure 5. Stages of an evidence-focused review (Source: Hagen-Zanker and Mallett,2013)

In addition to scientific articles sourced from academic databases (the databases being the same as for the systematic literature review described above), grey literature was sourced from 3 online databases (www.humanitarianlibrary.org, www.alnap.org, publications.arup.com). This yielded 76 journal papers, 15 conference proceedings, 25 books (including working papers and guidelines from donor organisations), 12 project reports and the contents of 28 humanitarian practitioner / donor websites. A comprehensive desktop study of these sources resulted in the identification and analysis of PHR management issues and corresponding measures to overcome them and achieve the intended PHR outcome goals (Bilau et al. 2017).

2.2.4 Case Study

Amaratunga and Baldry (2001) describe the case study as a research strategy focusing on understanding the dynamics present within a single setting. Yin (2009) defines case study research as "an empirical inquiry that investigates a contemporary phenomenon within its real life context, especially when the boundaries between phenomenon and context are not clearly evident".

An exploratory case study of the post-disaster housing reconstruction and recovery context was conducted in Lokoja, Kogi State, Nigeria. This reconstruction followed the 2012 flooding in Nigeria in which 7.7 million people were affected and approximately 600 000 houses were damaged or destroyed. During October and November 2015, 31 semi-structured interviews were conducted with representatives of stakeholders involved in the PHR programme.

The survey tool was designed on the basis of "Build Back Better" (BBB) expectations under the Sendai Framework for Disaster Risk Reduction 2015-2030 (SFDRR) and the BBB framework of Mannakkara and Wilkinson (2014). The case study established that the BBB framework provided a robust set of universally applicable principles in relation to outcome goals which PHR programme success could be measured against (Bilau et al. 2016).

2.2.5 Expert Interviews

The final phase of data collection comprised seventeen (17) in-depth, semi-structured interviews of between 60 and 90 minutes conducted with PHR experts. Expert respondents were identified using a purposive snowballing technique (Flick 2014). They represented a wealth of PHR experience in developing countries including Bangladesh, Haiti, India, Indonesia, Iran, Maldives, Malaysia, Nepal, Pakistan, and Sri Lanka working as policy-makers, practitioners and researchers with multi-lateral donor agencies, reconstruction management agencies, International Non-Governmental Organisations and higher education institutions (Bilau et al. 2018a, 2018c). The intention of the expert interview survey was to fill gaps in the data, to minimise bias, triangulate the data collection sources and methods, and thus increase the validity and reliability of the findings (Malalgoda and Amaratunga 2015).

The interviews were audio recorded with the consent of respondents, then transcribed and analysed by coding and classification according to both pre-defined and emerging themes using NVivo 11 qualitative content analysis software. This led to a clearer understanding of the issues, goals, measures and complexities of the PHR context. The findings were synthesised with those obtained earlier from the literature reviews and the case study and served to finalise and validate the issues, outcome goals and corresponding PHR management measures. Subsequent integration of the resulting

measures and their organisation with respect to time enabled the development of a framework for the management of PHR programmes.

Publication III: Research methodology for the development of a framework for managing post-disaster housing reconstruction gives a more detailed account of the research methodology for the study.

3 Management issues that affect post-disaster housing reconstruction

Several recurring issues or challenges arise in the post-disaster reconstruction context that affect the management of PHR programmes. Poor management of these issues by implementing agencies leads to ineffectiveness and failure to achieve the objectives for which the programmes were initiated.

Management issues were identified from a systematic review of the literature and from expert interviews. They are presented below where they have been organised into categories and the issues under each category are ranked from most to least significant according to the number of experts who made reference to them in the experts' opinion survey.

3.1 Coordination and communication issues

Numerous stakeholders are involved in large-scale housing reconstruction programmes. Successful management of PHR programmes relies on the collaboration of stakeholders at different levels and hence the need for effective coordination and communication. Significant challenges arise with respect to coordination and communication in reconstruction and these issues were identified as (ranked in order of importance):

- (1) Poor or unfair distribution of roles, responsibilities and resources;
- (2) Inadequate communication between stakeholders due to a lack of communication tools, communication gaps, lack of stakeholder cooperation;
- (3) Insufficient capacity of local institutions resulting in poor coordination of stakeholders and a lack of trust among agencies;
- (4=) Unclear delineation of implementing agencies' responsibilities resulting in gaps, overlaps and duplication of efforts, confusion and resource wastage;
- (4=) Insensitivity to community needs on the part of donor agencies leading to resentment and lack or inadequate beneficiary participation.

3.2 Financial management issues

Large-scale housing reconstruction programmes are financed by multiple funding sources with differing conditions, accounting requirements and financing time-frames associated with each of them. The inability of management and implementing agencies to meet the conditions set by funders gives rise to financial management issues that negatively affect PHR programmes. These are presented (and ranked) below:

- (1) Nonremittance or delayed remittance of donor funding pledges due to a lack of donor confidence (e.g. resulting from corruption, lack of transparency and accountability, etc.) and associated with cash flow constraints;
- (2=) Rigidity of the recipient countries' budgetary systems in conjunction with stipulated spending deadlines;
- (2=) Lack of sufficient institutional capacity in the recipient country to properly manage and disburse donor funds, including deficiencies in financial management, accounting and reporting systems and standards.

3.3 Human resource issues

By definition, disasters involve the serious disruption of communities. Therefore, reconstruction programmes are often beyond the capacity of affected communities and their local construction industries and acquiring the requisite human resources to facilitate effective management and implementation of PHR initiatives constitutes a major challenge. Human resource issues identified in the study are listed (with rankings) below:

- (1) The lack or shortage of readily deployable experts, local builders and skilled workers;
- (2) Tensions between upward pressure on wage and salary levels in the reconstruction environment and the financial constraints to paying the required wages or salaries. This affects the engagement and/or retention of key human resources;
- (3) The lack of adequate local human resources suitable for strategic and implementation management level roles to drive the formulation of appropriate policies and strategies for PHR;
- (4) The high demand for quick and extensive mobilisation and recruitment of a skilled workforce to facilitate PHR programme implementation in conjunction with the high labour turnover resulting from seasonal changes, competition between implementing agencies, low job satisfaction and inadequate motivation;
- (5) Tensions between the local workforce and workers sourced from outside the local community to fill human resource gaps leading to political and trade union issues;
- (6) Cultural issues in relation to local communities' acceptance of imported human resources, new (graduate) engineers and the challenges faced by imported workers (e.g. in obtaining visas, work permits, etc.).

3.4 Health and safety issues

The post-disaster context is often dangerous and health and safety issues arise from the existence of underlying risks and the presence of hazardous materials, unsafe structures, debris, damaged infrastructure, contaminated water and salvaged materials all of which pose risks to reconstruction workers and affected communities.

Identified health and safety issues include:

- (1=) Insufficient awareness of health and safety risks present in the reconstruction environment;
- (1=) Inconsistent health and safety standards among donors and implementing agencies and inadequate adherence to and enforcement of approved building codes (including health and safety regulations) and guidelines for housing reconstruction;
- (3=) Utilisation of substandard and hazardous salvage materials;
- (3=) Massive transportation of materials producing unsafe environmental conditions;
- (3=) Cultural and attitude problems towards adherence to health and safety policies and guidelines and a lack of commitment to health and safety.

3.5 Logistics and supplies issues

The demand for materials and other components for the implementation of large-scale PHR programmes is significant and unpredictable. This necessitates a high degree of expertise to manage logistics and supply chains to ensure adequate resource deliveries for PHR operations. Logistics and supplies challenges identified in the research are (ranked):

- (1) Increased prices of materials and inflation affecting resource supplies and overall reconstruction costs and potentially reducing the quantity of housing provided;
- (2=) Delays in procurement processes and resource supplies due to the scale of resource needs;
- (2=) Increases in transportation costs and access difficulties resulting from a lack of or damage to roads, infrastructure and services;
- (4) Materials shortages resulting from disrupted local resource markets and the high demand of materials due to concurrent, large-scale reconstruction projects;
- (5=) Requirements to import materials and difficulties in clearing imported materials;
- (5=) Disrupted and inadequate local supply chains and poor supply quality.

3.6 Workmanship and quality issues

Workmanship and quality issues are a common feature identified with large-scale housing reconstruction programmes which may lead to rework, low acceptability and even rejection by beneficiaries. The identified workmanship and quality challenges are:

- (1) Inadequate training and mentorship, supervision and inspection with insufficient regulatory mechanisms to enforce building codes, construction guidelines and quality management procedures during implementation;
- (2) Use of poorly skilled labour, poor quality materials and technology for construction;
- (3=) Inadequate pre-qualification of implementing agencies, and lack of competency on the part of implementing agencies including corruption;
- (3=) Poor assessment of worker skills, inadequate beneficiary participation and workforce motivation;
- (5) Use of spontaneous imported labour resulting from pressures to build quickly and short-term delivery targets.

3.7 Monitoring and control issues

PHR programmes require adequate monitoring and control to ensure that their intended outcomes are achieved. The most significant monitoring and control issues identified are:

- (1=) Inadequate capacity of local institutions to facilitate the necessary monitoring functions for concurrent reconstruction of housing often over a wide geographical area;
- (1=) Inadequate participation of beneficiaries in the monitoring process;
- (3=) Inadequate implementation planning arising from a lack of capacity and stakeholder pressure for quick reconstruction;

- (3=) Inadequate or insufficient technical personnel for project monitoring, evaluation and control and the provision of inconsistent standards (for design and specification);
- (5=) Lack of autonomy / political influence on monitoring parties for compromise, corruption on the part of stakeholders involved;
- (5=) Ineffective communication between donors, implementing agencies and beneficiaries.

Further details regarding the identification of management issues may be found in **Publication I**: An analysis of issues for the management of post-disaster housing reconstruction and **Publication V**: Practice Framework for the Management of Post-Disaster Housing Reconstruction Programmes.

4 Outcome expectations for PHR programmes

The various stakeholders involved in post-disaster housing reconstruction hold numerous perspectives regarding the desired outcomes from PHR programmes. These include at least the provision of dwellings for the disaster-affected communities, reestablishment of permanent communities, disaster risk reduction, quick reconstruction, socio-economic recovery and development of communities, and the long-term sustainability of reconstructed housing and communities. The Sendai Framework for Disaster Risk Reduction 2015–2030 (SFDRR) conveniently establishes the overall requirements for all post-disaster reconstruction programmes in that it reflects a global policy consensus around the need to “Build Back Better” (BBB) in reconstruction (UNISDR 2015). Thus, it was clear for this research that, in overall terms, outcome expectations for successful PHR programmes must meet BBB requirements. The elaboration of the BBB requirements in detail therefore became the focus of the data collection and analysis effort aimed at investigating PHR outcome goals. This effort comprised both a literature review and a case study of the reconstruction following the 2012 Nigerian floods to determine whether it was built back better.

A number of guidelines, including (FEMA 2000, Clinton 2006), provide some insight and guidance on the implementation of “Building Back Better" in post-disaster reconstruction but they are rather inconsistent. An exception is the work of Mannakkara and Wilkinson (2013, 2014) which is more comprehensive and holistically considers affected communities' physical, social and economic conditions in reconstruction and recovery to delineate the elements of BBB as risk reduction, community recovery and implementation

4.1 Risk reduction

Disaster risk reduction (DRR) refers to the systematic identification, analysis and prevention of new risk, reduction of existing risks and management of residual risks towards developing community resilience to disasters (UNISDR 2017). DRR involves both structural measures (e.g. improved design, building codes, construction guidelines) and non-structural measures (e.g. hazard-based land use planning, vulnerability assessments) (Wamsler 2006, Bosher 2007, Haigh and Amaratunga 2010) to minimize socio-economic vulnerabilities and exposure to environmental hazards, and to improve the capacity and resilience of communities (IFRC 2012, UNISDR 2017). Integrating risk reduction measures into reconstruction minimises communities' vulnerabilities by enhancing the resilience of communities and the built environment.

In the Nigerian case study, it was found that some structural and non-structural measures were taken into consideration to ensure risk reduction in reconstruction. Regarding structural measures, buildings were designed to approved structural standards that took account of soil conditions and environmental challenges. Rather than provide new building codes or revise existing ones, the existing codes together with construction guidelines were simply enforced through the establishment of quality assurance mechanisms and procedures along with regular inspections and approvals of the production process at various stages. To minimise the vulnerability of communities to flood risk in high-risk zones, shoreline protection and an embankment along the river bank was constructed which would also serve as a park for recreation.

Non-structural measures included risk and multi-hazard vulnerability assessments that were conducted to produce a flood risk map. In addition, a suitable location to

resettle displaced communities and those in high-risk zones was identified while buffer zones created earlier were enforced and new developments barred within these zones. Designated local institutions including the State Emergency Management Agency (SEMA) conducted public awareness and enlightenment campaigns on vulnerability to flood risk, disaster preparedness and response using all media channels.

4.2 Community recovery

Disasters take a heavy toll on affected communities causing severe local economic conditions, grief due to the loss of loved ones and trauma due to injuries, loss of livelihood sources, social networks and investments in properties and assets. These, in turn, often lead to increased mortality and psychosocial issues (Pérez-Fructuoso 2007, Mooney et al. 2011, Reifels 2013). There is a consequent need for effective community recovery which can be achieved through the provision of sustainable livelihoods and psychosocial support to help improve the social and economic conditions for the affected communities (Clinton 2006). Mannakkara and Wilkinson (2014) consider community recovery in terms of social recovery and economic recovery.

4.2.1 Social Recovery

Social recovery refers to supporting the recovery of affected communities' psychosocial, physical, and cultural well-being (Lyons 2009, Mooney et al. 2011). Social recovery can be enabled through adequate beneficiary community consultation, participation and involvement that allows for beneficiaries to contribute to reconstruction and the alignment of reconstruction outcomes to beneficiaries' needs (ALNAP 2011, IFRC 2010, Sadiqi 2017). Effective community engagement helps to reduce trauma and the sense of hopelessness, it helps to re-build social networks and it strengthens communities' coping capabilities (Lyons and Schilderman 2010, Ophiyandri et al. 2010). Beneficiary engagement provides communities with a sense of ownership of the reconstructed housing and improves their confidence in its safety and quality while restoring dignity to communities (Sphere Project 2011, Kennedy et al 2008, Niazi and Anand 2010).

In the Nigerian case study, health and psychosocial support were provided to traumatized victims so they could work through their experiences, but beneficiary community members were not sufficiently engaged in the planning, design and reconstruction process of the settlement. This led to the provision of houses that were inadequate in terms of the numbers and sizes of rooms and also to complaints about the quality of houses provided. Non-property owners did not benefit in the allocation of reconstructed housing, they were given some grants to rent dwellings but these were not sufficient to pay for suitable rental housing around the affected community. The inadequate beneficiary community involvement in the PHR programme and a lack of consideration for non-owner residents compromised community recovery efforts and undermined the principles of the "Build Back Better" approach in this case.

4.2.2 Economic Recovery

Effective beneficiary participation in the housing reconstruction process also provides possibilities for training and capacity building for community members. This, in turn, imparts new skill sets to beneficiaries as well as alternative livelihood sources and these offer opportunities for employment during and after the PHR programme, which enable the communities' economic recovery as well as maintainability and long-term sustainability of the reconstructed housing. The engagement of local businesses in housing reconstruction functions such as material procurement contributes significantly

to the revival of local markets and enables the return of businesses, so enhancing the socio-economic conditions for affected communities. See also Mannakkara and Wilkinson (2014). To enable community recovery in the Nigerian case, grants and construction materials were given to beneficiaries whose properties were either destroyed or damaged by the floods for reconstructing their homes and to help mitigate the effects of property loss. Livelihood support programmes including training and capacity building were also provided by implementing agencies to help beneficiaries develop competencies for disaster risk reduction and to enable the development of sustainable livelihood sources.

4.3 Implementation

Implementation, according to Mannakkara and Wilkinson (2013), is the means for enabling effective reconstruction processes that allow the integration of risk reduction, facilitate socio-economic recovery of communities and promote the sustainability of housing reconstruction programmes. Effective implementation requires that appropriate institutions are established that enable the coordination of resources, stakeholders and the PHR programme as well as the provision of enforceable legislative, regulatory and policy frameworks to regulate and provide direction for the reconstruction process. Community consultation and engagement must be facilitated to ensure the acceptability of reconstructed housing and to enable socio-economic recovery. Effective monitoring and evaluation of the programme are also essential in implementation for accountability and for learning and documenting lessons to improve future programmes.

To enable implementation in the Nigerian case, a flood relief management committee, headed by the deputy governor of the state, was established to coordinate the stakeholders involved, to oversee recovery operations and procurement and to monitor reconstruction progress and performance. To ensure performance of the coordinating personnel, training and capacity development programmes were organised to enhance their capabilities for managing the reconstruction and recovery process. Local councils were not, however, included and this affected the coordination of beneficiaries at the local level.

Regarding legislative and regulatory provision, no new legislation was enacted in the Nigerian case. Rather, existing legislative provisions (particularly those relating to land use acts and building regulations) were enforced to reduce disaster risks.

Community consultation for the housing reconstruction programme was lacking in that beneficiaries were not adequately engaged. Beneficiaries were only shown designs of the buildings to be reconstructed before construction and taken to visit the reconstruction site during implementation. As a beneficiary community member commented: "*We were given no choice but to accept what the government provided since we were getting it for free*". Inadequate consultation, as observed in this case regarding resettlement, building design types and the construction process, negatively affects beneficiary satisfaction, psycho-social recovery possibilities and the achievement of PHR programme outcomes.

In terms of monitoring and evaluation in the case of the Nigerian PHR programme, a systematic monitoring approach was initially established but it was disrupted by political interference, which adversely affected the implementation of the reconstruction projects. On the other hand, lessons learnt from the PHR programme were appropriately documented for future projects.

Publication II: Housing Reconstruction Following the 2012 Nigerian Floods: Was it Built Back Better? provides a more detailed analysis of the Build Back Better approach and the complete findings from the Nigerian case study.

5 Integrated measures for managing PHR programmes

Having identified the management issues that affect PHR programmes (Chapter 3) and established the outcome expectations for successful PHR (Chapter 4), it was possible to systematically investigate and compile the management measures which could be taken to resolve the issues and achieve the intended outcomes. This was carried out through an evidence focused review of the academic and grey literature and an experts' opinions survey in which 17 PHR experts were interviewed (as described in Chapter 2). By qualitative content analysis of the literature and the expert interview transcripts, comprehensive lists of measures that have historically proven to be effective were identified. The measures were then thematically classified, integrated and organised with respect to time and this enabled the development of a framework for the management of PHR programmes. The integrated management measures are summarised below under time-based categories (preparedness, initiation, assessment and planning, and implementation, monitoring and evaluation) as well as cross-cutting measures (that apply to multiple time phases) before the framework itself is presented.

5.1 Preparedness measures

The first requirement for successful PHR is that vulnerable communities are adequately prepared before the next disaster event occurs. This involves the assessment of existing conditions by designated agencies so that capacity needs (e.g. skills, expertise, materials, finance) can be anticipated and allows the prepositioning of resources including local skills and expertise development through education and training as well as the development of an information system to facilitate the management and implementation of PHR programmes when they become necessary.

5.2 Initiation measures

In the immediate aftermath of a disaster event, the management of a PHR programme must be initiated and this involves:

- Damage and loss assessment
- Securing international assistance
- Establishing institutional and organisational arrangements.

5.2.1 Damage and loss assessment

Damage and loss assessment is required to determine the disaster impacts on communities (with respect to housing) and to establish the resource needs for PHR. This assessment should be conducted by experts, relevant stakeholders and representatives of the affected community. Typically, satellite imagery and GIS techniques are deployed to map impacts on housing and to record data such as housing types, numbers and damage severity levels. In addition, household surveys are conducted to capture housing reconstruction and beneficiary needs.

5.2.2 Secure international assistance

PHR programmes typically require significant resources which are beyond the capacity of vulnerable communities, especially in developing countries, to provide for themselves. External assistance is therefore sought (by the national government) from the international donor community through a donor conference for reconstruction and the results of the damage and loss assessment (described above), preliminary resource

estimates and the government's policy direction for PHR all provide important conference inputs.

5.2.3 Establish institutional and organisational arrangements

Local institutional and organisational capacity is usually limited and, in developing countries, is often inadequate even before a disaster event which is likely to place existing institutional and organisational arrangements under further strain. Following a disaster, institutional and organisational arrangements must be robust to enable effective stakeholder and resource coordination and PHR programme management. This may be achieved by establishing new or strengthening existing institutions. A multi-tiered governance structure is recommended that includes units created or designated to manage aspects such as financial management, logistics and supplies, stakeholder communication, etc. It must also involve the engagement of local authorities and beneficiaries (the community) for coordination at the local level and to enable the buy-in and participation of beneficiaries while engaging external agencies for local capacity building. Elements of the envisaged, multi-level institutional structure include:

- Central reconstruction authority
- Coordination system for stakeholders and resources
- UN coordination agency
- Multi-donor trust fund or donor basket

5.3 Assessment and planning measures

Effective implementation of PHR programmes rests upon thorough assessment and planning. These are subdivided into three: stakeholders assessment and planning; multi-hazard vulnerability and risk assessment and planning; needs assessment, livelihood mapping and planning; and discussed below.

5.3.1 Stakeholder assessment and planning

With the multitude of stakeholders involved in PHR, assessment and planning of stakeholders is required to determine who they are, their functions and capabilities and how they can be effectively engaged. Stakeholder assessment involves the accreditation and categorisation of stakeholders as well as communication-based assessment to identify communication needs and challenges, communication channels and first respondents, and to ascertain stakeholders' perceptions and expectations of the programme. Effective coordination also requires that all stakeholders' information, assigned roles and responsibilities are collected in a database or management information system.

5.3.2 Multi-hazard vulnerability and risk assessment and planning

Multi-hazard vulnerability and risk assessment involves reviewing and, if necessary, improving land-use planning, building (design) codes and construction standards to ensure resilient housing. To ensure acceptance of new requirements and standards, local councils and affected communities must be involved in the assessment and decision-making process. Access to livelihood sources, provision of social infrastructure and the safety of new settlements are all essential for acceptability.

The establishment of standards is essential for integrating risk reduction measures and for facilitating effective management of PHR. Key measures for this include:

- Building codes and construction guidelines;

- Provision of model houses, establishment of minimum workmanship and quality criteria and quality management plan;
- Detailed construction documents and implementation plan;
- Provision of standard operating procedures and monitoring checklists.

5.3.3 Needs assessment, livelihood mapping and planning

A comprehensive assessment of the local housing sector should be conducted to identify resource needs - construction materials, techniques and technology options, their disaster resilience characteristics, sufficiency and cultural acceptability, health and safety and environmental sustainability. Livelihood sources should be mapped with possible constraints indicated to aid planning.

The use of local resources enables quick reconstruction and provides livelihood source options for beneficiary communities, reduces logistics and supply problems and overall construction costs and enhances acceptability and long-term project sustainability. Identified material sources need to be mapped and arrangements should be made for alternative material sources to cater for supply shortages and possible price variations.

Human resource constraints can be managed through early assessment of available local competencies and capacities, skills requirements for PHR and the constraints affecting skills provision. Transportation needs and the condition of transportation systems and networks should be assessed to identify constraints and their impacts on logistics and supplies, and to identify alternatives and required interventions.

Once the assessment of resource needs for PHR has been carried out, detailed financial management and action plans should be developed.

5.4 Implementation, monitoring and evaluation measures

The implementation stage follows assessment and planning and incorporates concurrent monitoring and evaluation, as well as reporting. Analysis of the data collected highlighted the following key areas:

- Resource procurement
- Logistics and supplies
- Stakeholder communication and coordination
- Workforce recruitment and motivation
- Supervision and inspection
- Reporting.

5.4.1 Resource procurement measures

To maximise procurement efficiency, an e-procurement system should be used. Resource procurement should be stratified into different categories to allow for suppliers of different capacities and for both single sourcing (e.g. for speed and efficiency) and multiple source procurement approaches (e.g. for more competitive prices and increased local participation). An economic and financial analysis can be conducted to ascertain the most suitable procurement approach.

5.4.2 Logistics and supplies measures

In engaging logistics and supplies organisations for PHR, supplier prequalification criteria such as organisational capacity, financial strength, capabilities for effective resource delivery, procurement experience in the post-disaster context and knowledge of local markets should be assessed. To facilitate logistics and supplies, essential support services are required from the government, e.g. a functional road network, etc.

5.4.3 Stakeholder communication and coordination measures

For effective stakeholder coordination, a multi-stakeholder platform that regularly brings all participating stakeholders together for periodic meetings should be created. Such a platform enables periodic project reviews, helps with knowledge and experience sharing and facilitates stakeholder collaboration. It is important that the language of communication should be generally understood. Project reviews, experiences, lessons learnt and minutes of coordination meetings should be collectively derived, documented and communicated for use in current and future projects.

5.4.4 Workforce recruitment

To manage the human resource shortages in large-scale PHR, alternative recruitment measures were identified. Mobilisation and recruitment of local manpower enables the utilisation of local resources, indigenous skills and techniques, and facilitates the development of local capacities for long-term sustainability of the PHR programme. It creates local employment and sources of livelihoods. Beneficiary engagement in supervision reduces unethical construction practices, helps to ensure that housing is properly built, gives beneficiaries a sense of ownership and reduces satisfaction and acceptability problems. The engagement of local workers is more effective for simple buildings constructed under minimal time pressure and there is a corresponding need for education, training and capacity building.

The importation of skilled workers for PHR often raises visa, local trade association and licensing issues. The research findings suggest that importation of skilled workers should be primarily for training and capacity building purposes to develop local competencies as workforce importation denies local livelihood opportunities, encourages capital flight, reduces local knowledge transfer and negatively impacts acceptability, maintainability and beneficiaries' sense of ownership. Thus, it affects the socio-economic recovery of beneficiary communities and long-term sustainability of the programme.

The engagement of construction industry actors can resolve the human resource shortages for PHR and provide the competence and capacity required for reconstruction speed and quality and a resilient product. However, it can also adversely affect the long-term sustainability of PHR programmes. Typically, a compromise is called for in which contractors are allowed to participate but are also compelled to help develop local skills and competencies.

5.4.5 Workforce motivation

Motivational measures are necessary to raise workers' enthusiasm and enable their retention and performance in PHR. They include the provision of market wages, incentives, rewards and livelihood support, opportunities for long-term employment and career progression, use of local construction materials and techniques, and participation in reconstruction of one's own house. Wage-based motivation may lead to problematic wage escalation and inter-agency competition so that donors and implementing agencies need to collaborate and agree appropriate wage levels.

5.4.6 Supervision and inspection

Supervision and inspection are required to ensure effective integration of risk reduction measures and the achievement of workmanship and housing quality standards. This calls for the deployment of technical personnel for regular and close technical supervision. Engagement of beneficiaries (especially women) in supervision is desirable and

mentorship should be provided by skilled and experienced technical personnel to develop local capacity for supervision.

Technical inspections at pre-established project stages by an independent agency or third-party experts helps ensure that risk reduction measures are incorporated and quality standards are met before approvals are given and payment certificates are issued. Stage-wise inspection also facilitates effective progress monitoring, and helps in tracking financial resource disbursements for transparency and accountability. To ensure adherence to local building regulations and the alignment of reconstruction housing with approved plans, local councils should be engaged in inspection.

5.4.7 Reporting, monitoring and evaluation measures

To effectively monitor, evaluate and report progress, compliance and financial resource use, it is first necessary to establish appropriate reporting protocols. The need for the development of a management information system or database has already been noted in section 5.1 and it should be used to collect and make accessible all PHR reporting. A central database for project information enables reporting, monitoring and evaluation by stakeholders at different levels.

Engaging the beneficiary community in monitoring of PHR projects helps to minimise the chances for corruption and establish the transparency and accountability of the PHR programme. Local council involvement in monitoring and evaluation is also important as it facilitates the development of their institutional capacity to establish and enforce local regulations and standards and helps ensure transparency, accountability and long-term sustainability of the PHR programme.

Auditing provides assurance to stakeholders that technical quality, financial accountability and social responsibilities are being upheld. Auditing requirements for PHR include regular internal and third-party financial audits, third-party quality audits and social audits.

Lessons from the successes and failures of PHR programmes must be captured and learned. A third-party consultant should be engaged by the reconstruction management authority to review PHR activities and draw out and document lessons to enable continuous improvement in the management of the current and future PHR programmes.

5.5 Cross-Cutting Measures

To ensure the effective management of PHR programmes, three groups of cross-cutting measures were identified as being required through multiple stages of reconstruction:

- Legislative, regulatory and policy framework
- Engagement and involvement of beneficiaries
- Education and capacity building.

5.5.1 Legislative, regulatory and policy framework

Even where countries have existing legislation, regulation and/or policies relating to reconstruction, the need for their review, amendment and the formulation of new ones arises in one or more of the preparedness, initiation and assessment and planning stages of PHR. Appropriate legislation, regulation and policies provide necessary guidance to participating stakeholders and direction to the PHR programme.

5.5.2 Engagement and involvement of beneficiaries

The engagement and involvement of beneficiaries is essential throughout all stages of housing reconstruction programmes. For example, to ensure effective assessment and planning the knowledge of the local community must be drawn on to provide requisite information about vernacular construction technologies, supply chains and resource markets, environmental conditions, etc. The beneficiary community is also the "biggest monitoring tool" for PHR programmes and housing acceptability is ultimately a function of beneficiary expectations.

5.5.3 Education and capacity building

Education and capacity building are required for the development of requisite local competencies and capacities and enhance effective management throughout the PHR process. For example, in the preparedness stage, communities are educated about their vulnerability and the need for disaster risk reduction. Local capacity is developed for disaster response, to minimise disaster impacts and to enable quick reconstruction start-up and effective management of PHR programmes. To enable PHR initiation, education and capacity building for strategic and programme-level management personnel can improve disaster risk and reconstruction knowledge and facilitate legislative, regulatory and policy review and formulation. It should also be central to strengthening local institutions, enhancing the coordination of stakeholders and resources and enabling effective PHR programme management. In assessment and planning, technical personnel require training on the criteria and methodology for carrying out effective assessments and drawing up plans. In implementation, training, upskilling and on-the-job mentorship is required for local artisans and supervisory, inspection and monitoring personnel, to enable the production of safe and resilient housing.

Education and capacity building are also required to offer possibilities for turning acquired skills into long-term livelihood opportunities.

5.6 Framework for the management of PHR programmes

Figure 6 represents the measures described above as an integrated whole, with each key category of management measures arranged with respect to time and in order of precedence. Some important management measures are included under each category for illustration. The framework above represents an overall, evidence-based framework for PHR management practice intended to guide PHR practitioners and policy-makers. It is also intended to be of utility and interest to PHR researchers in that it delineates the scope of PHR programme management and, in the process of its derivation, comprehensive and validated lists of PHR management issues and measures have been compiled which are a potentially useful source of data for PHR researchers.

The proposed framework is generally applicable to all PHR situations as it is focused at a level of detail which is not context-specific. Therefore, it should be adapted and developed further and in greater detail according to any specific geographical / social / etc. post-disaster context. The framework should be considered to apply particularly to developing countries as the evidence from which it was derived is almost entirely captured from PHR programme experiences in the developing world.

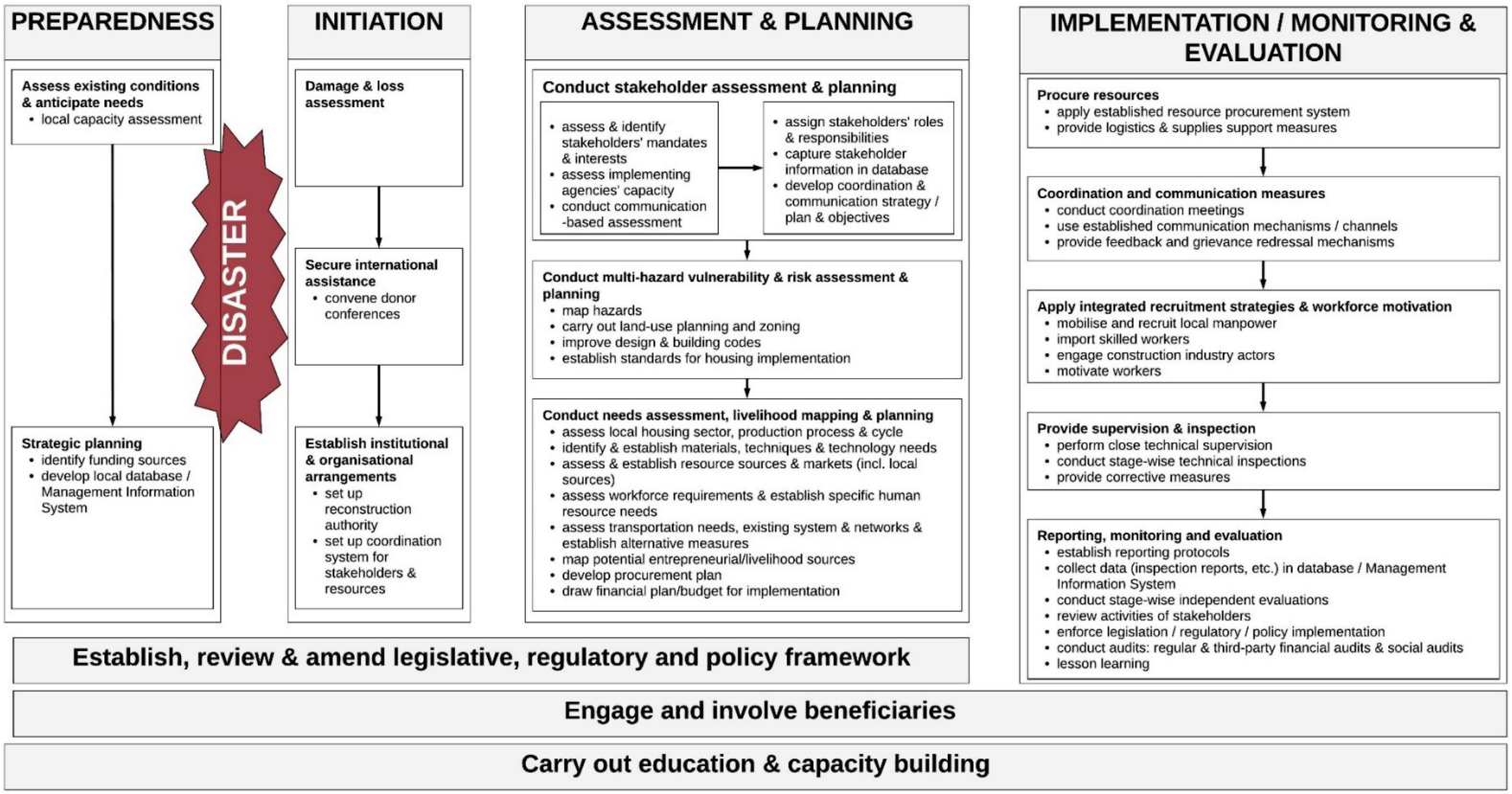

Figure 6. Framework for the management of PHR programmes

Full details regarding the management measures and their identification are reported in **Publication IV**: Analysis of Measures for Managing Issues in Post-Disaster Housing Reconstruction and in **Publication V**: Practice Framework for the Management of Post-Disaster Housing Reconstruction Programmes, which also provides further details on the framework and its derivation.

6 Conclusions and recommendations

6.1 Conclusions

Disasters damage and destroy buildings and infrastructure and their consequences include fatalities, injuries, loss of livelihood sources and the slowdown, stagnation or even reversal of economic development. Considerable resources are channeled into post-disaster reconstruction globally and, since housing is particularly affected and is of central importance to community recovery and the development of societal disaster resilience, a substantial portion of funding is typically allocated to permanent housing reconstruction (PHR). Large-scale PHR programmes are intended to remedy the impacts of disasters on housing and facilitate the recovery of affected communities. Historically, however, PHR has been one of the least successful forms of international development and humanitarian sector intervention. Particularly in developing countries, the implementation of PHR programmes has often been ineffective and their intended outcomes have not been achieved. The housing reconstruction process and its management remain considerable challenges. These challenges have been globally recognised in United Nations' policy and reflected in the targets and priorities for action of the recently adopted Sendai Framework for Disaster Risk Reduction 2015-2030 (SFDRR).

The aim of this doctoral research was to develop a framework for the effective management of post-disaster housing reconstruction programmes. The research identified and addressed the problems associated with the management of PHR programmes using a qualitative research approach. On the basis of a systematic literature review, a conceptual framework was developed relating the characteristics of the post-disaster housing reconstruction context to PHR management issues and the strategies and measures that can be taken to ameliorate the issues and achieve the desired outcome goals.

Initial lists of issues and measures were identified through an evidence focused review of academic and grey literature. A case study was conducted in Nigeria in order to evaluate and understand the outcome expectations of stakeholders. The final stage of data collection involved an experts' opinions survey which elicited effective measures in response to identified issues. The expert interviews served to fill gaps in the data and increase the validity and reliability of the findings.

A comprehensive inventory of 'good practice' measures resulted and these were then synthesised and organised with respect to time in order to develop the proposed practice framework for the management of PHR programmes. In developing the management framework, a number of key management measures for PHR effectiveness were identified. These included:

- Preparedness: Community preparedness is of the utmost strategic importance. Pre-disaster assessment of existing conditions, vulnerabilities, needs and capacities, the prepositioning of resources and local capacity building all enable the community to respond more appropriately when reconstruction is necessary.
- Initiation: Sound initiation of a PHR programme based on a thorough damage and loss assessment, and taking the needs of affected communities to mitigate potential future hazards into account. Securing international assistance is crucial to initiating effective PHR programmes. Of similar importance are the

establishment of multi-level institutional and organisational arrangements at national and/or state levels to facilitate programme management and the coordination of stakeholders and resources and the strengthening of local level administrative and organisational structures to enable the beneficiary communities to take ownership of the programme.

- Ensuring the existence of an appropriate legislative, regulatory and policy framework provides direction for stakeholders and facilitates effective PHR programme management.
- Critical assessments (e.g., of communities' vulnerability, stakeholders and resource needs) are required to enable disaster risk reduction, the development of standards and and effective implementation of the programme.
- Beneficiary community engagement in all stages of the PHR process is essential to give beneficiaries a sense of ownership of the programme, to ensure adherence to risk reduction measures and enable the development of local capacities to support social and economic revival of the community. It also facilitates project sustainability and ensures the accountability of stakeholders involved in the programme.
- Education and capacity building for stakeholders are essential throughout the PHR process. They facilitate all aspects of programme implementation and also long-term sustainability.

6.2 Recommendations for further research

The proposed framework for the management of post-disaster housing reconstruction is aimed at providing general guidance to practitioners and policy-makers. It recommends a participatory strategy in managing large-scale PHR programmes. With consideration of the singularity, complexity and catastrophic nature of all post-disaster contexts, this framework for practice would be expected to be broadly applicable to developing countries but it should be adapted in its finer details in order to suit specific post-disaster reconstruction situations.

The research culminating in the proposed framework for the management of post-disaster housing reconstruction programmes has compiled, extended and up-dated current knowledge regarding the management of PHR programmes. Further research is recommended to apply, evaluate and validate the proposed framework in practice. This would enable its refinement and, ultimately, more effective delivery of PHR programmes.

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Abstract

The management of post-disaster housing reconstruction programmes in developing countries

Large-scale disasters damage and destroy buildings and infrastructure. The consequences include fatalities and injuries, loss of livelihood sources and the corresponding slowdown, stagnation or even reversal of economic growth. Considerable resources are channelled towards post-disaster reconstruction and, since housing is particularly affected and is also central to community recovery and the development of disaster resilience, a substantial portion of these resources are typically allocated to permanent housing reconstruction. However, housing reconstruction programmes have historically left much to be desired and the housing reconstruction process and its management remain considerable challenges. These ongoing challenges have been recognised at the global policy level in the recently adopted Sendai Framework for Disaster Risk Reduction 2015-2030.

This doctoral research addresses the problems associated with the management of post-disaster housing reconstruction programmes through a qualitative research approach. On the basis of case studies and a systematic review of the literature, a conceptual framework was developed that relates the post-disaster contextual characteristics to housing reconstruction management issues and the management strategies and measures that can be adopted to overcome these issues in order to achieve the desired outcome goals.

The management issues that affect post-disaster housing reconstruction programmes and appropriate measures to overcome them were systematically identified by an evidence-focused literature review and expert interviews. The identified reconstruction management measures were then integrated and organised with respect to time to produce a practice framework for managing post-disaster housing reconstruction programmes. This practice framework highlights the strategic importance of preparedness measures that should be taken before the next disaster strikes, the institutional and organisational arrangements and the legislative, regulatory and policy framework that enable the reconstruction process and ensure adherence to established standards. In addition, the framework draws attention to the cross-cutting nature of education and capacity building measures as well as beneficiary community participation and engagement measures which are essential to all stages of the post-disaster reconstruction process.

The proposed framework is considered to apply generally to post-disaster housing reconstruction situations and it may be adapted to different, specific contexts. However, the research findings should be considered limited to developing countries as the evidence on which they are based is almost entirely from post-disaster housing experiences in the developing world.

This research has compiled, extended and up-dated current knowledge regarding the management of housing reconstruction programmes and it provides practical guidance for policy makers and practitioners. Further research is recommended to apply, evaluate and validate the framework in practice.

Keywords: disasters, reconstruction management, disaster resilience, housing

Lühikokkuvõte
Katastroofijärgne elamute rekonstrueerimise korraldus arengumaades

Ulatuslikud katastroofid purustavad ja hävitavad hooneid ja taristut. Kurvaks tagajärjeks on hukkunud ja vigastatud, kaotatud elatusallikad ning sellele järgnev majanduse aeglustumine, seisak või koguni langus. Katastroofijärgsele taastamisele suunatakse olulisi ressursse, millest märkimisväärne osa läheb elamufondi renoveerimiseks, mis saab eriti kannatada ning on kogukonna taastumiseks ülioluline. Kuivõrd varasemad elamufondi rekonstrueerimisprogrammid on jäänud puudulikuks, siis on eluasemefondi rekonstrueerimisprotsess ja selle juhtimine jätkuvaks väljakutseks ühiskonnale. Probleemi on teadvustatud ning pööratud sellele tähelepanu ka maailmapoliitilisel tasemel, mille võtab kokku hiljuti vastu võetud raamkokkulepe "Sendai Framework for Disaster Risk Reduction 2015-2030".

Käesolev doktoritöö käsitleb katastroofijärgsete eluasemefondi taastamisprogrammide juhtimist kvalitatiivse analüüsi meetodil. Soovitud eesmärkide saavutamiseks loodi juhtumiuuringute ja süsteemse kirjanduse ülevaate alusel kontseptuaalne mudel, mis ühendab katastroofijärgsed olulised näitajad eluasemefondi rekonstrueerimise juhtimise ja strateegiatega ning probleemide lahendamiseks vajalike meetmetega.

Katastroofijärgsete eluasemefondi rekonstrueerimisprogrammide juhtimisprobleemid ja nende lahendamiseks vajalikud meetmed tuvastati analüüsides süsteemselt asjakohast kirjandust ja intervjueerides eksperte. Praktilise suunitlusega katastroofijärgse elamufondi rekonstrueerimis-programmi koostamiseks tuvastati ja integreeriti rekonstrueerimise juhtimismeetmed ning seoti need ajateljega. Praktiline juhtimismudel rõhutab eriti katastroofiks valmisoleku strateegilist tähtsust ehk meetmeid, mida saab rakendada juba enne järgmist katastroofi, parandades ametkondlikku ja organisatsioonilist korraldust ning juriidilisi, seadusandlikke ja poliitilisi regulatsioone. See võimaldaks paremini juhtida rekonstrueerimisprotsessi ja tagada selle protsessi vastavus kehtestatud standarditele. Lisaks toob mudel välja nii hariduse kui ka kogukonna kaasamise olulisuse, mis mõjutavad tugevalt katastroofijärgset rekonstrueerimisprotsessi selle kõikidel etappidel.

Pakutud juhtimismudel on mõeldud kasutamiseks peamiselt katastroofijärgse elamufondi rekonstrueerimisel, kuid seda saab kohaldada ka erinevates spetsiifilistes olukordades. Siiski tuleb uurimustulemuste laiemal interpreteerimisel arvestada teatud piirangutega, kuna analüüsi algandmed, millele järeldused tuginevad, on saadud arengumaade katastroofijärgsest elamuehitusest.

Käesolev uurimuse käigus on kogutud, laiendatud ja ajakohastatud teadmisi elamufondi rekonstrueerimisprogrammi juhtimisest ning see annab praktilise juhiseid poliitikutele ja praktikutele. Soovitatavalt peaks edasine uurimustöö kasutama, hindama ja kinnitama saadud tulemusi praktikas.

Märksõnad: katastroofid, elamute rekonstrueerimise korraldus, katastroofi-resistentsus.

Appendix 1

PUBLICATION I

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AN ANALYSIS OF ISSUES FOR THE MANAGEMENT OF POST-DISASTER HOUSING RECONSTRUCTION

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ABSTRACT. There is an urgent need to improve the management of housing reconstruction programmes. Post-disaster housing reconstruction represents a significant portion of global property investment but its management has often proved to be ineffective. Although the post-disaster context makes management more challenging, it also offers exceptional opportunities to invest in and develop a more resilient built environment. On the basis of a systematic review of the existing literature, characteristics of the housing reconstruction context and successes, failures and management issues arising from historical housing reconstruction programmes were identified. These were synthesized into a conceptual framework that relates the contextual characteristics with management strategies and with the desired outcomes for housing reconstruction initiatives. This framework will enable field data collection in order to better understand the interrelationships between context, management strategies and outcomes. Ultimately, it is intended to provide practitioners with decision support tools for selecting appropriate housing reconstruction management strategies.

KEYWORDS: Built environment; Disaster resilience; Housing reconstruction; Management strategies; Reconstruction management

1. INTRODUCTION

One of the largest sources of global property investment has been the development of permanent housing after disasters (Tas *et al.* 2011). Housing typically makes up the greatest component of disaster losses with huge estimated recovery costs and, consequently, substantial funds flow towards housing reconstruction (CERA 2012; Chang-Richards *et al.* 2013). Lester (2003) estimated that half of post-disaster aid from the World Bank is channeled to housing reconstruction.

A disaster is a serious disruption of society that exceeds its coping capacity (EEA 2006; UN-ISDR 2007). The impacts of disasters range from physical to socio-economic effects and are felt not only by the directly affected communities but also have repercussions for surrounding communities. Impacts include deaths and injuries, damage to or outright loss of property investments and environmental losses (Otero, Marti 1995; Lindell, Prater 2003). While recorded fatalities from natural disasters appear to have been reducing in recent years (Guha-Sapir *et al.* 2011), there has been a marked increase in economic losses (Munich Re 2013).

The concept of housing is complex, multidimensional and dependent on the context in which it is being considered. It has variously been defined as a product (Low, Chambers 1989), a process (Agbola 1998), a human right (Nuuter *et al.* 2014), etc. Whatever the perspective, however, there seems to be consensus in terms of its importance to human well-being. Housing must satisfy multiple needs including physical and structural quality, location, socio-economic, cultural, psychological and neighbourhood requirements (Bourne 1981; Rapoport 2001; Aluko 2012). In the context of disasters, its location, structural integrity / state of repair and the provision of facilities and services enabling its safety and security all contribute to its exposure and ability to resist hazards (Neilson 2004).

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Post-disaster housing reconstruction offers an exceptional opportunity to invest in and develop a more robust and resilient built environment. However, many housing reconstruction initiatives, particularly in third world countries, have reproduced or even exacerbated vulnerabilities and thus failed to achieve a "bounce-forward" for the affected communities (DNS, PASA 2006; Seneviratne *et al.* 2010). In addition to these missed opportunities to bring about positive improvements in disaster resilience, post-disaster housing reconstruction programmes have often simply failed to deliver their stated objectives (Lyons 2009). One of the factors leading to these failures has been identified as ineffective management processes for housing reconstruction initiatives (L. Liu, J. Liu 2014).

Numerous calls for further research on disaster risk reduction and recovery in the context of the built environment have been made (for example, those by Godschalk 2003; Bosher *et al.* 2007; Haigh, Amaratunga 2010). Effective project organization and management of the reconstruction process have specifically been identified as important for successful housing reconstruction and for ensuring that disaster risk reduction measures are incorporated (Johnson *et al.* 2006; Johnson 2007; Ahmed 2011). Yet, while several different research themes have been explored (for a list of the recent research see Yi, Yang 2014), the organization and management of the housing reconstruction process for disaster risk reduction remains insufficiently investigated (Chang *et al.* 2010; Sadiqi *et al.* 2011; Ismail *et al.* 2014). In addition, Ahmed (2011) called for the development of global good practice guidelines for post-disaster housing reconstruction noting that, although numerous reconstruction guidelines exist, hardly any are widely endorsed.

This research is ultimately aimed at addressing the need for improved management of housing reconstruction programmes. It is intended to achieve this by developing evidence-based decision support tools for practitioners that will assist them to adopt appropriate management strategies for successful reconstruction implementation in their particular post-disaster context. However, such tools can only be developed once a thorough understanding of the interrelationships between the contextual characteristics, management strategies and outcomes of reconstruction programmes has been gained. As a first step towards achieving such understanding, a conceptual framework is needed which will provide a basis for the collection of field data. To this end, this paper analyzes the management issues identified from a systematic search of the existing literature on housing reconstruction in order to derive a proposed conceptual framework.

The research methodology is described in section 2 of this paper. Characteristics of the post-disaster context drawn from the literature are described in section 3. Successes, failures and management issues from historical reconstruction programmes are reported in section 4. Alternative approaches to managing reconstruction project delivery are outlined in section 5 and a review of typical outcome goals for housing reconstruction programmes is presented in section 6. These findings are then synthesized into a conceptual framework that relates the specific characteristics of post-disaster contexts with management issues, elements of management strategies and outcome goals for housing reconstruction programmes (in section 7).

2. RESEARCH METHODOLOGY

A preliminary study to this research (Bilau *et al.* 2015) established the need to further understand the specific characteristics of the post-disaster reconstruction context and to elaborate the interrelationships between these characteristics, management approaches and housing reconstruction outcomes. Taking this forward, the present study comprises a comprehensive review of the literature to identify:

- the characteristics of the post-disaster housing reconstruction context;
- the successes and failures of past housing reconstruction initiatives;
- the management approaches to housing reconstruction;
- the intended outcome goals for housing reconstruction programmes.

The literature search followed a three-stage process. Firstly, keyword searches of databases were undertaken during January 2015. The resulting articles were then individually screened for relevance based on their titles and abstracts. Finally, the citations of all relevant articles identified were exported into an EndNote X4 library and the EndNote software was used to identify and remove duplicated references.

Six electronic databases were selected for their large collections of refereed journal articles and conference proceedings:

- Web of Science;
- EBSCO Host;
- Scopus;
- Science Direct;
- Proquest Science (Journals);
- Emerald Insight.

Combinations of the following keywords were used in the searches: post disaster; housing; reconstruction; rebuilding; rehabilitation; project management; management framework.

After the elimination of duplicates, a total of 141 papers were identified as being relevant to this research. These formed the body of literature from which the subsequent data have been drawn.

On the basis of the contextual characteristics, successes and failures, management approaches and outcome goals identified from this body of literature, a conceptual framework reflecting how these variables interrelate was derived. The immediate purpose of this conceptual framework is to enable field data to be collected for the further development and then the validation of the framework. The data collection itself and the development and validation of the framework for selecting management strategies are beyond the scope of this paper.

3. CHARACTERISTICS OF THE POST-DISASTER HOUSING RECONSTRUCTION CONTEXT

The post-disaster housing reconstruction context differs markedly from that which pertains to routine construction. From the literature reviewed, numerous characteristics which define the post-disaster context were identified and these are summarized in Table 1.

4. HOUSING RECONSTRUCTION: INSIGHTS FROM THE CASE STUDY LITERATURE

Some of the literature identified related to case studies and experiences from specific housing reconstruction programmes. These included references to the 1999 Marmara earthquake in Turkey, the 2001 Gujarat earthquake in India, the 2003 Bam earthquake in Iran and the housing reconstruction efforts in Aceh, Indonesia and in Sri Lanka after the 2004 Indian Ocean tsunami. This case study literature was, in the first instance, reviewed in order to identify examples of successes and good practice as well as examples of failures and poor practice. It also provided further insights into some of the contextual issues (already noted in section 3 above) that affect the management of housing reconstruction initiatives.

4.1. Successes and good practice examples

The housing reconstruction following the 1999 Marmara earthquake in Turkey has been noted for its speed – more than 43,000 units of permanent housing in 27 different settlements were delivered in a short period of time. This was achieved through a number of measures including resettlement of communities to safer zones in conformance with a new legislative framework, a contractor–driven approach to reconstruction being utilized

Table 1. Characteristics of the post-disaster reconstruction context

Characteristics	Literature sources
Acceptability of provided housing	Barenstein (2006), UN-HABITAT (2006), Da Silva (2010), Shaw, Ahmed (2010)
Accessibility issues - disruption of access to site and resources	Chang *et al.* (2011), Tas *et al.* (2011)
Bureaucratic and institutional issues in reconstruction	Sullivan (2003), Zuo *et al.* (2008)
Chaotic and dynamic reconstruction environment	Davidson *et al.* (2007), Steinberg (2007)
Large scale and complex reconstruction	Steinberg (2007), Felix *et al.* (2013)
High exposure to health and safety hazards	Davidson *et al.* (2007), Kennedy *et al.* (2008)
Community participation issues	Barakat (2003), Barenstein (2006), Ophiyandri *et al.* (2013)
Complications to communications and coordination	McEntire (1999), Altay (2008), Shaw, Ahmed (2010)
Extraordinary financial requirements	Lester (2003), Freeman (2004), Fengler *et al.* (2008)
High expectations on risk reduction, opportunity to "bounce forward"	El-Masri, Tipple (2002), Davidson *et al.* (2007), Kennedy *et al.* (2008), Lyons (2009)
Requirement for quick housing reconstruction due to societal pressure from stakeholders	Ahmed, McEvoy (2010), Tas *et al.* (2011), Iwai, Tabuchi (2013)
Legislation issues (building code and construction guidelines, budgeting; import regulations).	Gharaati (2007), Le Masurier *et al.* (2006), Fallahi (2007), Zuo *et al.* (2008), Rotimi *et al.* (2009)
Market issues – price fluctuations, inflation	Jayasuriya, McCawley (2008), Chang *et al.* (2011)
Resource challenges such as limited resource availability, limitations to resource procurement	Oxfam (2006), Steinberg (2007), Zuo *et al.* (2008), Chang *et al.* (2011)

with contractors employed on the basis of turnkey, lump-sum contracts and the use of large numbers of subcontractors (Tas *et al.* 2011). The emphasis on quick housing provision was reflected in the guidelines for both design and construction which focused on simplicity, structural stability and integrity, time and cost, and also in the contracts which narrowly defined conditions for time extensions (Turkish Court of Accounts 2002 cited in Tas *et al.* 2011).

Aspects of good practice in planning, organization and institutional development may be drawn from the housing reconstruction programme following the 2003 Bam earthquake. A reconstruction plan that facilitated both technical and financial monitoring and control systems was put in place. Project feasibility studies were carried out. The Bam Architecture Council was established to issue orders on building designs with consideration of the socio-cultural and regional characteristics of the ailing community to aid acceptability. A number of preferred earthquake resilient housing models were offered to beneficiaries with allowance for choice in design. Building code and construction guidelines were established. Local expertise was utilized to create sources of livelihood and to promote the development of technical know-how in the community. Supervisory teams which included beneficiaries' representatives were set up to manage the reconstruction and to bring about better monitoring by both government agency representatives and beneficiaries. In this way, technical knowledge was disseminated from inspectors through the working relationships during the reconstruction and this led to reduced reconstruction times, higher production and improved quality (Gharaati 2007; Ghafory-Ashtiany, Hosseini 2008).

In Gujarat, the private sector was commissioned to undertake damage assessment and engineering analysis in affected communities and a range of alternative management approaches to implementation was adopted to facilitate housing reconstruction depending on local conditions. These included the owner-driven, subsidiary, participatory and contractor-driven approaches (Barenstein 2006).

Reconstruction authorities were established in the affected localities to facilitate and supervise reconstruction works. The beneficiaries were largely involved in communities where the owner-driven and participatory approaches were adopted. They participated in the design, estimation and construction while donor organizations provided materials and financial resources. Beneficiary participation provided a sense of ownership and helped to reduce trauma resulting from disaster effects. High levels of satisfaction and construction quality were reportedly achieved (Barakat 2003; Barenstein 2006).

A good practice example from Sri Lanka was the establishment of construction guidelines and procedures for approvals and certification of reconstructed housing by the national Urban Development Authority (UDA) to ensure safe building construction (Ahmed, McEvoy 2010).

4.2. Failures and poor practice examples

The case study literature revealed several examples where factors led to reported failures of the different housing interventions. In Turkey, the non-involvement of the affected communities in both the design and selection of the location for housing reconstruction were criticized by the beneficiaries (Tas *et al.* 2007, 2010). The focus on quick disaster recovery reportedly led to hasty design resulting in important factors being overlooked such as the local climate and environment, socio-cultural factors and the beneficiaries' identity. Construction planning and production were also affected by inadequate selection of materials, ineffective use of labour, poor workmanship and supervision. All of these factors compromised the quality of the reconstructed houses (Tas *et al.* 2011).

From the contractors' side, there was criticism of the strict time constraints imposed on the projects. This, in some cases, reportedly led to excessive sub-contracting with severe consequences for the profitability of the main contractors (Balamir 2001).

In Sri Lanka, policy shifts and a lack of reliable data with respect to housing targets and reconstruction plans led to systemic confusion and delays in housing reconstruction. Coordination and communication issues arose and the demarcation of responsibilities was unclear (Uyangoda 2005; Grewal 2006).

Although construction guidelines had been established for housing reconstruction, they were not adequately followed by most reconstruction agencies and their enforcement by the national agency in charge was not uniform. A great deal of evidence of poor construction was observed. On some houses, "irremediable" defects were reported while many others required significant maintenance. However, beneficiaries tended to neglect

this maintenance due to financial constraints and a lack of technical know-how.

Thus the buildings were left to become more vulnerable to hazard (Ahmed, McEvoy 2010).

Other factors that led to recorded failures of the Sri Lankan housing reconstruction program include the considerable pressure on implementing agencies for quick reconstruction, poor project management by implementation agencies leading to utilization of poor quality workmanship and substandard construction materials. In addition, competition among participating implementation agencies with a greater focus on the quantity rather than the quality of houses built and the non-inclusion of beneficiaries in the construction process (Barenstein 2006; Ahmed, McEvoy 2010).

In Gujarat, some of the materials and technology used in the housing reconstruction were considered unsuitable for the local weather and the cultural sensitivities of the community and this led to the rejection of some housing (Barenstein 2006).

Numerous home owners in Gujarat expressed displeasure with the contractor-led approach. This was largely due to a perception of poor building materials and low quality workmanship and it resulted in the rejection of housing. Some community members chose to repair and remain in their old homes rather than live in the poorly constructed new buildings (Barenstein 2006).

In Bam, failures were reported especially in buildings where new construction methods were employed. Structural joints failed where elements had not been properly installed. Semi-skilled labourers who were expected to gain some degree of knowledge did not acquire it due to inadequate supervision and mentoring and this affected their ability to carry out effective maintenance. Poor workmanship was also reported. This was considered to be due to poor supervision (Gharaati, Davidson 2008).

In Aceh, failures occurred due to inadequate management planning both at the strategic and operational levels. The time allowed to mobilise participating community members and to resolve land allocation issues delayed implementation start-up. The lack of resources - construction experts and skilled labour – alongside inadequate material procurement and logistics arrangements created setbacks for the project. Other issues including poor coordination and inadequate supervision also negatively impacted the speed and quality of housing delivery (ACARP 2007; Kennedy *et al.* 2008; Ophiyandri *et al.* 2010).

4.3. Issues affecting the management of housing reconstruction initiatives

Considerable challenges arise in large scale post-disaster reconstruction situations. These include access, logistical, health and safety issues, inadequate resources and more (Davidson *et al.* 2007; Ophiyandri *et al.* 2013). Such challenges are recurring and continue to affect the implementation of housing reconstruction programmes resulting in beneficiaries' dissatisfaction. This has often led to the modification or outright rejection of the housing provided. In some cases, the houses are even dismantled for their components (Shaw, Ahmed 2010; Ahmed 2011). For housing reconstruction programmes to be effective and successful, these issues need to be adequately managed. The primary issues emerging from the case study literature together with a brief explanation of each are summarized below.

Logistics and supplies

Reconstruction programmes are dependent on the delivery of supplies to the point of need. Whether this calls for the re-establishment of local supply chains or the bulk import of resources is context dependent but, in either case, the large-scale but uncertain levels of demand call for a high degree of logistics expertise. Markets in the affected areas tend to be in disarray due to disrupted access, infrastructure and services. And even where local markets are still functioning, the scale of demand can cause local shortages and price rises (Gustavsson 2003; Kovacs, Spens 2007; Altay 2008; Lyons 2009; Chang *et al.* 2011).

Human resource issues

Large-scale reconstruction programmes are often beyond the capacity of local construction industries leading to a shortage of experts and skilled labour. This may be dealt with by up-skilling and training labour from the beneficiary communities, importing expertise and skilled labour from neighboring regions or from abroad. In either case, specific human resource-related challenges arise within the reconstruction programmes (Le Masurier *et al.* 2006; Kennedy *et al.* 2008; Petal *et al.* 2008; Zuo *et al.* 2008; Jayasuriya, McCawley 2008; Chang *et al.* 2011; Chang-Richards *et al.* 2013).

Health and safety

Construction operations are unacceptably dangerous at the best of times but the post-disaster environment is considerably more hazardous with debris, unsafe structures, damaged infrastructure, contaminated water, etc. Health and safety challenges therefore present a specific management issue for reconstruction operations (Sawacha *et al.* 1999; Attalla *et al.* 2004; Kennedy *et al.* 2008; Grosskopf 2010).

Risk management issues

Beyond health and safety issues, the disrupted post-disaster environment also calls for enhanced risk management in other spheres. For example, the bonding issues between old and new materials which arose in the Bam housing reconstruction programme illustrate the risks associated with technological innovations (Gharaati, Davidson 2008).

Financial management

Financial arrangements for reconstruction programmes can be very complex with multiple funding sources (domestic and international NGOs, bi-lateral and multi-lateral donors) all with their own accounting requirements and allocation timeframes (Jayasuriya, McCawley 2008; Fengler *et al.* 2008). This can lead to conditions which compromise reconstruction implementation in terms of efficiency, quality, etc. (Freeman 2004; Steinberg 2007). The inflow of funds may also cause local price inflation (Jayasuriya, McCawley 2008; Lyons 2009).

Monitoring and control

Although detailed planning for reconstruction may be in place, the many difficulties constraining implementation including shortages of capable management and technical personnel can lead to delays and cost overruns. The monitoring and control function thus represents a particular challenge in reconstruction programmes (Assaf, Al-Hejji 2006; Kennedy *et al.* 2008; Ophiyandri *et al.* 2010).

Workmanship and quality management issues

Poor quality workmanship has been a common feature of many housing reconstruction projects (Gharaati 2007; Kennedy *et al.* 2008). This has been variously associated with a lack of skills and expertise, site conditions, poor quality materials but, primarily, with management failures (inadequate monitoring and supervision, communication problems, etc.) (Gharaati 2007; Fallahi 2007; Ophiyandri *et al.* 2010).

Communication and coordination

Achieving effective collaboration between the many entities working to deliver reconstruction programmes presents a considerable communication and coordination challenge (McEntire 1999; Altay 2008; Shaw, Ahmed 2010; Nakagawa, Shaw 2004; Patel, Hastak 2013).

5. HOUSING RECONSTRUCTION DELIVERY APPROACHES

The selection of an appropriate reconstruction delivery approach depends on numerous factors including resource availability, capacities and experience, speed, efficiency, technological and socio-economic considerations (Barenstein 2006; Davidson *et al.* 2006; Hayles 2010; Chang *et al.* 2011). Several approaches are identified in the literature such as contractor-driven, technology-driven, participatory, community-based, and so on (Barakat 2003; Barenstein 2006; Twigg 2006). However, Barakat (2003) observed that there are no precisely defined approaches – practical approaches have to be tailored to the specific post-disaster context. In order to define a specific management strategy that is appropriate to a specific post-disaster context, the set of decisions to be taken in defining that management strategy must be considered in greater detail than simply the choice of leading stakeholder group (e.g. owner-led) or the focus of the intervention (e.g. technology-driven). For this reason it is necessary to identify the underlying 'elements' of management strategies which reflect each decision to be made in determining an appropriate management strategy.

In this paper, the discussion is limited to comparing the two extreme 'poles' of the general delivery approaches referred to in the literature – the top-down, contractor-driven approach and the bottom-up, community-based approach – in order to indicate the wide range of delivery possibilities that exist between these and to make a first attempt at revealing some of the component management considerations or elements of management strategies which underlie these approaches.

5.1. Contractor-driven approach

Under the contractor-led extreme, housing reconstruction is contracted to professional construction firms that are often responsible for designing and building the houses. This approach is categorized into two types: in-situ where housing is reconstructed on the same site that was affected by the disaster; and ex-nihilo where the reconstruction takes place at a new site (Barakat 2003; Barenstein 2006).

Authors including Barenstein (2006) and Felix *et al.* (2013) observed that the contractor-led approach is faster and effective in urban settings. However, the principal drawbacks of this approach include inadequate consideration for affected communities' socio-cultural needs and the introduction of construction materials and technologies that may not be appropriate for the environment in which they are being used and this may lead to acceptability and maintainability issues (Barenstein 2006; Shaw, Ahmed 2010).

5.2. Community-driven approach

Involvement of affected communities in housing reconstruction after disasters is critical to the success of the initiative (Lawther 2009). The community-led approach does not necessarily involve prospective owners reconstructing their houses themselves but does place the community at the centre of the reconstruction process with external support provided in the form of building materials, training, finance, technical services and supervision (Barenstein 2006).

Community-led approaches have become popular with donor agencies and, under the right conditions, they provide employment and livelihood benefits and they help to overcome psychological trauma. They can enable community empowerment and capacity development, cost effectiveness, better housing quality, early occupation of housing units and improve long-term maintenance prospects (Barakat 2003; Barenstein 2006; Fallahi 2007).

However, the use of the community-based approach is no panacea. Its success depends on other factors including stakeholder coordination, effective management processes and resource availability. Its appropriateness can also be limited by the technical complexity and scale of the housing reconstruction (Barakat 2003; Barenstein 2006; Lizarralde, Massyn 2008; Lawther 2009).

6. OUTCOME GOALS

Housing reconstruction programmes may have various objectives (Barakat 2003). The literature review above has already implied the existence of a generally applicable set of outcome goals by ascribing the notions of 'successes' and 'failures' to aspects of the case studies. Some examples of outcome goals identified from the literature are further elaborated below. However, it should be noted that there is considerable overlap between these goal descriptions and also that the list below is not exhaustive.

Reestablishment of permanent community

Provision of permanent housing addresses the issues of shelter, privacy and dignity. It reduces the traumatic effect of the catastrophic event, restores confidence and trust and provides safety and security to the affected communities. This in turn allows the community members to reestablish their livelihoods. (Kennedy *et al.* 2008; Niazi, Anand 2010).

Acceptability of reconstructed housing

Acceptability relates to the functionality, good quality and habitability of reconstructed housing from the occupants' perspective (Da Silva 2010; Shaw, Ahmed 2010). There is a direct correlation between product quality, beneficiary satisfaction and acceptability (UN-HABITAT 2006).

Socio-economic recovery

The need for socio-economic revival of affected communities has been noted as an outcome goal by several authors (Johnson *et al.* 2006; Lyons 2009; Mannakkara, Wilkinson 2013, 2014). This may be enabled through psycho-social well-being (Mooney *et al.* 2011), skills acquisition and training programmes, and through employment, particularly in the reconstruction and future maintenance of the buildings (Steinberg 2007; Lyons 2009). Post-disaster reconstruction interventions may also be used as opportunities to solve long-standing housing supply issues (Tas *et al.* 2010).

Quick reconstruction and recovery

Affected communities and investors need housing reconstruction projects to be rapidly realized to foster recovery. Yet numerous studies (including Steinberg 2007; Iwai, Tabuchi 2013) have shown that most reconstruction projects are completed behind schedule.

Housing quality and sustainability

Donors and other stakeholders expect the recreation of a high-quality environment so that quality housing is one of the key objectives for any permanent housing reconstruction intervention (Da Silva 2010). Authors including Pearce (2003) and Davidson *et al.* (2007) have observed that the participation of the community in the reconstruction process helps to ensure the sustainability of the constructed housing.

Risk reduction

A general consensus exists in the literature that priority should be given to sustainable hazard mitigation through the incorporation of disaster risk reduction measures into housing reconstruction (El-Masri, Tipple 2002; Wamsler 2004; Bosher *et al.* 2007). According to Clinton (2006), reconstruction and recovery programmes must leave communities safer by putting in place risk reduction strategies in all phases of reconstruction. Similarly, the 'build back better' concept relates to integrating both structural and non-structural disaster risk reduction measures into the planning, design and implementation of reconstruction programmes (Lyons 2009; Kennedy *et al.* 2008; Mannakkara, Wilkinson 2013, 2014).

7. PROPOSING A FRAMEWORK FOR SELECTING MANAGEMENT STRATEGIES

This literature review has confirmed the need for the improved management of housing reconstruc-

tion initiatives and has provided some insights into the housing reconstruction problem as follows:

Contextual dependence

In section 3, a number of characteristics of the post-disaster context were identified but the degree to which each of these factors differs from their normal status depends upon the nature of the particular situation. The implication being that, for each post-disaster context, a unique housing reconstruction problem will arise and this calls for a management strategy specifically tailored to suit it.

Complex interrelationships between contextual characteristics, management strategies and outcomes

A wealth of experience exists with regard to previous housing reconstruction initiatives. The literature review showed that both positive and negative aspects of historical reconstruction programmes are evidenced. However, one striking feature of this evidence is the complexity of the interplay between contextual characteristics, management strategies and outcomes. For example, elements of certain strategies (e.g. the contractor-driven approach) were reported to be effective in addressing particular outcomes (the need for speed) while, at the same time, they were criticized for worsening others (quality).

Specific management issues

Relating to both the above points, a number of management issues are seen to have recurred in historical housing reconstruction programmes (see section 4.3). These can be thought of as the contextual characteristics emerging as specific challenges to be managed. The appearance and recurrence of a defined set of these issues in past initiatives suggests that they could provide a basis for a generic means to define context-specific management problems.

Elements of management strategies

The two extreme forms of delivery approach considered in section 5 (top-down / contractor-driven and bottom-up / community-based) serve to illustrate that a range of specific management strategy elements can be identified which have varying appropriateness and utility in relation to the context (and consequently emerging management issues) and which will increase or decrease the likelihood of achieving particular outcome goals. From the literature reviewed in section 5, it follows that these management strategy elements would include but not be limited to decisions regarding the roles of the various stakeholders, the use of contractors, the siting of the new housing, materials and technological choices, financing and supervisory arrangements.

Outcome goals

A number of generally applicable outcome goals were identified (section 6). While these outcome goals exhibit considerable overlap and may be incomplete, they do serve to demonstrate the existence of a generally applicable set of outcome goals and this suffices for our purpose of proposing a conceptual framework to relate the post-disaster context (and the management issues which emerge from that) to management strategies and to desired outcomes.

7.1. An initial conceptual framework

The conceptual framework proposed in Figure 1 illustrates the suggested relationship between contextual characteristics elaborated into specific management issues, elements of management strategies to deal with these issues and the various

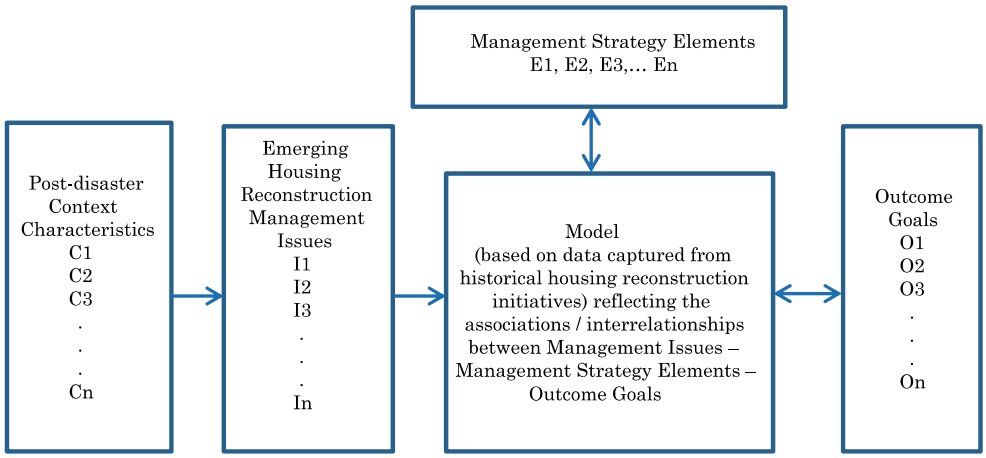

Fig. 1. Conceptual framework for effective housing reconstruction management strategies

outcome goals which are desired to be achieved in implementing these strategies.

In the first instance, this framework provides a structure which enables the systematic collection of field data from current and historical housing reconstruction programmes (in terms of contextual factors, desired outcome goals and elements of the management strategies which have been adopted).

7.2. Further research to develop the framework

Once adequate field data have been gathered, it is expected that generic lists of the variables: significant characteristics (C1, C2, C3,..., Cn), management issues (I1, I2, I3,..., In), management strategy elements (E1, E2, E3,..., En) and outcome goals (O1, O2, O3,..., On), will be identified and that appropriate value scales can be derived for each of them so that evidence from any historical housing reconstruction intervention may be coded and captured in a database. This database can then be used to identify the relationships between these variables. Our proposition is that such a model could enable better understanding of the links between context, management strategies and outcomes so as to enable the selection of management strategy elements for desired outcome goals. It may also facilitate the anticipation of likely outcomes when elements of existing management strategies are input. (This dual functionality is indicated by the double-headed arrows between the Model and Management Strategy Elements and the Model and Outcome Goals in Figure 1). This would enhance our understanding of the management of housing reconstruction programmes and provide a much-needed decision support tool.

8. CONCLUSIONS

Post-disaster housing reconstruction represents a significant portion of global property investment yet the management of reconstruction programmes has often proved to be ineffective. While the post-disaster context admittedly makes the management challenge considerably greater than it is for housing construction under 'normal' property development conditions, it also offers exceptional opportunities to invest in and develop a more resilient built environment. Thus there is an urgent need to improve the management of reconstruction programmes.

To this end, a literature search was undertaken. Typical post-disaster contextual characteristics were identified and a list of common reconstruction management issues arising as a consequence of these was derived. Similarly, primarily from an analysis of historical reconstruction successes and failures, the existence of commonly desired outcomes was demonstrated and an initial list of outcome goals for reconstruction programmes was derived.

Management strategies are needed to address the management issues and achieve these outcome goals. The existing literature was found to offer only general descriptions of overall management approaches (e.g. contractor-driven, community-based, etc.) but these are too broad to be directly useful. However, they did serve to indicate some of the elements which must be considered in determining a detailed management strategy.

These findings were then synthesized into a conceptual framework outlining the overall relationships between context, management issues, management strategy elements and outcome goals. This conceptual framework provides a basis for data collection.

The next step for this research will be to collect data from current and historical reconstruction initiatives so that the detailed relationships between these variables can be more fully understood. It is then intended to apply the acquired knowledge to develop decision-support tools for the management of housing reconstruction programmes.

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Appendix 2

PUBLICATION II

Publication II

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Constructing commitment and acknowledging human experiences

Edited by
Matthijs Prins, Hans Wamelink, Bob Giddings, Kihong Ku and Manon Feenstra

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Housing Reconstruction Following the 2012 Nigerian Floods: Was it Built Back Better?

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Abstract

The recently agreed Sendai Framework for Disaster Risk Reduction 2015-2030 calls for reducing the exposure and vulnerability of communities and thus preventing the creation of new disaster risks. It specifically identifies the need to use post-disaster reconstruction to "Build Back Better" and thus emphasizes the strategic importance of housing reconstruction in achieving disaster resilience. In the 2012 flooding in Nigeria, 7.7 million people were affected, 363 fatalities were recorded and approximately 600 000 houses were damaged or destroyed. This disaster greatly worsened an already existing housing deficit thereby placing huge pressure on all levels of government to address the sharp increase in housing demand.

This research assesses the performance of the post-flood housing reconstruction programme in Lokoja, Kogi State, Nigeria. It identifies the efforts made to enable affected communities to achieve improved disaster resilience after the event and compares these to the Build Back Better expectations under the new Sendai Framework.

Qualitative data were collected from stakeholder interviews, project documents and reports and personal observations in the field. The findings indicate that, while some aspects of Build Back Better were implemented in this particular case, others were not and so the reconstruction programme in Lokoja fell short of the Sendai Framework's Build Back Better expectations.

Keywords: Build Back Better, built environment, construction management, housing, post-disaster reconstruction

1. Introduction

The new Sendai Framework for disaster risk reduction 2015-2030 (SFDRR) sets out distinct targets and priorities for action with the intention of reducing disaster losses. The framework focuses on addressing global disaster risk drivers in order *to effectively protect vulnerable persons, communities and countries.* The SFDRR also aims to strengthen community and environmental resilience to disasters (UNISDR 2015) and outlines guiding principles and essential responsibilities for states and institutions. It emphasises the engagement of all-of-society and all state institutions in disaster risk reduction practices (Wahlström 2015).

The SFDRR outlines seven global targets that are expected to be achieved by the end of the next decade (UNISDR 2015). It further identifies four priorities for action to substantially reduce disaster effects and losses over the next 15 years. The priorities for action are:

1. understanding disaster risk;
2. strengthening disaster risk governance;
3. investing in disaster risk reduction;
4. enhancing disaster preparedness for effective response and to “Build Back Better” in recovery, rehabilitation and reconstruction.

This study is focused on the fourth of these priorities for action and, specifically, achieving "Build Back Better". The case of a Nigerian housing reconstruction programme following the flooding of 2012 is considered in terms of the "Build Back Better" expectations under the SFDRR in order to determine whether the reconstruction programme measured up to these expectations and, if not, what recommendations can be made for future initiatives.

In section 2, the Build Back Better concept and its elements are described in detail. In section 3, the background to the reconstruction efforts following the 2012 flooding in Nigeria is presented. The methodology for this research is described in section 4 and its findings are presented and discussed in section 5. Section 6 of the paper sets forth conclusions and recommendations.

2. The Build Back Better Concept

The Build Back Better (BBB) concept seems to have originated following Hurricanes Mitch and George in the Americas in 1998 when USAID and its partners agreed to reconstruct affected buildings using techniques and standards to enable the resilience of structures. The measures adopted included: incorporating environmental and geological analysis into designs; encouraging the utilization of effective land-use planning; creating social and economic opportunities for affected communities; and ensuring effective monitoring and coordination by the donors (USAID 1999; Reliefweb 2006). However, BBB gained global attention and adherence during the reconstruction of Aceh, Indonesia, following the Indian Ocean earthquake and tsunami in 2004 (Lyons 2009).

The post-disaster context offers an exceptional opportunity to develop an improved and resilient built environment and BBB advocates the utilisation of this opportunity for the identification of underlying and new disaster risk factors and proposes the systematic incorporation of long-term mitigation measures into reconstruction (Kennedy *et al*. 2008). In addition, BBB emphasises the inclusion of disaster-hit communities in reconstruction processes to create livelihood support and opportunities that facilitate long-term resilience for communities (Lyons 2009).

Several reconstruction guidelines (including FEMA 2000; Clinton 2006) aimed at "Building Back Better" exist but these are not necessarily consistent and this can cause confusion. Consequently, Mannakkara and Wilkinson (2013; 2014) reconceptualised the guidelines to produce a comprehensive framework that considers the physical, social and economic conditions of communities in post-disaster reconstruction and recovery. The authors categorised the themes into three basic elements that represent the BBB concept:

1. Risk reduction;
2. Community recovery; and,
3. Implementation.

These three elements are broken down and further discussed in the following sections.

2.1 Risk Reduction

Risk reduction focuses on minimizing the damage caused by disaster. This includes measures put in place to minimize vulnerability, improve the capacity and resilience of communities (IFRC 2012). Such measures have been classified as structural and non-structural.

Structural Measures: Structural measures involve improved design, establishment and enforcement of building codes and construction guidelines, strengthening of structures exposed to hazards and implementation of effective construction practices (Wamsler 2006; Bosher *et al.* 2007).

Non-structural Measures: Non-structural measures include hazard-based land use planning and vulnerability analyses, discouragement of development on high risk areas, the creation of buffer zones, relocation of settlements to protected zones, public enlightenment campaigns regarding hazards, vulnerability, risk reduction and the development of resilience to disasters (Wamsler 2006; Shaw and Ahmed 2010).

2.2 Community Recovery

Community recovery emphasises the creation of sustainable employment and livelihood support programmes for affected communities (Clinton 2006). It involves measures aimed at the restoration and improvement of social and economic conditions for the affected communities. Community recovery measures are classified into social recovery and economic recovery (Mannakkara and Wilkinson 2014).

Social Recovery: Social recovery refers to the need for disaster victims' physical, psychosocial and cultural well-being to facilitate recovery (Lyons 2009; Mooney *et al.* 2011). Social recovery calls for collaboration between the professionals involved (e.g. psychologists, designers) and the community. Besides attending to mental health challenges, psychological support should be provided to improve communities' adaptive capacity to disasters (Mooney *et al.* 2011).

Economic Recovery: Economic recovery concerns the return of businesses and local economies to stability following a disaster (Chang and Rose 2012). It includes access to subsidized loans and business grants, provision of equipment, seedlings to support farmers, education and skill acquisition programmes to allow affected communities to participate in reconstruction activities and to provide them with the means for sustainable livelihoods (James Lee Witt Associates 2005; NEMA 2013; UN OCHA 2013)

2.3 Implementation

Implementation describes the processes by which risk reduction and community recovery is executed. It involves a number of sub-themes that transmit the BBB concept efficiently. The sub-themes as categorized in Mannakkara and Wilkinson (2013) are stakeholder coordination, legislation and regulation, community consultation and, monitoring and evaluation.

Stakeholder Coordination: Stakeholder coordination deals with the organisation of stakeholders involved in reconstruction projects. The BBB concept recommends the creation of a central body that will effectively coordinate stakeholders involved in reconstruction and recovery (Moe and Pathranarakul 2006).

Legislation and Regulation: BBB recommends supportive laws and regulations that are instituted and enforced in order to reduce disaster risk and to create an enabling environment for managing the reconstruction and recovery processes (Clinton 2006; Le Masurier *et al*. 2006).

Community Consultation: The BBB concept emphasises the involvement of affected communities in reconstruction (James Lee Witt Associates 2005). Community consultation enables reconstruction projects' outcome goals to be better aligned with community needs and thus it facilitates acceptability (ALNAP, 2011).

Monitoring and Evaluation: To ensure successful reconstructed, detailed management plans should be formulated with long-term monitoring schemes to ensure that all the intended risk reduction measures are duly incorporated (Clinton 2006; Moe and Pathranarakul, 2006). Lessons learnt should be documented and adapted in future projects.

3. The 2012 Nigerian floods

The 2012 floods affected 30 of the 36 states in Nigeria and resulted in devastating property losses with about 600,000 houses damaged or destroyed. 363 fatalities were recorded and over 7.7 million people affected (IFRC, 29 Sep 2012; UN OCHA, 15 Nov 2012).

Responding to the disaster, the national government provided relief funds to affected states and to some federal agencies for disaster response, relief and rehabilitation. Non-governmental organisations and corporate bodies also supported the victims with relief materials and financial assistance. Some state governments initiated mass housing schemes to ameliorate the disaster effects on housing and to enable affected communities to recover.

Lokoja, the administrative capital of Kogi State was chosen as an ideal case study area for this research because it was severely affected by the 2012 floods and has since benefited from recent housing reconstruction and community recovery projects. Lokoja is located at the confluence of the rivers Niger and Benue. Community members within Lokoja are largely farmers and are often affected by floods that cause considerable damage to their properties.

In Lokoja, about 1700 houses were affected by the flooding, some of which were reconstructed while others on the flood plain were to be demolished and the affected community relocated (News24 2013). In April 2013, the Kogi State government initiated the construction of 272 housing units for the 2012 flood victims with priority being given to affected property owners.

4. Methodology

Qualitative data were collected from the literature, interviews, project documents and reports and personal observations in the study area. 31 semi-structured interviews were conducted in October and November 2015 with representatives of stakeholders involved in the housing reconstruction and recovery programme.

Representatives of national level agencies and non-governmental organisations as shown in Table 1(a) were interviewed to compile a detailed description of national efforts towards community recovery. At the state level, agencies responsible for managing the government's efforts towards risk reduction, housing reconstruction and community recovery were identified and each of these agencies (described in Table 1(b)) were interviewed to recount their perspectives of the recovery programme. The head of the Farmers Association at the state level also gave details of the disaster effects and efforts made by stakeholders to enable the recovery of affected farmers.

At the project level, supervisory engineers and the contractors involved in the housing reconstruction projects gave an account of the contractor-driven housing production processes. Representatives of owner-driven reconstruction - building-owners who were relocated and affected tenants - also give an account of their participation and efforts.

Representatives of local governments were also interviewed to describe local government's efforts and their inclusiveness in the recovery process. Representatives of the local community, the residents of the new housing scheme, were interviewed to gain an understanding of their involvement and opinions. Descriptions of these local level interviewees are provided in Table 1(c).

Table 1(a): Profile of Interviewees at National Level

Interview Code (C)	*Description*	*No. of Interviews*
C1	*National Emergency Management Agency (NEMA)*	*1*
C2	*Manager, National Inland Waterways (NIWA), Lokoja*	*1*
C3	*Researcher, NASRDA*	*1*
C30	*Representative, The Nigerian Red Cross Society*	*1*
C31	*OXFAM, Nigeria*	*1*

The information received from the interviewees was validated through triangulation. This was done by verifying questions from other interviewees and available project documents and literature. Personal details of the interviewees were kept confidential to encourage the reliability of the information received. Data collected were encoded according to the elements and sub-elements of BBB which were described in section 2 above. The findings and analysis are presented in section 5 as a narrative based on this thematic categorization (Kvale 2007).

Table 1(b): Profile of Interviewees at State Level

Interview Code (C)	*Description*	*No. of Interviews*
C4-C5	*Managers, State Emergency Management Agency (SEMA)*	*2*
C6	*Head, Town Planning and Development Board, Kogi State*	*2*
C7	*Head, Department of Building Control, Kogi State*	*1*
C8	*Manager, Ministry of Land, Housing, Urban Development*	*1*
C9-C10	*Supervisory personnel/Engineers (Post-flood Housing)*	*2*
C11-C12	*Contractors, Post-flood Housing*	*2*
C13	*Manager, Ministry of Environment and Natural resources*	*1*
C17	*Head, Kogi State Farmers Association*	*1*

Table 1(c): Profile of Interviewees at Local Level

Interview Code (C)	*Description*	*No. of Interviews*
C14	*Development officer, Lokoja Local Government*	*1*
C15	*Development officer, Ajaokuta Local Government*	*1*
C16	*Development officer, Kogi Local Government*	*1*
C18	*Community representative, Lokoja Local government*	*1*
C19	*Community representative, Adankolo Local government*	*1*
C20	*Community representative, Koton-karfi Local government*	*1*
C21-23	*Residents, New Housing Estate*	*3*
C24-26	*Owner-built housing reconstruction and rehabilitation*	*3*
C27-29	*Tenants affected by flood (without allocation)*	*2*

5. Findings

Based on the analysed data, the study findings are presented and discussed under each of the three elements of Build Back Better and their corresponding subthemes.

5.1 Disaster Risk Reduction

Structural Measures: According to C7-C10, the government adopted a contractor driven-approach for the construction of new buildings due to the need for quick delivery. C6, C7 and C8 reported that the buildings were designed to the structural standard and took account of the soil conditions and environmental challenges of Lokoja. According to C7, no new building code was established, rather existing codes and construction guidelines were enforced with inspections carried out and approvals issued at prescribed developmental stages for all new development. In addition, quality assurance mechanisms and procedures were established to ensure quality control in reconstruction. C7 identified the quality management procedures established included material quality and specifications checks, multi-department/agency inspections and regular monitoring and supervision.

According to C7, C8 and C9-C10 some contractors who were politically well-connected did not comply with the established quality management standard. C7 emphasised that they were given executive fiat and operated without applying the laid-down quality management procedures with the excuse that they were following a superior order that emphasized quick delivery. Although, beneficiaries had just been allocated their dwellings, wall cracks and damped walls were observed confirming that quality procedures were compromised (Figures 1a and 1b). C9-C10 mentioned that some contractors lacked the capacity to do a good quality job, but were awarded contracts due to their influence.

Figure 1(a) and (b) Figures showing visible defects on newly constructed houses for Post-2012 flood victims in Lokoja, Kogi State, Nigeria.

For owner-driven housing reconstruction, C24 reported that his building was destroyed by the flood but since it was not located within the buffer zone, a new design submitted was approved by the town planning board. C24 mentioned that the reconstruction of the building was often inspected by supervisors from the board to ensure compliance with building guidelines.

The authors observed a lack of drainage channels in the new scheme which exposed the settlement to flood risk due to run-off. However, C13 reported that new drainage channels are being constructed while old ones are being rehabilitated within the Lokoja metropolis to reduce flood risk. In addition, C13 and Tribune (June 26 2015), reported that a shoreline protection and embankment project alongside the river bank is being built to protect some high-risk communities from exposure to flood risk and to serve as a recreational area and park.

Non-structural Measures: A number of non-structural risk reduction measures were undertaken by the government. After the event, risk and multi-hazard vulnerability assessments were carried out and a flood risk map was produced (Aderoju *et al.* 2014). Another study identified the location to site the new housing scheme for relocated victims (Isa *et al.* 2015).

According to C5 and C7, only affected property owners with valid documents were relocated from high risk zones while new developments were barred and buffer zones which were earlier created were now enforced. However, C19, C22 and C23 reported that "we were relocated without provision for basic facilities like schools, hospitals and connecting roads to the town".

C5 reported that National Meteorological Agency and Nigeria Inland Waterways Authority provided early warnings that gave notice of the significant rise in water level to the community through the State Emergency Management Agency (SEMA). All of C4, C5, C13 and C14-C16 mentioned that before, during and after the flooding, SEMA conducted public enlightenment campaigns on vulnerability to flood risk, disaster preparedness and response using all media channels.

5.2 Community Recovery

Social Recovery: C30 reported that assistance was provided by the Nigerian Red Cross Society in the form of relief materials, health, hygiene promotion and, most importantly, the provision of psychosocial support to help traumatized victims work through their experiences. According to C4 and C5 teams of medical experts and psychologists were deployed to various internally displaced persons camps to attend to the medical and psychological needs of the victims.

In terms of housing reconstruction, C21-C23 reported that they were not adequately involved in the housing design and reconstruction process so that the houses provided to them had inadequate numbers and sizes of rooms. It was observed that non-property owners were not given consideration in the allocation of housing. Although, C27-29 mentioned that they were given some money to rent dwellings.

Economic Recovery: According to C22 and C5, grants of NGN50,000 were given to property owners. C14, C15 and C16 emphasised that some money was given to flood victims as relief to ameliorate the effects of property loss. In addition, livelihood support programmes were implemented by NGOs with the distribution of seedlings and fishing nets, while training and capacity building programmes were conducted on risk reduction and disaster resilience (UN OCHA, 01 April 2013).

5.3 Implementation

Stakeholder Coordination: Following the 2012 disaster, a Flood Relief Management Committee, headed by the Deputy Governor's office was set-up to coordinate stakeholders involved in reconstruction and recovery. C7 and C8 reported that the committee coordinated recovery operations, procurement and monitored reconstruction progress and performance. C4 and C5 mentioned that training and capacity development programmes were organised for management personnel to build disaster management capabilities and to enhance the management of the reconstruction and recovery process. However, C18, C19 and C20 mentioned that they were only involved in the distribution of relief items to the locals.

Legislation and Regulation: According to C6, C7 and C8, no new legislation or regulations were established. Rather, existing regulations regarding buffer zones were now enforced. C6 and C7 stated that the enforcement of the existing land use acts and building regulations would ensure that disaster risks are reduced.

Community Consultation: According to C18-C20 they were shown designs of the buildings to be reconstructed and taken to the housing reconstruction site during implementation (News 24 2013). We were given no choice but to accept what the government provided since we were getting it for free. C22 and C23 complained that the new houses are too small.

Monitoring and Evaluation: C6, C7 and C8 stated that lessons learnt from the housing reconstruction projects initiated by government were documented. C8 further mentioned that lessons learnt are applied in an on-going bond-housing project (of 500 units). However, C8 noted that the Post-2012 recovery projects initiated by the government are still in progress.

5.4 Summary of Findings

Disaster Risk Reduction – Structural Measures – BBB *not achieved*: Some measures were taken (embankment construction) but non-conformance with quality management procedures during construction and the lack of drainage channels left the new buildings vulnerable.

Disaster Risk Reduction – Non-structural Measures – BBB *achieved*: Multi-hazard vulnerability analysis, flood-risk mapping and (earlier identified) buffer-zones were enforced. Housing was relocated from high-risk zones.

Community Recovery – Social Recovery – BBB *not achieved*: A lack of involvement of owners in relocation planning, building design and construction processes and a lack of consideration for non-owner residents compromised community recovery.

Community Recovery – Economic Recovery – BBB *achieved*: Several successful measures were taken to enable affected communities to recover economically from the disaster.

Implementation – Stakeholder Coordination – BBB *achieved*: A central committee to coordinate stakeholder involvement was set up by the state government. However, the selection of contractors was influenced by politics and local authorities should have been more involved.

Implementation – Legislation and Regulation – BBB *achieved*: Although no new legislation was passed, existing land-use and building development regulations were enforced.

Implementation – Community Consultation – BBB *not achieved*: Inadequate consultation (especially regarding the relocation site, building design types and the construction process).

Implementation – Monitoring and Evaluation – BBB *not achieved*: A systematic approach to monitoring was initially established but this was negated by the political influence which affected reconstruction implementation. Lessons learnt were documented for future projects.

6. Conclusions

The Sendai Framework for Disaster Risk Reduction 2015-2030 calls for priority action to Build Back Better in reconstruction. Using a comprehensive BBB framework as a guide to evaluate the housing reconstruction programme in Lokoja following the 2012 floods in Nigeria, it is evident that considerable efforts were made by government agencies and other stakeholders and, indeed, some of the elements that comprise BBB were achieved (refer to section 5.4). However, other elements of BBB were not achieved. In particular, the non-conformance of some contractors to the established quality management procedures resulted in some poorly constructed housing units and the lack of drainage channels to mitigate flood risk threatens to undermine the reconstruction and recovery programme unless it is quickly remedied. In addition, the non–participation of the affected community in the design and reconstruction of housing and the lack of consideration of non-owners (affected tenants) in the reconstruction and allocation process indicate that this specific example of a recent housing reconstruction initiative falls short of the BBB expectations under the new SFDRR.

This study has used the SFDRR as a reference framework to measure the performance of the Nigerian post 2012 flooding housing reconstruction programme. By doing so, we can recommend specific improvements in terms of:

- structural measures (building quality improvements),
- social recovery and community consultation (inclusion of all affected community members and greater involvement of the community in the design and reconstruction process)
- monitoring and evaluation (putting in place safeguards to ensure that the reconstruction programme is protected from political influence).

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Appendix 3

PUBLICATION III

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Research methodology for the development of a framework for managing post-disaster housing reconstruction

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Abstract

Following the increasing occurrence of large-scale disasters, several permanent housing reconstruction programmes have been initiated particularly in developing countries. However, stakeholders within the international development and humanitarian sector have identified permanent housing intervention as ineffective and *one of the least successful sectoral intervention* particularly in terms of implementation. As a result, stakeholders have increasingly demand for evidence-based studies that will provide insights and guidance to policy makers and practitioners on the measures that could be applied in achieving effective implementation of permanent housing reconstruction programmes. The paper presents the methodical framework including the epistemological foundation and selection of research methodology for which a PhD research that focus on developing a framework for effective management of permanent housing reconstruction programmes was conducted. The article seeks to enhance research methodology knowledge base especially within the disaster resilience - (re)construction management - field that would yield research output to enhance policy-making and practice on the management of housing reconstruction programmes.

Peer-review under responsibility of the scientific committee of the 7th International Conference on Building Resilience.

Keywords: framework development; post-disaster housing reconstruction; research methodology; research phiosophies

1. Background

In the aftermath of major disasters, permanent housing reconstruction (PHR) programmes are initiated to reduce loss impact, mitigate disaster risk, facilitate long-term sustainable recovery of affected communities and to recreate a

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more robust and resilient built environment. However, reconstruction after disasters have been a significant body of research [1] and PHR is a key component of most post-disaster reconstruction initiatives [2]. Nevertheless, some stakeholders' have found PHR to be one of the least successful humanitarian sectoral intervention in terms of implementation [3]. Besides, several authors have identified most PHR interventions particularly in developing countries to be ineffective due to the interventions failure to achieve stakeholders expectation owning to poor implementation [4, 5].

Considering the need to reduce vulnerability to natural hazard, loss impact, build resilience to disasters and to provide meaningful return for stakeholders investment, key stakeholders have emphasized the need for evidence-based studies that provides insights and guidance for policy makers and practitioners towards achieving effective implementation of PHR programmes [5]. The provision of measures for strategic and operational management will enable PHR in developing countries to achieve expected outcomes. The study therefore seeks to develop a framework for effective management of PHR programmes in developing countries.

Against this backdrop, there was the need to determine a research methodology through which the study can be appropriately conducted to achieve the study aim and objectives. However, authors were confronted by the challenge of designing or adopting a research methodology appropriate for data collection, synthesis and analysis towards finding valid and reliable results to a complex research problem that concerns the management of permanent housing implementation founded within a complex organizational, social, political and dispersed geographical contexts and involving different stakeholders. Besides, the research was also constrained by resources and time which limited the authors possibilities of exploring other possible alternatives in achieving the study outcomes. As a result, a pragmatic "what works" epistemological position was adopted in order to achieve the study aim and objectives.

2. Research methodological considerations

Research methodology is the theory and analysis of undertaking a research [6]. It justifies for the procedural framework applied in producing research data and analyses towards knowledge creation [7]. Different research models have been used in different disciplines, for the built environment discipline the procedural frameworks mostly utilized conducting research has been is the research onion considering the detailed information it provides to guide researchers [8], see [6] for details. However, the research methodology and design for conducting a research should be guided by the research questions, study aims and objectives. This study aims at developing a framework for effective management of permanent housing reconstruction programmes. See Table 1.

Table 1. Research questions and objectives

S/N	Research Questions	Research objectives
1	What are the management issues that affect post-disaster housing reconstruction effectiveness	To identify the issues affecting effective management of Post-disaster housing reconstruction;
1.1	What are the impacts of disasters on affected communities?	To assess the impact of disasters on built environment of affected communities;
1.2	What are the responses of stakeholders towards effective housing reconstruction and recovery of affected communities?	To evaluate stakeholders response towards effective Post-disaster housing reconstruction and community recovery;
2	What are the measures to be applied to manage identified issues affecting permanent housing reconstruction programmes effectiveness.	To identify the measures for effective management of PDHR and;
		To develop a framework for effective management of Post-disaster housing reconstruction programmes

2.1. *Research Philosophy*

Research philosophy concerns the source, nature and knowledge development [9]. It helps to determine the appropriate method by which a research can be conducted [10]. According to Amaratunga and Baldry [11], a research should be founded on philosophical view-point without which the study quality can be determined. The researcher's

understanding of his research philosophical position helps to identify workable research design, methods alternatives and to identify the suitable and practicable method for conducting his study [11-13]. The research philosophy is classified into ontology, epistemology and axiology and subsequently discussed.

2.1.1. Ontology

Ontology is described as "*the study of being"* [14]. It is concerned with the nature of reality of the assumptions we make about reality [15]. That is, ontology is associated with the question "whether social entities need to be perceived as objective or subjective" "how things really are" and "how things really work"[16], suggesting realism and idealism as the two ontological assumptions. Whereas, realist are of the believe that reality is independent of human cognition and consciousness and predetermined by nature, idealist believe in the contrary. Idealist recognize that observers may have opposing views since the reality is as a result of human mind [17].

2.1.2. Epistemology

Epistemology concerns the requirements for approaching a research to yield an acceptable and valid knowledge in a field of study [13, 18] and it could be objective or subjective. While objective epistemology considers the outside world as being hypothetical impartial, subjective epistemology views the world *"in the realm of clarifications from reflection"* [19].

Positivist develop knowledge from the philosophical perspective that the reality exists in the outside world [20]. They hold the view that the researcher is independent of the subject under observation [12], and as a result conduct research using quantitative methods through experiments, simulations and surveys that can be statistically analyzed and replicated [21]. For positivist research is it crucial to formulate hypothesis for knowledge verification [22].

Interpretivist or social constructivist views knowledge as being socially constructed, context-dependent and complex in nature [23]. Besides, interpretivists recognize the significance of history and practice in knowledge development *(ibid).* They hold the philosophical view that research participants' plays a veritable role in the research process and that the researchers background and experience influences the object under study [23], since the researchers background shapes the researchers interpretation of the discussion with participants on the specific context being understudied [20].

Realism like positivism assumes a scientific approach to knowledge development [6], except that the realists philosophical position is anti-positivist were triangulation through survey is applied in seeking the truth [10, 12]. For the realists, it is important to provide interpretations for the socially constructed environment [10].

Pragmatist researchers develop knowledge without commitment to a particular research philosophy and reality. "*Pragmatists do not see the world as an absolute unity"* [20]. They believe research occurs in varying context, be it historical, social or political and that the world view can be dependent and independent of the mind. As a result, the pragmatists applies pluralistic research approach for data collection and analysis for knowledge development [20, 24]. Pragmatist are mostly concerned with the utilisation of available research approach to understanding and solving the research problem [25]. Pragmatist focus more on the research problem and the application of workable research approaches to finding solution to the problem [20], and they choose research methods and techniques considering on the suitability of the methods towards achieving the research purpose. However, the rationale for the use of the pluralistic research methods should be established (ibid).

The study aims at developing a framework for effective management of post-disaster housing reconstruction with particular emphasis on developing countries. From the study aim, the researcher seeks to collect and analyze data to provide knowledge that brings about effective management of PHR programmes drawing from historical, social and political contexts and complex organizational systems. Therefore, it is deemed suitable to approach the study through the pragmatic lenses of "what works" in finding appropriate answer to the research questions. For some of the research objectives, the researcher's background plays a significant role in the study. Besides, the study output is determined by the research participants background and experience who are in this case experts in the built environment with wide-ranging experience in the management of post-disaster reconstruction and recovery field, thus, the interpretivists epistemological views would be applied for most of the objective. However, for one of the objectives, a combination of methods is to be applied to ensure triangulation. Thus, a pragmatic approach is applied for the study. See Table 2.

2.1.3. Axiology

Axiology concerns the nature of values and the researchers basis for value judgment [26]. A researcher personal value, beliefs and experiences can be expressed in the cause of a research and the researcher can also be positioned to be unbiased about the value concept in a research [13]. The two value axiology position relates to positivism (value-neutral) and interprevism (value-laden). The research which is based on a pragmatism applies both values depending on the research objectives, see Table 2.

Table 2. Research objectives and the adopted philosophical position

S/N	Research objectives	Ontology	Epistemology	Axiology
1.0	What are the management issues affecting PDHR ineffectiveness	Knowledge is derived from existing social phenomena. *Idealism* was applied	Data were collected through multiple-case studies of qualitative literature and validated through experts opinion survey, thus an Interpretive approach were applied	The study was not independent of the researcher at the initial knowledge drawing stage, thus *Value-laden*
1.1	What are the impacts of disasters on the built environment?	Knowledge were drawn from an enquiry of reports from existing social phenomena. *Idealism* was used	This study was conducted to identify the impacts of disasters on the built environment, data drawn from existing reports and analyzed using *Interpretivist* qualitative content analysis.	This study was not independent of the researcher, thus, *Value-laden*
1.2	What are the responses by stakeholder in reconstruction affected communities?	Knowledge is derived from existing social phenomena. *Idealism* was applied	The study was conducted with the assumption that *the reality is as a result of human mind,* data collection was from stakeholders' opinion. Thus, an *Interpretivis*t approach was applied.	The study was not independent of the researcher thus *Value-laden*
2.0	What are the measures that could be applied to manage identified issues affecting PDHR programmes effectiveness.	The knowledge is derived from both existing social phenomena and with the assumption that knowledge can be drawn from outside the social phenomena, therefore *realism* applies.	The study seeks to identify the measures for managing identified issues affecting PDHR effectiveness. To identify the measures, data were collected through evidence-focused reviews and experts' opinions survey using the Delphi method. A *Pragmatists* research approach was applied.	The researchers experience and opinion were required at the initial stage of drawing knowledge but the researchers opinion and experience were not required at the knowledge validation stage. That is the study was not independent of the researcher at the initial knowledge drawing stage, thus *Value-laden*. but at the knowledge validation stage, the study became independent of the researchers knowledge and experience thus *Value-free*

2.2. *Research approach*

Research approach could be inductive, deductive or abductive [6]. From data collection point of view, the deductive approach concerns theoretical development that is rigorous evaluated though a number of propositions related to the theory [6], and it is more predisposed to by positivist research [15]. Similarly, the inductive approach concerns making sensible meaning of the data collected and analyzed from a given phenomenon through the identification of themes and patterns for the formulation of a theory presented in the form of conceptual framework [6]. The inductive approach is predisposed to interpretivists research [15], often concerned with context being understudy and the utilisation of small sample size is deem to be appropriate [6]. Also, the abductive approach relates to research data collection for exploring a given phenomenon, themes and patterns identification, conceptual framework development and for testing the validity of results [6]. The abductive approach applies for this study.

3. Research strategy and design adopted

A research strategy is a researchers plan for answering research questions [6]. It is the procedural framework between the research philosophical positioning and the choice of methods to be applied for data collection and analysis

[27]. The researchers choice of research strategy should be led by the research aim and objectives and the philosophical positions for which the study is based [6]. However, in defining a research strategy due consideration should be given to the research approach, depth of existing knowledge in the study area and accessibility to data source and the availability of resources that would facilitate the conduct of the study (ibid). Different research strategy may be applied for conducting research. This include systematic reviews, case study, surveys, Delphi method, ethnography, field experiments, grounded theory and narrative research among others.

In order to better understand the complexity of the PHR context, the issues affecting effective permanent housing implementation and the measures that could be applied in managing the issues affecting permanent housing implementation, the importance of drawing evidence from multiple sources was identified. As a result, the multi-strategy were applied for the study, see [24]. The research strategy includes content analysis of case studies literature and exploratory case studies, evidence-focused review and experts opinion survey through the Delphi method. These research methods were applied for data collection and analysis for the research towards achieving valid and reliable results and to ensure triangulation [22].

3.1. *Case study research*

Amaratunga and Baldry [11] describe a case study *as a research strategy that focuses on understanding the dynamics present within single settings.* Yin [28], define case study research method as *"an empirical inquiry that investigates a contemporary phenomenon within its real life context, especially when the boundaries between phenomenon and context are not clearly evident".* Case study research can be categorized into descriptive, explanatory, and exploratory. While the descriptive case studies analyze and present the sequence of an events under study, explanatory case studies answers to the question 'how' or 'why' and exploratory case studies provides answers to the 'what' or 'who' questions [29], and it could be qualitative or quantitative [28], reliant on multiple evidence sources and small sample selection that gives room for in-depth study of a real-life context [30] draw on inductive methods of research. A distinguishing feature of the case study approach is the comprehension a study's processes of occurrence within given context. The case study is conducted interviewing participants or studying life historical documents to draw the distinctive attribute and common characteristics of the persons in a given classification [22]. To this end, this research strategy is considered appropriate for providing preliminary answers to research question 1.0. while it provides answers to the research objective 1.2, see (Table. 1 and 2). In which case, historical case studies literature were explored to identify the management issues affecting effective implementation of PHR programmes. Besides, an exploratory case study of a post-disaster context using semi-structured interviews were conducted with representatives of stakeholders involved in the housing reconstruction and recovery programme in response to objective 1.2. Data collected were coded and thematically analyzed.

For objective 1.1, qualitative content analysis of media reports of a case study were applied in assessing the disaster impact on the built environment. Prior to data analysis, the impacts of disasters on the built environment were classified into themes and impacts of disasters identified from the reports were coded and analysed accordingly using NVivo 10.

3.2. *Evidence-focused review*

Systematic reviews have become an essential part of scientific research [31], especially for research aimed at enhancing an intervention's effectiveness in terms of policy making and management practice [32]. It is a research method prominent in the medical sciences to evaluate health-care interventions' effectiveness and to support evidence-informed management decisions in medical practice [33]. Considering the importance of "*what works"* for policy and management decision-making [32], some humanitarian and international development partners have recently adopted the systematic review as a basis for interventions [34-36].

Systematic review follows a "*fixed process* involving *the identification, assessment and synthesis of available evidence to generate a robust, empirically derived answer to a focused research question"* [34]. However, Maynard et al. noted that standard systematic review process are well founded in research fields such as in health-care, evidence were evidence are drawn from randomized control trials (RCTs), cohort and or case studies[36]. Whereas, in international development and humanitarian sector reviews are mostly evidence-focused with evidence and insights

drawn from case-studies' evaluations, opinion surveys and other academic research projects, thus, the need for flexible review process. Considering the research question in focus and that this study is founded within the international development and humanitarian sector [35], the flexible evidence-focused review method was adopted one of the research techniques applied for this research. The stages of evidence-focused review is as in Fig. 1.

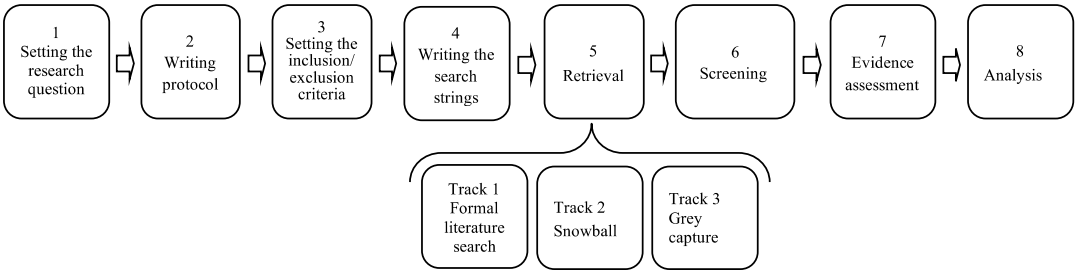

Fig. 1. Stages of evidence-focused review
Source: Hagen-Zanker and Mallett [35]

For objective four, the preliminary qualitative evidence measures were drawn from a comprehensive evidence-focused review of six (6) academic databases and grey literature. Data drawn from the review were thematically analyzed and synthesized to produce charts representing the process measures for managing each of the identified issues affecting post-disaster housing reconstruction effectiveness

Although, systematic evidence-focused reviews is considered a robust research method to eliciting well-founded answer to a focused research question, Mallett et al. noted that evidence-focused reviews is "*not an end in themselves since it can only promote"* evidence-informed policymaking or management practice in research areas "*with a strong and well-developed evidence base"* [34]. Besides, Davies et al. [32] observed that systematic reviews is just one the processes by which best-evidence on "*what works"* are drawn for policies and management practice decisions. As a result, follow-up experts opinion survey using the Delphi method was considered appropriate in drawing best practice measures for effective management of issues affecting PHR reconstruction programmes.

3.3. *Experts' opinions survey*

Delphi is a research method that applies anonymity of opinion of a panel of experts to forecast future trends founded on reliable evidence or data drawn from historical or an ongoing phenomenon to bring about knowledge that could be applied for policy and decision-making [37]. The Delphi research method is suitable for filling knowledge gaps about a phenomenon and it is specifically appropriate for identifying and ranking "*management issues in new product development projects*", eliciting data from practitioners for the development an effective implementation system and for the development of a descriptive knowledge framework of a phenomenon [38]. It is appropriate for a research with geographically dispersed experts [39], with communication facilitated using different communication channels including emails, telephone calls, internet means of communication such as Skype among others. The importance of anonymity of respondents is to prevents bias or unnecessary influence of the process [37].

Delphi questions focus on identifying problems and eliciting solutions, with questions for subsequent rounds generated from the response of preceding questions. The process come to end on receiving answers to the research question [38].

The Delphi process typically take up to two or more rounds [38, 40], however, studies have shown that the Delphi studies have also been completed after one round [41, 42]. The Delphi process is completed after the achievement of consensus with "*a statistical aggregation of the responses in the final round determines the result"* [40].

The Delphi research method is particularly suitable for finding appropriate answers to the research questions. This is considering the aim of the study being to develop a framework for managing post-disaster housing reconstruction programmes with particular focus on developing countries. Besides, the research seeks to identify the issues affecting

effectiveness of PHR and to identify the measures that could be applied in managing identified challenges. Answers to these research objectives can be favourably achieved through the Delphi research method.

Experts panellists for the study were identified using the purposive-snowball sampling [43]. This was considering the specific features of the experts required for the research to be conducted. The features considered for experts selection was areas and country(ies) of experience, knowledge and expertise in post-disaster reconstruction and recovery projects in the built environment and stakeholder group/institution to which the participant belong. This was done so that participants can provide appropriate answers to the different issues from which questions were based. Experts panellists drawn for the studies were drawn from different geographical locations with wide-ranging experience in developing countries such as Bangladesh, Haiti, India, Indonesia, Iran, Maldives, Malaysia, Nepal, Pakistan, and Sri Lanka working with multi-lateral donor agencies, reconstruction management agencies, International Non-Government Organisations (NGOs) as policy-makers, practitioners and researchers.

Sample size for Delphi method studies varies markedly from one studies to the other. While some studies have had 4 participants, other studies have had as much as 171 panel of experts [38]. Thus, Delphi sample size is designed to fit the research questions and circumstance surrounding the studies (ibid). For this study, letter of invitation for experts participation were sent through email along with an carefully designed interview guide to 35 pre-identified experts. However, only 17 of the experts invited accepted the invitation and participated in the first round.

Preparing the instrument for data collection, an interview guide was develop and pilot tested following which the content of the interview guide were refined based on the feedback received. The interview guide was designed to elicit measures for managing the different issues affecting effective implementation of PHR programmes.

Data for the first Delphi round were collected through in-depth semi-structured interviews which were conducted using differing communication medium (emails, internet communication via Skype, telephone and face-to-face) based on the experts preference. The interviews which took an average of an hour were audio recorded with the permission from the interviewees. The subsequent data collection round will follow a structured questionnaire survey using a 5-point likert-scale to draw consensus on the answers provided from the previous interview round.

Recorded interviews were transcribed with relevant answers to the questions as identified and codified under pre-identified themes. from the analysis of the data, new themes of similar answers emerged. The data analysis were conducted with the aid of NVivo 11 which facilitated data coding and for assessing data analysis outputs.

4. Conclusion

Considering that there is no unanimous agreement as to the most appropriate approach for conducting disaster resilience research, there the need to formulate research design and strategy unique for every study. The consequence being the need for greater explanation of research methodological choices taken in such research in the discipline to ensure research rigour which is what this study have tried to do. To this end, this paper has reviewed the research methodology and explained the research philosophies, strategies and data collection and analysis of the methods applied for the development of a framework for managing post-disaster housing reconstruction programmes in developing countries. In the paper, we have presented the argument for assuming the pragmatist philosophical position towards achieving the research aim by selecting the multi-strategy approach of reviewing through multiple case-study literature and exploratory case study, conducting evidence-focused review and the application of the experts' opinions survey through the Delphi method in order to achieve the research aim.

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Appendix 4

PUBLICATION IV

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Article

Analysis of Measures for Managing Issues in Post-Disaster Housing Reconstruction

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Abstract: After large scale disasters, reconstruction is often initiated by stakeholders to minimize disaster impacts and to mitigate a recurrence. For most reconstruction programmes, priority is given to reconstruction of permanent housing in consideration of the multiplying effects of housing reconstruction on social and economic recovery and the development of community resilience. However, numerous challenges arise during implementation which have reportedly been poorly managed and this has resulted in the ineffectiveness of housing reconstruction programmes and the failure of housing interventions to achieve their intended goals. In previous, related research, the issues affecting the implementation of housing reconstruction programmes were identified and a conceptual framework proposed. This study systematically reviews the academic literature, case studies and working papers in order to identify measures that have been applied by managers of reconstruction programmes to overcome these previously identified issues. The measures identified will be used to develop the previously proposed conceptual framework and thus to enable data collection through an experts' opinion survey. Findings from the experts' opinion survey will, in turn, be used to deduce best practice measures for managing permanent housing reconstruction programmes. This study is intended to aid policy making by providing stakeholders with good practice measures for managing issues in post-disaster housing reconstruction. In addition, it improves the knowledge base by presenting current housing reconstruction management practices and recommending how they can be improved for better community recovery and resilience building after large-scale disasters.

Keywords: built environment; community recovery; disaster resilience; housing reconstruction; natural hazards; reconstruction management

1. Introduction

While scientific research on global vulnerability to hazards, risk reduction and disaster resilience is on the rise, disasters continue to have severe consequences such as deaths, huge economic loses and social disorder. Impacts of disasters on the built environment lead to homelessness, mass population displacements and increased mortality [1–3]. Following disasters, considerable resources are often channeled to the reconstruction and recovery of affected communities [4], a substantial part of recovery funds being invested in permanent housing reconstruction [5,6]. Aside from being a visible investment choice, the reconstruction of permanent housing is considered the most effective means to return affected communities to better livelihood conditions [7–9] and providing safe and more secure housing to live in after temporary accommodation [10]. The reconstruction of permanent housing aids the empowerment of communities through the development of local capacities towards building resilient communities [8–10]. In addition, it promotes the redevelopment of the physical and social environment and facilitates the recovery of affected communities [5,11,12]. Further objectives

for stakeholders' investments in housing reconstruction include the construction of hazard resilient structures, revival of household incomes, restoration of social order and the economic recovery of communities [12–14]. In summary, housing reconstruction, as a product, should produce good quality, resilient and acceptable dwellings [14] and, as a process, contribute meaningfully to the social and economic recovery and resilience development of beneficiary communities [15,16]. For the correlation between housing reconstruction and community recovery, see [17].

Due to the contextual characteristics of the post-disaster reconstruction environment and the outcome goals of most reconstruction programmes [18,19], a range of management issues arise in large-scale housing reconstruction programmes [18,20,21]. Implementing organisations' failure to adequately manage these issues results in the ineffective delivery of reconstruction programmes [22]. In earlier studies, we identified the management issues [18,23]. They include:

- Human resource issues
- Workmanship and quality management issues
- Monitoring and control issues
- Coordination and communication issues
- Logistics and supplies
- Health and safety issues
- Financial management

In the wake of calls for effectiveness in the management of large-scale housing reconstruction, the importance of drawing evidence-based measures from the literature to provide guidance for the management of (re)construction projects has been recognised [24]. Ulrich observed that a systematic review of the literature can provide information and insights into evidence-based measures to facilitate the fulfillment of stakeholders' expectations and achievement of projects' outcomes [25]. The identification and subsequent synthesis of evidence can inform the development of best practice measures [24] in order to provide effective guidance for the management of housing reconstruction programmes and facilitate the achievement of their intended outcomes.

This study involves a comprehensive desktop review of refereed articles, gray literature and case study reports from previous housing reconstruction programmes to identify measures applied in historical housing reconstruction programmes and to draw useful insights into the measures that could be applied to overcome the (previously identified) management issues that affect implementation of large-scale housing reconstruction programmes. The identified evidence of good management practice is synthesised and presented in the subsequent sections.

The methodology applied for this study is described in Section 2. The measures identified for managing each of the listed issues affecting housing reconstruction programmes' effectiveness as drawn from the literature are tabulated against their effects in Section 3. The synthesis of identified evidence measures is outlined and summarised process measures for managing each issue are presented as charts in Section 4. The conclusions drawn from the study are outlined in Section 5.

This study is premised on a trade-off between the centralized donor-led and beneficiary community driven, participatory approach [6] for large-scale housing reconstruction in low-income urban areas in developing countries.

2. Research Methodology

In conducting this study, a systematic literature search was conducted on six (6) selected electronic databases to collect journal articles, conference proceedings and case study reports on housing reconstruction programmes [18]. The databases were selected to ensure a wide collection of peer-reviewed literature. A combination of keywords generated from an overview of keywords used by peer-reviewed, case study literature on historical reconstruction programmes was used for the literature search. The search terminology as applied for title, abstract and keywords included: "permanent housing reconstruction programme" OR "post-disaster housing reconstruction projects"

OR "housing restoration projects" OR "post-disaster housing recovery projects" OR "post-disaster rebuild" OR "housing reconstruction management". Limiters such as publication year, subject areas, document type, source title, industry, database were applied. The publication year for database search was limited to articles before November 2016. The output of the search is as shown in Table 1.

Table 1. Search results from academic databases.

Database	Articles Retrieved
Scopus	210
Web of Science	123
EBSCO Host	150
Proquest Science (Journals)	121
Emerald	70
Science Direct	158

Collected articles were individually screened using their abstracts and, in other cases, the body of literature, to retrieve articles relevant to the study. Some articles collected through the keyword search were found to not be useful to the study as their content does not relate to the study focus. Articles identified as relevant to the study were exported into an EndNote X4 library.

Aside from the articles drawn from the academic databases, literature was also retrieved from a collection of humanitarian donor and practitioners' research networks. This was done by adapting the search terms used in the academic databases. Articles collected were screened for relevance and their citation details were entered into the Endnote library. The number of articles retrieved are as shown in Table 2. However, we observed that some papers retrieved from the databases had been earlier collected from the academic databases. With the aid of the EndNote software, duplicated references were removed. On deleting duplicates, 238 papers were established to be relevant to this study. Nonetheless, some literature that was found to be useful but not captured through the database search was also utilised. Of the 238 papers, some were left out because their focus was on temporary/transitional housing, while others were not used because the measures they identified were already captured. As a result, only 156 papers formed the body of literature. The distribution of the body of literature is as shown in Table 3.

Table 2. Distribution of literature retrieved from humanitarian practitioners' networks.

Name	Website	Literature Retrieved
Humanitarian library	www.humanitarianlibrary.org	88
ALNAP	www.alnap.org	40
ARUP	publications.arup.com	11

Table 3. Distribution of the body of literature.

Literature	Number
Journal articles	76
Conference proceedings	15
Books (including working papers and books from donor websites)	25
Reports	12
Humanitarian practitioner/donor websites	28

Subsequently, a comprehensive desktop study was conducted to identify the measures that could be applied in managing each of the issues affecting effective implementation of large-scale housing reconstruction. The identified measures and their corresponding effects were collated, synthesised and presented in the form of a chart representing the basic process for managing each of the issues.

3. Measures for Managing Issues in Permanent Housing Reconstruction

This section presents the measures that have been applied for managing each of the identified management issues that affect permanent housing reconstruction (as stated in Section 1). The tables below (Tables 4–11) present the measures and their effects on the achievement of housing interventions outcomes.

Table 4. Measures for managing human resource issues and their effects.

Measures	Effects
{Needs assessment/planning}	
Assess locally available skills and capacities [26] Plan construction team [27,28]	Identifies local skills constraints, aids effective utilisation of available resources/capabilities and facilitates the implementation of housing reconstruction programmes [14,26,27]
{Recruitment and alternative recruitment strategies}	
Mobilise and/or recuit local artisans, construction workers, volunteers and beneficiaries [8,14,29]	Expands skilled workers supply [14,29]; Reduces labour costs [21]; Facilitates indigenous skills and capacities [9,14]; Provides jobs and livelihood support for affected communities [9,14,30,31]; Enables acceptability and long-term sustainability [14,29,32]; Enables beneficiary satisfaction [5,16]; Aids the spread of scarce resources and minimises capital flight [33,34]; Enables beneficiaries to express their needs [35]; Enables knowledge transfer [16,36]; Requires long lead-time, delays production start-up and causes extended delivery period [37,38]; Slows construction speed [37,38]; Yields inconsistent housing quality [39,40].
Import workers [8,29,41]	Helps to meet expertise, skills and competency demands [42,43]; Increases reconstruction costs [44]; Stabilizes escalating workers' wages [45]; Exacerbates housing shortage and causes rental price inflation [46,47]; Discourages community participation and deprives locals of job opportunities [41]; Hinders acceptability, maintainability, socio-economic recovery and long-term sustainability of housing [8,35,48]; Deprives beneficiaries of a sense of ownership [8,35,45]; Reduces knowledge transfer [36].
Engage construction industry actors [49–52]	Provides skills, expertise, experience [42,53]; Facilitates reconstruction speed and efficiency [8,42,54]; Produces quality, resilient housing [8,42,53,54]; Helps meet skills and capacity demands [51–53]; Enables knowledge sharing and local capacity development [42]; Does not resolve underlying socio-economic issues [8,54]; Denies beneficiaries a sense of ownership, acceptability and long-term sustainability [8,35,45].
{Capacity development}	
Educate and develop skills and capacity of recruited workers [28]; Supervise and mentor workers [8,15]. Develop and utilise multi-skilled workers [58]	Expands skills supply, develops local capacities for effective engagement, project sustainability [8,31,32,55]; Aids effective knowledge transfer [56,57]. Reduces costs, requirement for workers and increases workers retention and earning potential [49,58]
{Motivation}	
Provide timely remuneration [15] and incentives [59]; Provide appropriate accommodation [43,46,60]; Recognise and engage workers [27]; Provide health and safety needs [61]	Inspires enthusiasm and enhances workers' performance [27,59];Enables retention of workers [27]

Table 5. Measures for managing workmanship and quality management issues and their effects.

Measures	Effects
{Capacity development}	
Assess and identify specific skill requirements and provide requisite skills development programme for local artisans and other workers [8,29,41,62]; Provision of special training workshops for supervisory (including beneficiary) and management personnel on project inspection, supervision and enforcement [37,62,63]; Provision of capacity development workshops for management personnel [64] Educate and sensitize participating organisations, artisans and labourers on compliance [62,63]	Helps to develop and deploy requisite skills and capacity required for good quality workmanship and management [8,29,37,41,62]; Enables effective supervision, early fault identification, quick remedial action and good quality workmanship [63]; Imparts requisite skills required for quality workmanship and management [8,36]; Enables adequate inspection at specified construction stages to ensure compliance to set standards [64]
{Establishment and enforcement of standards}	
Provide new/improved building codes and construction guidelines [8,57,62]; Provide technical construction guidance [8,44,57]; Constitute effective assessment procedure for issuing building permits [44,63]; Provide quality management plan, monitoring and control system [35];	Provides the minimum expected quality standards that ensure the construction of safe and resilient buildings [8,57,65]; Ensures compliance to standards [63] Assists in production quality monitoring and enhance quality workmanship [44] Helps to regulate the construction quality and reduce the vulnerability of buildings [35]
Select and utilise only good quality materials and components [61,66] Provide detailed construction documents and communicate changes [36,67]	
Establishment and adherence to quality management plan and quality assurance mechanisms [66,68];	
Provide adequate supervision and technical monitoring to ensure compliance and enforcement of standards and for quality control [8,36]; Provide adequate field inspection [44,69,70];	
Test material quality, check specifications and ensure adequate monitoring before issuing approvals or completion certificates [65,71].	
{Institutional arrangements}	
Ensure implementing organisations have requisite knowledge and competencies for effective housing production [72,73]; Establish procurement quality assurance mechanism [37]; Identify and review grey areas in contract procurement process [37]; Ensure compliance to conditions of housing contracts [37]; Accredit and certify organisations to participate in implementation [59,74].	Ensures competencies of implementing organisation [72,73]. Ensures organisations (NGOs) possess technical and managerial capacity for housing implementation [45,59,74].

Table 6. Measures for managing monitoring and control issues and their effects.

Measures	Effects
{Institutional/organisational arrangements}	
Establish multi-tiered institutional arrangements—dedicated management agency, area authority, local monitoring and control units at all organizational and geographical levels [57,60,62,75,76]; Deploy professionals and trained personnel and local representatives to monitoring units (i.e., local govts/NGOs) [77];	Serves as *project manager* with structure and arrangements to facilitate effective monitoring and control practices during reconstruction [60,78]. To provide high level quality monitoring and control for quality assurance [60]
Set-up monitoring committees/work groups at local community level [79];	Brings about better monitoring during production [57,80]
{Community participation}	
Constitute and deploy resident teams [80]; Ensure beneficiary participation in monitoring process to ensure that housing aligns with community needs and expected standards [15,45,81]	Facilitates monitoring and control at local level [80] Enables the alignment of buildings to beneficiary needs [15,82]; Ensures beneficiary satisfaction [60] Higher production rates, reduced construction time, better quality and acceptable housing [15,36,45,65,82]. Ensures transparency [60].

Table 6. *Cont.*

Measures	Effects
{Recruitment}	
Recruit and deploy experienced management personnel or experts with requisite technical managerial skills to adequately monitor and apply control measures in reconstruction [15,59,74].	Enables achievement of on-time quality housing delivery [59]; Experts are suitable to manage project monitoring, evaluation and control systems for assessing work progress and project control [83]
{Operational/implementation measures}	
Establish housing reconstruction programme/project implementation plans that include product quality management plan, timescales and cost plan [35]	Basis for monitoring progress [35,60]. Improved product quality and increase production output [85].
Provide adequate production plans [30,59,62,84]; Set-out activities with long-lead times [41,59,86]	Improves speed and efficiency of reconstruction process [85]
Supervisors should monitor implementation plans with local communities' participation [30,59,62,84];	Enables compliance specification, quality, design and integration of DRR measures [41,86]
Establish monitoring and control and evaluation systems [83]	Enables compliance with building codes quality standard, timescale [83]
Conduct technical inspection and assessment [8,64,83] Conduct technical auditing on new buildings [62,87]; Provide corrective measure guideline [62]	Ensures incorporation of risk reduction measures and provision of good quality housing [62]

Table 7. Measures for managing coordination and communication issues and their effects.

Measures	Effects
{Institutional arrangements}	
Create or strengthen existing central coordinating authority [76,88–90]	To coordinate stakeholders' activities for optimal pull, allocation and to ensure effective resource utilization [76,90–92]; To manage stakeholders and appropriately respond to their needs [19,75,93] and the development of strategies to overcome challenges [76]
Set-up multi-level institutional/organisational structure with units at different operational levels [75,76,88,89,94]	Enhances stakeholders' coordination [75,76,94,95]; Enhances the coordination of strategies and processes for information and communication management [75,76,94]; Enables decentralisation of institutional structure [75,76,94]
Identify and incorporate local level authorities [83], establish development authorities or committees at local/municipal levels [8,14,89]; Provide defined roles, lines of authority and functions for personnel [83] and mandates for stakeholders [96]	Enhances stakeholders coordination and management of reconstruction at local levels [8,14,95]; Facilitates local level cooperation, participation and long-term alignment [83,95]; Helps adapt the intervention to local needs and capacities [97] It helps to identify personnel and stakeholders responsible for different functions and responsibilities [98]
{Multi-stakeholder platform}	
Form/create a multi-stakeholder platform (MSP) or temporary organisation [99,100]	Serves as coordinating platform for participating stakeholders [101]; Enables collaboration of stakeholders with similar mandate and interests [99,100]; Enables participation of stakeholders, inclusiveness [93,102]; Ensures consensus on implementation approach [93,102]; Helps resolve resourcing challenges and to decide on better strategies to resolve emerging issues [32]; Provides a medium for participatory governance for the development of project implementation and monitoring system [101]; Minimises lapses and duplication of efforts to aid reconstruction efficiency [103]; Enhances transparency, accountability [104]; Enables information, knowledge and expertise sharing among stakeholders [60].
{Capacity development}	
Train and educate management personnel on coordination [37,88,105] Educate and sensitize stakeholders on governing rules and regulations [60]	Enhances stakeholder coordination [37,105]
{Needs assessment}	
Identify, analyse and categorise stakeholders based on their interests, challenges and interconnections with others [15,106,107]	Enables effective stakeholder engagement [15,106,107]; Helps to evaluate stakeholder needs and expectations for effective support [15,108]; Prevents misunderstandings in implementation [15,108];
{Strategic coordination measures}	
Provide strategic coordination systems [45]	Facilitates stakeholder coordination [45]
Engage independent third party consultant to monitor participating organisations' activities [76,82,84,90]	Minimizes redundancy, wastage and resource overlaps, ensures transparency and accountability [76,82,84,90]
Conduct regular review and document organisations' performance [76]	

Table 8. Measures for managing communication issues and their effects.

Measures	Effects
{Needs assessment}	
Conduct communication-based assessment (CBA) [109]	Determines stakeholders' perceptions, knowledge and expectations to provide effective communication strategy [109]; Helps to develop communication framework for stakeholder coordination [109]
Examine existing communication practices and needs of stakeholder groups [110];	Helps to better target communication content [110]
{Communication strategy}	
Determine communication objectives [110]; Develop communication framework/strategy [106,107,109]	Identifies the main stakeholders, determines stakeholder communication objectives, facilitates communication plans development and information dissemination and feedback channels [106,107,109]; To transmit vital information and knowledge needed to influence stakeholders' thoughts and actions [106,107,109]
{Institutional arrangements}	
Establish effective communication and information systems [75,88,91].	Promotes coordinated and collaborative working relationships [75,91]
Develop stakeholder communication plans [107,109];	Helps establish communication schedules, channels, outreach and methods [107]
Establish effective stakeholders communication channels [92]	Enables information dissemination to reconstruction stakeholders [92]
Collaborate with local organisations, structures and groups [110]	Ensures full community participation [110]
{Operational measures}	
Use range of communication channels [111]	
Conduct regular stakeholders meetings [112]	Enables presentation of progress and challenges with solutions proffered [112]
Seek communication feedback [110]	Helps to develop efficient strategy [110]

Table 9. Measures for managing logistics and supplies issues and their effects.

Measures	Effects
{Recruitment}	
Engage qualified and dedicated procurement experts to manage resource procurement [14,113,114]	Provides knowledge and expertise for effective management of resource procurement [113]
{Capacity development}	
Educate and provide continuous capacity training for procurement personnel on effective assessment and resourcing procedures [113,115]	Enhances managerial, technical and administrative procurement skills required to reduce resourcing challenges [113,115]
{Needs Assessment and planning}	
Assess resource requirements based on sufficient quality, availability, supply point and time of resource need [14,116]	Enables identification and selection of quality, sustainable and acceptable resources for procurement [14,117]; Enables scheduled and cost-effective resource delivery [118]
Engage locals in resource assessment [14]	Helps to draw knowledge on locally available resources [14]
Identify and mobilise for resourcing with long lead times [116]	Ensures on-time delivery of resources [116]; Mitigates disruption of production process and its negative impacts on project performance [117,119,120]
Map resource markets and make provision for price variations due to seasonal variations [26] and changing market conditions [35,41]	Aids effective resource delivery [35]
{Procurement arrangements}	
Procure resources from available local and regional markets [9,55,121,122];	Facilitates revitalisation of local materials industries, markets and transportation system [9,55,121,122]. Facilitates local materials usage and preserves cultural identity of community and local construction knowledge [115]. Helps to minimise emissions from transportation. Stimulates recovery of local economy [115]

Table 9. *Cont.*

Measures	Effects
Engage/incorporate locals in logistics and supply chain functions [26]	Creates multiplying effects for local population and helps reinvigorate local economy [26,115]; Creates basis for further investment in the local economy that helps to control material prices and minimise freight movements on roads [123]; Enhances local leaders' interest in the success of supply chain operations [124]; Provides information on local geological conditions that could impede effective resourcing [125,126].
Engage resourcing experts with adequate institutional arrangements [50–52]	Provides value for investment, saves time and costs [52]
Examine and certify supplier capacity [127].	Helps ensure supplier capacity to provide efficient delivery [127]
Provide information and communication systems [114,128,129]; Provide essential services support systems [41,52,113,130]	Facilitates communication between parties and location tracking helps to minimise logistics challenges [114,128,129] Facilitates market linkage and scheduled and secured resource delivery [114,128,129]
{Procurement approach options}	
Multiple source procurement (resource procurement through multiple suppliers)	Results in stiff competition among resourcing organisations and yields inflation in local economy [114,122,127]; Often results in poor performance [127];
Single source procurement [129]	Often provides effective supplier performance [109,131,132]; Provides efficient and safe delivery of large volume of resources for reconstruction [129]; Requires relatively longer delivery period at higher procurement cost [129]

Table 10. Measures for managing financial management issues and their effects.

Measures	Effects
{Needs assessment}	
Conduct needs assessment [14,62,84,90] Engage local communities in assessments [62] through ocal government/NGOs [8]	Identifies resource requirements for reconstruction [14,84,90,133]; Aids reconstruction resource mobilisation [82,83,109] Enables comprehensive community level assessments [62] and beneficiary satisfaction in financial support [8]
{Multi-donor trust fund}	
Establish a Multi-Donor trust fund (MDTF) [92]	Helps to pool donor financial pledges for reconstruction projects [92]; Improves coordination and effectiveness of reconstruction processes [83]; Helps minimise administrative costs [92]; Provides framework for utilisation of donor funds [92]
{Institutional/budgetary arrangements}	
Establishment of (independent or dependent) reconstruction management agency [83,134];	To make reconstruction funds more flexible and efficiently responsive to reconstruction needs [83]; Allows for efficient response to stakeholders' financial needs towards effective project implementation [83]
Provide housing reconstruction budget through communities' government's budget system [6,83]	Provides spending schedules and details Ensures transparency and accountability and donor confidence [6,83]
Establish special finance mechanisms to provide for flexible reconstruction funds disbursement [83]	Provides auxiliary mechanism for reconstruction financing other than government budgetary system [83] To provide effective disbursements and allocation of funds for reconstruction [83]
Commission international consultant to coordinate and monitor reconstruction financing [135].	Enables effective financial resource utilisation where disaster affects communities' institutional structures and/or capacities [83]
Confirm credibility, monitor and facilitate receipt of donor funds [29,83,136]	Mitigates delayed disbursements [56] Facilitates timely remittance of financial pledges and resource needs [83,136,137]
Provide financial monitoring, evaluation and control system [83,138] Provide independent monitoring mechanism [37] Incorporate municipal/area councils in financial monitoring and evaluation [138] Publicise financial evaluation reports [138]	Ensures transparency, accountability and probity [37,83,138,139]
{Operational measures}	
Establish accreditation system for financial accounting and reporting using standards [138];	Ensures transparency, accountability and probity in financial management [37,83,138]

Table 11. Measures for managing health and safety issues and their effects.

Measures	Effects
{Vulnerability assessment and hazard mapping}	
Undertake multi-hazard vulnerability assessment of reconstruction sites [63,140–142];	Helps to identify disaster risk factors, hazard types, their severity and the degree of exposure to them [63,140–142]; Helps in the development of effective building codes and regulations to guide design and development [63]
Map hazards [63,140–142]	Identifies vulnerable areas within communities [109,141]
Involve and ensure active participation of local community in vulnerability assessment and hazard mapping [142,143];	Helps to grow local capacities for the development of technically sustainable and acceptable solutions [142,144]; Improves local management attitudes and enables risk reduction behaviours and long-term cost effectiveness [144]; Helps communities anticipate, respond and accept assessment outcome and risk reduction measures [143,145]
{Establishment and enforcement of codes}	
Provide legislation and regulations governing land-use and building development [94,141] Ensure compliance with land-use regulations [84,94,141] Apply land use planning/zoning [146]	Encourages application of land use acts and building regulations [141]; Defines the public's role in ensuring the safety of buildings and the environment [141] Serves as a risk reduction measure that provides public safety and protection of the environment [147] Helps to restrict development in vulnerable areas and to mitigate severe exposure to disaster risk [140]
Relocate communities to safe areas [71,140,148]	Addresses severe exposure to ongoing risks and high degree vulnerability to disruption [71,140,148]
Consider geological nature of resettlement site, access to sources of livelihood, social and physical infrastructure and safety prior to relocation [14,148,149]	Enhances acceptability, facilitates community recovery and helps to reduce disaster risk [35,150]
New or improved building codes and guidelines [53,94,140,147].	Provides guidance for design, material selection and production management practice to improve structural quality and building performance [53,94,140,147,151]
Ensure compliance to building codes and guidelines and quality assurance mechanisms through regular material quality testing [63].	Provides much needed safety of buildings and beneficiaries and protects critical assets within the communities [141] Enables buildings to withstand exposure to hazards [141]. Provides confidence and assurance to investors on sound investment decisions [141]
{Operational measures}	
Provide supervision, inspection, monitoring and enforcement [63,71]	Ensures housing production quality does not compro- mise the codes, guidelines and designs provided [63,71]
Deploy health and safety personnel to assess salvaged materials [112]; Communicate health and safety concerns and measures [9,112]	Reduces exposure of construction team and beneficiary community to health and safety risk [112]
Ensure adherence to regulations on the use of hazardous materials [121] Educate workers health and safety risk Ensure use of PPE [121] Identify risk zones and place signs [121]	Promotes safer reconstruction and protects the public from hazard exposure [121] Mitigates accidents, injury or loss of participants [152]; Protects workers from exposure to site hazards [121] Mitigates health and safety risks [121]

4. Discussion

Tables 4–11 contain the management measures referred to in the literature reviewed. In addition to these measures being grouped according to the seven previously identified management issues to which they correspond, they have also been tentatively classified within the tables according to the types of measures (needs assessment, recruitment, capacity development, operational measures, etc.) The intended purpose of the above tables is to directly report the measures as captured from the literature. There are undoubtedly gaps in this list of measures and these would need to be filled in order to describe a complete process of measures (i.e., a framework for management).The listed effects of the identified management measures that have been captured from the literature and therefore appear in Tables 4–11 are even less likely to be comprehensive. We note that some measures (e.g., 'Import workers' in Table 4) seem to invoke a relatively large number of effects, some of which are positive and others negative, while other measures (e.g., the 'Motivation' measures in Table 4) have relatively few listed effects for a larger number of measures. It seems that this ratio of effects to measures provides a rough guide to indicating how strategic the measure is. A highly strategic

measure will be one which has many effects on the outcome of the reconstruction initiative while a less strategically significant measure will be one of a number of measures which may be taken to increase or reduce a particular effect on the overall outcome. This suggests a hierarchy of measures in terms of their effects.

In the following sub-sections, the measures are discussed in more detail and an attempt is made to organize them into management processes to deal with each of the seven identified management issues. These proposed processes take account of the temporal and hierarchical differences in the measures identified. They are represented in both narrative form and in flow charts. As many of the measures tentatively classified as 'Operational measures' in Tables 4–11 would be considered standard good practice in the management of construction projects (e.g., 'Establish project implementation plans that include product quality management plan, schedule of activities and cost plan' in Table 6), the proposed management processes refer primarily to the measures which enable the reconstruction production process and that are specific to the post-disaster context. Normal good practice measures for the actual production process of reconstructed housing are assumed to be followed within the reconstruction production process.

4.1. Measures for Managing Human Resource Issues in Reconstruction

Effective measures for managing human resource issues in reconstruction commence with the engagement of human resource experts with experience in housing reconstruction to conduct an assessment and planning of human resources requirements (both skilled and unskilled) that would facilitate the production of permanent housing.

Depending on the context, a number of strategies could be applied in resolving human resource needs for quick construction of resilient, sustainable and acceptable housing. These strategies include:

- Mobilisation and recruitment of local builders, skilled artisans, volunteers and/or beneficiaries;
- Engagement of construction industry actors, especially those in the reconstruction area who can utilise their connections to recruit skilled workers;
- The importation of skilled workers and experts; and,
- Development and utilisation of a multi-skilled labour strategy.

Regardless of the measures applied in sourcing for workers, workers' capacities should be developed to ensure they are adequately skilled to meet the emerging demands for production and long-term sustainability of the buildings. This can be achieved by providing education, training, sensitisation workshops and on-the-job mentorship. In this way, workers can develop requisite skills and competencies and they should be sensitised on the need to ensure the incorporation of risk reduction measures during housing production.

To invigorate workforce performance, workers should be motivated. This should inspire enthusiasm, enhance efficiency and greater performance and ensure their retention within the reconstruction organisation and area.

From the synthesis of evidence, Figure 1 shows the summarised process measures for managing human resource issues in large-scale housing reconstruction programmes.

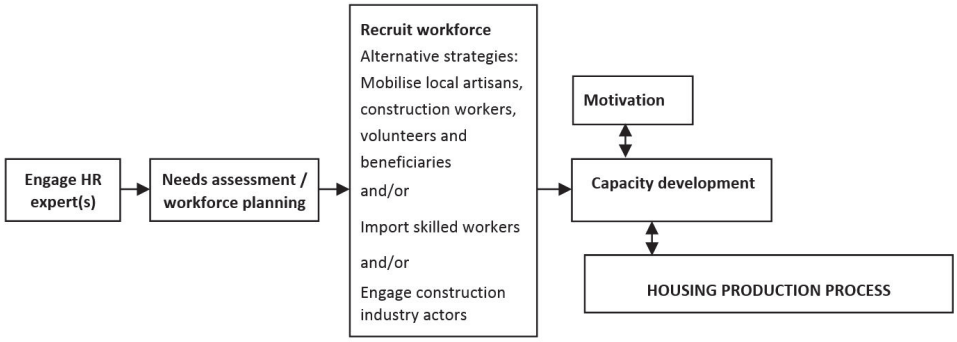

Figure 1. Measures for managing human resource issues in reconstruction.

4.2. Measures for Managing Workmanship and Quality Management Issues in Reconstruction

To ensure good workmanship and housing quality in reconstruction, it is crucial to conduct adequate assessments and identify the skills required for housing production prior to recruitment or the mobilisation of workers. For workers to meet emerging challenges and achieve set standards, training, up-skilling and technical skill development programmes should be provided for new recruits, artisans and other workers. Furthermore, special training should be provided for supervisory personnel including representatives of beneficiary communities to enhance their supervisory skills and to enable fault detection and swift corrective action. Capacity development and sensitisation workshops should be organised for inspectors and other management personnel to ensure quality inspection of work and compliance with guidelines and associated project requirements. It is also important that implementing organisations, artisans and labourers are adequately educated and sensitised on the importance of compliance to set standards.

As a measure for good workmanship and quality housing, the reconstruction management agency should provide new or improved building codes, technical construction guidelines, specification and quality management standards that show the minimum acceptable quality standard to ensure the provision of safe and resilient housing. Compliance to codes and guidelines must be ensured by setting out effective assessment procedures and systems for issuing building permits, approvals and completion certificates. Besides this, technical construction guidance should be provided with adequate field inspection including by beneficiary representatives during implementation to ensure compliance with construction standards. An effective quality management system which includes quality management plans and monitoring and control systems should be provided to ensure housing quality.

Considering the importance of providing detailed reconstruction documents and their effects on workmanship and construction quality, reconstruction organisations should be provided with detailed construction documents while updates or changes are effectively communicated to the site. Moreover, management and the implementing organisation should ensure the provision and utilisation of good quality materials and components to aid good workmanship and housing quality.

Quality management plans and quality assurance mechanisms including measures such as materials testing and specifications checks, workmanship quality control, adequate inspection and supervision by supervisory personnel should be provided.

It is crucial that implementing organisations have the requisite knowledge and competencies to avoid poor tendering and contract procurement processes. A procurement quality assurance mechanism should thus be established to identify and review grey areas in contract procurement processes and to manage the delivery of projects where contracts are awarded. In addition, organisations involved in the reconstruction should be accredited to ensure they possess the basic technical and managerial capacity required for participation.

Based on the synthesis of evidence, a summarised process of the measures for managing workmanship and quality management issues in large-scale reconstruction is shown in Figure 2.

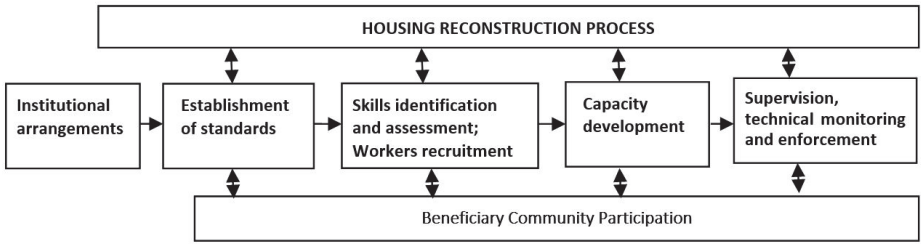

Figure 2. Measures for managing workmanship and quality management issues in reconstruction.

4.3. Measures for Managing Monitoring and Control Issues in Reconstruction

For large-scale housing reconstruction, multi-tiered institutional arrangements that facilitate monitoring and control effectiveness should be established. The institutional structure could be in the form of a dedicated management agency, regional authority, local monitoring and control units or committees at different organizational and geographical levels to enable effective monitoring and control of housing reconstruction. Experienced and trained personnel should be deployed across the structure to ensure effective monitoring and control during implementation.

Considering the importance of community participation in ensuring the alignment of reconstructed housing with the beneficiaries needs, community representatives should be engaged in the monitoring and control processes. Beneficiary participation facilitates the production of good quality and resilient housing, helps to monitor the implementation timeline and thus accelerates the housing implementation process and increases production.

Subsequently, monitoring and control during production can be ensured by establishing an effective monitoring, control and evaluation system to ensure better compliance to standards. The system may include local level work groups that monitor and evaluate housing production processes. The evaluation conducted by local level groups helps to achieve better project monitoring which often results in improved housing quality and reduced production time while ensuring the inclusion of the beneficiaries in the production and decision-making processes regarding their housing.

Implementing organisations should ensure that personnel deployed for monitoring and control are adequately skilled, experienced and certified to ensure monitoring and control effectiveness. The deployment of expert personnel for monitoring and control ensures adequate assessment of implementation plans, work quality and progress. Experts will tend to identify early warning signs and will provide measures for effective control towards timely, good quality and resilient housing delivery.

Implementation plans with realistic work schedules, quality management plans and budgets should be provided to serve as a tool for progress monitoring based on timeliness, resource utilisation and achievement of expected outcomes. In the development of production plans, activities with long lead times or affected by seasonal changes should be adequately considered.

As a measure for monitoring and control, technical inspection and assessment should be conducted to ensure compliance to building codes, construction guidelines and specifications at specified work stages before granting approvals or completion certificates. Besides, technical audits should be conducted on the buildings to ensure conformance to standards while corrective measure guidelines are drawn and implemented to effect corrections on defective buildings.

Figure 3 shows the summarised measures for managing monitoring and control issues in large-scale housing reconstruction.

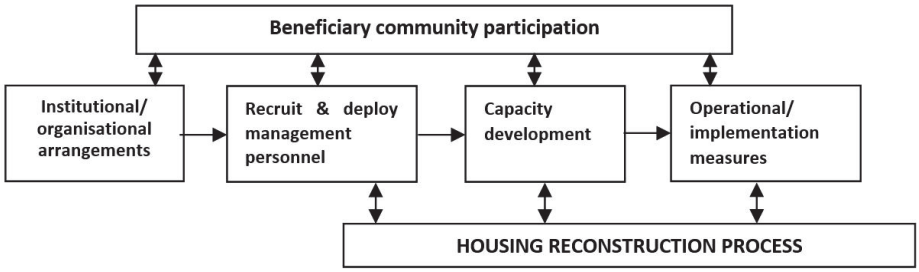

Figure 3. Proposed measures for managing monitoring and control issues in reconstruction.

4.4. Measures for Managing Coordination and Communication Issues in Housing Reconstruction

To coordinate the multitude of stakeholders involved in housing reconstruction, a central coordinating body in the form of a reconstruction authority should be established or strengthened to manage stakeholders' activities for optimal resource pull, allocation and utilisation and to agree on effective strategies to overcome emerging reconstruction challenges. The management agency should possess a well-defined institutional structure with operating units at different geographical and operational levels to enable decentralisation and effective stakeholder coordination and to enhance communication to participating stakeholders. Development authorities and/or committees may be established at municipal level to facilitate local community cooperation, engagement and participation and to ensure engagement of beneficiaries in the programme. Functions and lines of authority should be assigned and defined to operational level personnel to enable effective engagement and response to stakeholder needs.

Considering the importance of knowledge, skills and the capacity of personnel deployed for coordination, education, training and capacity development programmes should be provided for coordinating personnel to enhance their engagement and response to stakeholders and to enable them to make effective operational decisions in coordination. Sensitisation and enlightenment workshops should be conducted for stakeholders to understand the regulations and rules governing their activities and involvement in the housing reconstruction programme.

With the participation of several stakeholders often with varied mandates, interests and functioning levels, a multi-stakeholder platform (MSP) should be formed to ensure stakeholders collaboration and facilitate consensus building regarding the structure and the implementation strategy. The formation of an MSP would ensure the inclusiveness and active engagement of stakeholders towards the achievement of the housing interventions' intended outcomes. MSPs ensure participatory stakeholder governance that helps to resolve resource management challenges and enables operational efficiency, transparency and accountability.

For effective stakeholder engagement, it is important to identify, analyse and categorise stakeholders based on their interests, challenges and interconnections with other stakeholders. A critical analysis of stakeholders enables effective evaluation of stakeholder needs and expectations and helps to prevent potential misunderstandings among stakeholders.

Subsequently, a needs assessment should be conducted to identify resource requirements for housing reconstruction and to aid the development of a strategic reconstruction plan, coordinating and monitoring systems that identify and appropriately respond to stakeholder needs.

Tasks and responsibilities should be allocated to participating organisations and personnel and their performances should be regularly reviewed and appropriately documented. Moreover, independent third-party professional consultants should be engaged to monitor stakeholders' activities to minimise redundancy, identify overlaps and waste of allocated resources and to ensure transparency and accountability.

Communication-based assessment (CBA) should be conducted to determine the perceptions, knowledge and expectations of key stakeholders so as to enable the development of a communication framework or strategy for effective stakeholder coordination.

An effective communication framework would identify the key stakeholders involved, determines communication objectives, facilitates the development of effective communication plans and would also identify appropriate channels for effective information dissemination and for the receipt of feedback.

An effective communication plan would include a stakeholder engagement plan, communications strategies, establishment of communication schedules, channels, outreach and adequate methods for stakeholder communication. It is, therefore, important for the reconstruction management agency and organisations to determine appropriate channels through which information reaches stakeholders, especially the beneficiaries.

A number of communication channels could be utilised depending on the stakeholders to be communicated with, the timeframe and expected results. Communications channels that could be used may include media channels and face-to-face communication. Collaboration with local organisations, community structures and groups would enhance effective communication with beneficiaries. It is important that feedback is adequately communicated to help in the development of better strategies and to achieve the intended outcomes of housing interventions.

A summarised process for managing coordination and communication issues in housing reconstruction is presented in Figure 4.

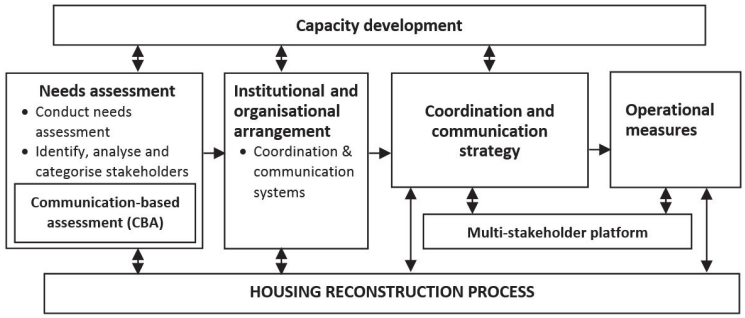

Figure 4. Measures for managing coordination and communication issues in housing reconstruction.

4.5. Measures for Managing Logistics and Supplies in Housing Reconstruction

One of the consequences of disasters is its impact on local construction markets that often results in resource scarcity and a hike in prices that affects availability of materials for reconstruction [119,153]. Besides, the disruption of transportation systems and networks compounds resourcing challenges in large-scale housing reconstruction [113,120]. It is, therefore, imperative that logistics and supplies are adequately managed to facilitate effective housing implementation.

In managing resource logistics and supplies in housing reconstruction, it is pertinent to engage dedicated in-house experts to oversee the management of resource supplies through effective assessment, planning, procurement, delivery and the management of resource needs for reconstruction [113]. Engaged experts would identify construction materials, components and equipment requirements especially those with long lead times, while their quantity, location and the timing of resource needs is established. Subsequently, adequate budgetary provision should be made with consideration for price inflation due to changing market conditions. Capacity development programmes should be organised for procurement personnel on effective assessment and resourcing procedures and on managerial, technical and administrative procurement skills required to minimise resourcing lead times, procurement costs and on networking with key resourcing stakeholders.

Considering the complexity and variability of the reconstruction environment and the impacts of disasters on construction markets, a critical assessment of the local availability of resources should be undertaken to determine the availability and sufficiency in quantity, their environmental implications and cultural acceptability, resourcing and distribution costs and affordability, while markets for which resources are available are mapped. A thorough assessment would provide information on capacity of available markets to meet supply requirements and possible embargoes or legislation that may affect resourcing. Assessment outcomes should provide information on the robustness or vulnerability of transportation infrastructure systems and their impacts and possible alternatives. Resourcing assessment would also identify resourcing limitations and the need for strategic interventions such as key material importation and improvements in local manufacturing capacity to enhance logistics and supplies for reconstruction. Close consultation with the local communities during assessments is crucial in order to draw information and knowledge of the local community and environment.

Adequate planning is crucial for effective logistics and supplies operations that would ensure resource availability, quality and selection of acceptable resources, cost-effectiveness in supplies and scheduled delivery of resources. In planning for supplies, resource requirements should be identified and established based on specification, quantity, supply points and time of need, while resources with long lead times should be identified and prioritised. Adequate budgetary provision should be made with consideration for contingencies that may arise due to increasing demands and changing market conditions.

Due to the interrelationships between housing reconstruction, livelihood provision and socio-economic recovery of beneficiaries, resources should be largely procured from available local and regional markets considering its effects on local materials production, revitalisation of local industries, markets and the transportation sector. Locals should be engaged in resource logistics and supplies to boost the recovery of the affected local economy as witnessed during reconstruction in Kosovo [115]. The engagement of local suppliers in housing reconstruction has tremendous benefits for the local community including job creation and income generation. It reinvigorates the affected economy while encouraging further investments for community development to be created due to continuous resource demand beyond the capacity of local markets. Evidence has shown that resourcing from local markets facilitates the use of local materials which is most desirable considering socio-cultural appropriateness, acceptability, ease of maintainability and long-term sustainability [14]. The expansion of the local construction materials industry helps to control local material prices and minimises the movement of freight on roads [123].

Considering that resource procurement for large-scale housing reconstruction comes in significant quantities and the inability of local markets to cope with demands [14], the challenges of inflation in the local economy or stiff competition among multiple suppliers/resourcing organisations which often results in poor supplier performance and with severe consequences for housing programmes' success [114,122,127]. It is, therefore, imperative that only experienced logistics and supplies experts with adequate institutional arrangements and capacity are engaged to ensure quality and scheduled resource delivery, save time, costs and provide value for donor funds. Single source suppliers to be engaged for large-scale housing should be examined and certified to have adequate capacity for efficient delivery. The examination of the supply could be based on previous experience and performance, communication efficiency, quality and timely resource delivery [127]. Some advantages of the single source resourcing approach include supplies efficiency, safe and protective delivery of large volumes of resources for reconstruction, restraint on unnecessary bureaucracy in logistics and a simplified supply chain. Nonetheless, the single source resourcing approach could be disadvantageous to organisations managing small sized housing due to the relatively longer delivery period and higher cost required for resource procurement [129].

Figure 5 shows a summarised process of measures for managing logistics and supplies in large-scale housing reconstruction.

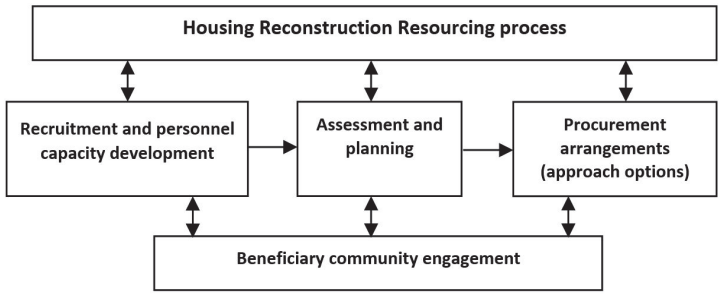

Figure 5. Measures for managing logistics and supplies in housing reconstruction.

4.6. Measures for Managing Financial Management Issues in Housing Reconstruction

Following large-scale disasters, external support is often sought by the government of affected communities from the international community, funding agencies and local organisations to provide recovery assistance in the form of outright gifts, donor funds, grants and long term loans for reconstruction. Despite the well-meaning intentions of the funding bodies, financial management in reconstruction has been problematic with consequences for housing reconstruction effectiveness.

Prior to implementation, a needs assessment is conducted to identify resource requirements for the reconstruction programme. The needs assessment is used by stakeholders to estimate and mobilise resources for reconstruction. However, the needs assessment does not reflect the financial estimate required for housing implementation. As a result, a housing reconstruction budget should also be drawn.

To minimise delays often encountered when utilising government budgetary systems, government's financing systems should be assessed to ascertain budget implementation, funds disbursement procedures and flexibility to enhance the reconstruction process [83]. An independent reconstruction management agency could be established to make reconstruction funds flexible and responsive to reconstruction needs or the creation of a different budgetary system for reconstruction operating outside the government budgetary framework that allows for effective response to financial needs. Special finance mechanisms can also be deployed to allow for the flow of reconstruction funds and to mitigate disruptions during housing implementation. Where disaster effects take a toll on affected communities' institutional capacities, international consultants may be commissioned to coordinate and monitor reconstruction financing for effective utilisation [135].

To finance large-scale reconstruction, the World Bank, on the advice of the government of affected communities, may establish a Multi-Donor Trust Fund (MDTF) to pool donor pledges to effectively finance reconstruction projects. Funding agencies also often recommend the provision of housing reconstruction budgets through governments' budgetary systems to ensure transparency, aid accountability and to inspire donor confidence. However, most government's budgetary systems are not flexible enough to allow for the rapid disbursement of funds that facilitates the housing reconstruction process. Moreover, housing reconstruction spending schedules rarely align with government appropriation cycles and this often causes disruption of the housing implementation process. The delayed financial disbursements and non-remittance of financial pledges by donors discourages the participation and cooperation of other stakeholders, affects phased resource procurement, impedes housing reconstruction start-ups, delays project implementation and subsequently affects quick recovery of communities. As a measure to minimise delay in remittance of donor pledges, the reconstruction agency should confirm credibility, monitor and facilitate timely receipt and disbursement of donor funds to mitigate disruption during housing implementation.

Corrupt acts, for example the misappropriation of funds, kickbacks for contract awards, bribing local communities to influence their acceptance of poor construction quality, are frequently perpetrated

in reconstruction and they result in severe loss of scarce resources [5,154,155]. Transparency, accountability and trust on the part of reconstruction organizations are an essential basis for donors to provide reconstruction funds. For accountability, transparency and effective management of donor funds, local councils and community representatives should be involved in financial monitoring and evaluation. Detailed financial evaluation reports and receipts should be publicised by reconstruction organisations while independent monitoring mechanisms are instituted to ensure transparency, accountability and probity. Organisations managing reconstruction must demonstrate value for money through the scheduled completion of the housing project within acceptable standards.

Operational measures to mitigate misappropriation and corruption in reconstruction should be established and this may include the provision of incentives for personnel involved in reconstruction as rewards for a corrupt-free project, continuous assessment of corruption risk throughout the reconstruction programme, the creation of a unit with motivated personnel within the reconstruction management structure to monitor resource utilisation, investigate and penalise corrupt and fraudulent practices, blacklisting and debarment of organisations or personnel guilty of corruption or fraud [156]. Also, the adoption of the "whistleblower" mechanism, where confidentiality and protection is offered to personnel that report corruption.

Based on the synthesis of evidence, the process measures for managing financial issues in large-scale housing reconstruction are presented in Figure 6.

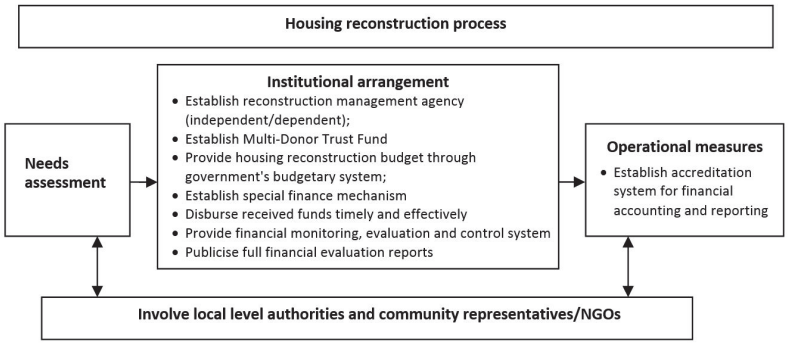

Figure 6. Measures for managing financial issues in large-scale housing reconstruction.

4.7. Measures for Managing Health and Safety Issues in Post-Disaster Housing Reconstruction

Several concerns arise in the post-disaster context including those of health and safety of buildings, reconstruction workers and beneficiary communities. To improve safety and health in reconstruction, an integrated approach is required.

Applying an integrated approach to ensure the safety of buildings and the community from vulnerability to natural hazards involves undertaking a multi-hazard vulnerability assessment to identify underlying disaster risk factors, types of hazards, their severity and the degree to which the reconstruction site is exposed to hazards. Hazard mapping helps to identify and prioritise highly vulnerable communities for possible retrofitting or eventual resettlement. The assessment and evaluation of underlying risk factors and lessons learnt from the behavior of affected buildings due to disaster effects and outcomes of diagnostics surveys aids the development of effective building codes and regulations that guide the development of safe and resilient housing. However, beneficiary communities' representatives should be trained and engage in vulnerability assessment and hazard mapping in order to build local capacities for the development of technically sustainable and acceptable solutions that can sufficiently respond to health and safety risk and in creating local community cultures and management approaches towards cost effective risk reduction.

To better translate vulnerability assessment and hazard mapping into risk reduction and subsequently a resilient and safe community, adequate land-use and building development legislation and regulations should be provided to encourage and enforce the implementation of land use and building regulations and to define the role of the community in ensuring the safety of buildings and the environment especially at the project level through land-use practice.

Land-use practice should be applied as a risk reduction measure to ensure public safety and for the protection of the environment against exposure to hazards [147]. Land-use practice concerns the application of the provisions and regulations for zoning and land use planning control development in areas considered vulnerable [146]. Where communities are severely exposed to disaster risk, and as a last resort, government may introduce restrictions (buffer-zoning) and/or outright relocation of communities to safe havens. However, beneficiary communities should be adequately consulted and engaged in the hazard assessment and resettlement process to buy into the relocation. The involvement of beneficiary communities in the decision-making process would enable acceptability, long-term sustainability and success of a resettlement programme. For successful community relocation, measures such as geological studies and vulnerability assessments should be conducted and the issues of community safety, access to economic and livelihood opportunities, proximity to social infrastructure, physical security and safety of the relocation settlement must be adequately considered prior to relocation.

Rather than reproduce buildings to pre-disaster conditions, communities' exposure to health and safety risk should be mitigated through structural quality improvements and performance of buildings such that they resist the effects of exposure to hazard and do not harbour health and safety risk. To mitigate safety risk in housing reconstruction, effective regulations such as improved building codes and construction guidelines that guide building design, material and component selection and improved building production and management practice should be provided. The application of effective codes minimises human casualty and economic losses resulting from natural hazard exposure. Reconstruction agencies and management organisations should ensure compliance to standards by establishing quality assurance mechanisms that ensure the integration of established risk reduction measures during housing production and that housing quality does not compromise the approved codes, guidelines and designs provided. Compliance to design standards provides investors' confidence in housing reconstruction investments.

Salvaged materials and components are often put to use in housing reconstruction [8,9]. Some of the salvaged materials may contain hazardous substances that emanated from disaster conditions and which pose a health risk to reconstruction workers, beneficiaries and the environment [38,41]. To manage the exposure to such risks, health and safety experts should be deployed to reconstruction sites to assess salvaged materials and the reconstruction environment. Thereafter, identified health and safety concerns should be adequately communicated with precautionary measures proffered to the reconstruction management team to ensure hazard mitigation. Additionally, reconstruction organisations should ensure strict adherence to local building regulations and environmental codes on the use of certain materials to ensure the health and safety of workers and the beneficiary community.

To ensure safety in housing reconstruction, workers should be educated and equipped with the skills and knowledge required to mitigate health and safety risk. The capacity of workers should be enhanced regarding the social and technical requirements of reconstruction tasks and appropriate tools and equipment should be provided to enable workers to conduct their assigned tasks in a safe and effective manner. Personal Protective Equipment (PPE) to protect workers from exposure to on-site health and safety risks should be provided and their use enforced. Besides, risk and safe zones should be identified while signage detailing health and safety concerns are appropriately provided. As a further measure, insurance coverage should be provided for workers against any potential hazards to minimise the impact of losses that may occur.

From the synthesis of the collected evidence, we present the process of measures for managing health and safety issues in large-scale housing reconstruction in Figure 7.

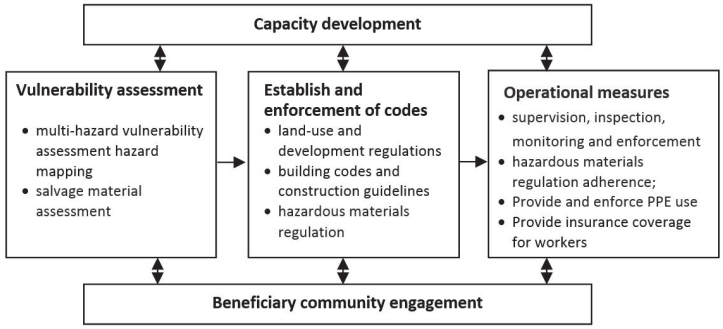

Figure 7. Measures to manage health and safety issues in post-disaster housing reconstruction.

5. Conclusions

Large-scale permanent housing reconstruction programmes are typically initiated to cushion the effects of disasters on housing and to facilitate the recovery of affected communities. However, particularly in developing countries, the implementation of housing interventions has often been ineffective and their intended outcomes have not been achieved. In earlier research, the ineffectiveness and failures of housing interventions have been linked to certain, specific management issues that arise in the context of post disaster reconstruction. The target of this study was to identify the measures that could be applied to manage these identified issues.

A comprehensive desktop study and synthesis of evidence from the literature enabled the identification of a number of measures that could be applied by management and implementing organisations to overcome the issues affecting housing reconstruction effectiveness. Four key measures for housing reconstruction programme effectiveness were drawn from the study:

1. Conducting assessments to determine the management needs that will enhance the housing reconstruction process and the achievement of the projects' outcomes;
2. Establishing and/or strengthening institutional and organisational structures and arrangements with adequately capable personnel deployed to effectively manage the processes involved in housing reconstruction;
3. Building the capacities of the participants involved in the reconstruction process, in particular, the management personnel and the beneficiary community to enable them to develop the requisite competencies for effectively managing the process and for the development of sustainable sources of livelihood;
4. The construction of resilient and acceptable housing to ensure disaster risk reduction, facilitate beneficiary community recovery and ensure the long-term sustainability and effectiveness of the housing programme.

Evidence also shows the importance of beneficiary engagement and participation in the housing reconstruction processes ranging from beneficiary involvement in the decision-making and implementation processes to participation in the building of their own houses to ensure resilience of the buildings and the recovery of beneficiary communities. The study relates to participatory large-scale permanent housing reconstruction programmes in low-income urban communities in developing countries.

The next stage of this research will subject the measures identified in this study to a validation process on the basis of expert opinion. It is intended that the resulting, validated measures will enable the development of a framework for the effective management of post-disaster housing reconstruction programmes.

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Author Contributions: Abdulquadri Ade Bilau is a PhD student and Emlyn Witt and Irene Lill are co-supervisors of his research. The overall research concept was developed in joint consultation and discussion. For this particular article, Abdulquadri Ade Bilau was the main author, Emlyn Witt assisted in developing the overall logic and structure of the article, writing some of the text and editing the manuscript. Irene Lill facilitated the research and the publication of this paper.

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Appendix 5

PUBLICATION V

Publication V

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Practice Framework for the Management of Post-Disaster Housing Reconstruction Programmes

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Abstract: Despite an international consensus for housing to be "built back better" (BBB) following disasters, and the considerable resources expended on reconstruction efforts globally, the management of post-disaster housing reconstruction programmes often leaves much to be desired. This research presents a framework for the management of post-disaster housing reconstruction in developing countries based on a comprehensive identification of the issues affecting the management of reconstruction programmes and the management measures which have proved effective in mitigating these issues and achieving the desired BBB outcomes. The framework highlights the strategic importance of preparedness measures that should be taken before the next disaster strikes and the cross-cutting nature of capacity building and beneficiary community engagement measures that are essential to all stages of the post-disaster reconstruction process. The research findings are limited to developing countries, as the evidence on which they are based is almost entirely from post-disaster housing experiences in the developing world. The framework may, however, be adapted to different, specific post-disaster reconstruction contexts. This research has compiled, extended and up-dated current knowledge regarding the management of housing reconstruction programmes and it provides practical guidance for policy makers and practitioners.

Keywords: developing countries; disaster resilience; housing reconstruction; natural hazards; reconstruction management

1. Introduction

Disasters damage the built environment. The extensive destruction of houses and infrastructure is accompanied by fatalities and injuries, loss of livelihood sources and the stagnation or reversal of local economies [1]. Housing is the most valuable social and economic asset [2,3] and is an essential loss component in disasters, particularly in developing countries [4–7], where affected communities become susceptible to homelessness and severe humanitarian conditions.

Housing is particularly affected by disasters [8] and, coupled with its centrality to humanitarian and international development concerns [9,10], substantial resources from multiple sources are channelled to post-disaster reconstruction [7] with a significant portion of these allocated to permanent housing reconstruction (PHR). Apart from being a visible investment choice, PHR is an effective means to provide safety and security, and to restore dignity and better livelihood conditions to mitigate the suffering of affected and/or displaced communities [11–14]. It typically follows the provision of emergency shelter, temporary shelter and temporary and transitional housing [15,16]. Post-disaster housing reconstruction extends beyond the traditional replacement of damaged or destroyed housing stock to produce dwellings [11,17]. It is a significant process fraught with complexities, challenges and uncertainties that requires an integrated plan and a coordinated chain of activities and stakeholders [5,18–20] in order to facilitate the quick production of safe, liveable and

acceptable disaster resilient housing and community recovery [21–23] in the chaotic, dynamic and complex reconstruction environment [24–26].

As a process, PHR is required to facilitate "build back better" (BBB) through the reduction of underlying disaster risk factors, building and strengthening local capacities for resilient development, enabling social and economic recovery of affected communities at all levels, and supporting the long-term sustainability of the PHR outcomes [13,27–29]. These outcomes include: technical aspects—local capacity to ensure resilient development, and maintenance of existing structures [30]; social aspects—sustenance of values (including culture and belief), and networks that enable social progress [31,32]; economic aspects—sustained livelihood provision and local economic growth; and, environmental aspects—effective protection and sustainability of the reconstructed settlement and environment [31]. Long-term sustainability of PHR programmes also relates to institutional aspects that enable the provision of effective and continuous assistance or support (information, education, technical assistance, etc.) [10,33], and should be sustained following reconstruction for over 10 years [32,34], in line with the expectations of the Sendai Framework for Disaster Risk Reduction 2015–2030 [35].

Housing evaluation reports [36,37] and studies [7,38] have identified PHR as ineffective and one of the least successful humanitarian sectoral interventions. This has led to calls for appropriate measures and strategies to guide policy-makers and practitioners towards achieving effective PHR programmes [38]. In this regard, a few studies [32,39,40] have proposed models or frameworks for post-disaster reconstruction to enhance community resilience to disasters. Specifically, [39] conceived a housing reconstruction model for community involvement in post-disaster housing recovery processes based on experiences from Turkey. Ref. [32] proposed a framework for owner-driven housing reconstruction projects to enhance disaster resilience in the long-term and at a micro-scale, and [40] developed a framework for effective disaster resettlement through community participation. These frameworks do not, however, provide comprehensive processes for the management of large-scale housing reconstruction programmes involving multiple scales. This paper therefore presents a framework for the management of housing reconstruction programmes involving multiple scales to enhance communities' resilience to disasters. The framework is intended to provide guidance to policy makers and managers of PHR programmes.

In carrying out this research, a conceptual framework was first developed (Figure 1) and published in [41], which framed the problem in terms of management issues arising from the post-disaster context, management measures (initially referred to as management strategy elements) to mitigate the issues and the desired outcome goals of the housing reconstruction process.

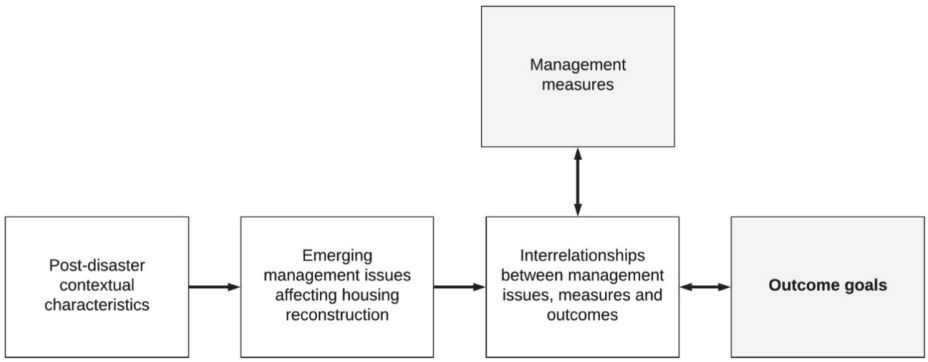

Figure 1. Conceptual framework for the management of post-disaster housing reconstruction.

In this paper, the research methodology is first described (Section 2), followed by the findings in terms of the desired outcome goals of housing reconstruction (Section 3), and the issues that affect

the management of PHR (Section 4). Section 5 describes the management measures which were identified and how these have been integrated and organised in order to provide a usable framework for managing post-disaster housing reconstruction. The framework itself is then presented and conclusions are drawn.

2. Research Methodology

This study was conducted in the context of PhD research, and adopted a qualitative research approach following the process stages illustrated in Figure 2.

The literature review process commenced with a review of the historical case studies to identify the successes and failures of past PHR programmes and to understand the management challenges facing them. This case-study review enabled an initial identification of the management issues affecting PHR effectiveness [42]. Drawing on this, a systematic search and comprehensive review of the literature were then carried out to identify the characteristics of the PHR context, the management issues that arise, the management approaches applied and the expected outcome goals for housing reconstruction initiatives. On the basis of the findings, a conceptual framework for PHR management was proposed [41]. The conceptual framework provided a basis for an "evidence-focused" review of the academic and grey literature to draw out effective measures for resolving the issues affecting the management of post-disaster housing reconstruction programmes. The measures drawn in relation to the outcome expectations of PHR interventions were thematically analysed, synthesised and presented [43].

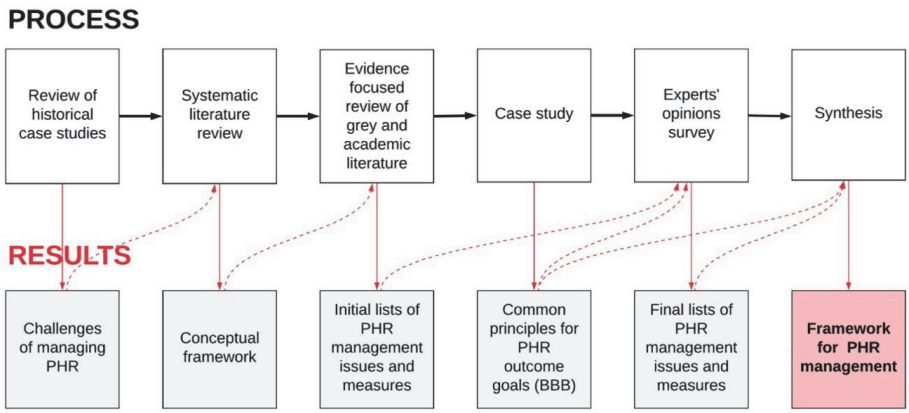

Figure 2. Research process for the development of framework for the management of PHR programmes.

An exploratory case study of the housing reconstruction and recovery programme in Lokoja, Kogi State, Nigeria, was undertaken with 31 semi-structured interviews of stakeholders conducted. The questionnaire guide was designed drawing on the "Build Back Better" (BBB) expectations under the Sendai Framework for Disaster Risk Reduction 2015–2030 (SFDRR) and utilising the BBB framework [27] to determine the issues affecting PHR, measures applied in managing the issues and whether the reconstruction programme measured up to stakeholders' outcome expectations. Data collected were coded and thematically analysed [44].

A final phase of data collection involved in-depth, semi-structured interviews (of between 60–90 min) conducted with 17 experts in the field of study. (Table 1 shows the profiles of the interviewees.) Expert interviewees were identified through a purposive-snowballing technique, experts' recommendations and their ability to provide information and/or opinions on PHR programmes. Experts were drawn from different geographical locations with wide-ranging experience in developing countries, including Bangladesh, Haiti, India, Indonesia, Iran, Maldives, Malaysia,

Nepal, Pakistan and Sri Lanka, working with multi-lateral donor agencies, reconstruction management agencies, international non-government organisations (INGOs) and higher education institutions (HEIs) as policy-makers, practitioners and researchers [45]. Expert interviews were conducted to fill gaps in the data obtained from secondary sources, to minimise bias, triangulate the data collection sources and methods, and to increase the validity and reliability of the research findings [46].

Table 1. Interview respondents' profiles.

Int. Code	Experience	Designation	Organisation	Experience Country Example
I#1	>10	Programme manager	UN Agency	India, Maldives, Sri Lanka
I#2	>15	Project mgt. expert PHR	Donor org., INGO	India, Nepal, Sri Lanka
I#3	>20	Programme director	Reconst. authority	Pakistan
I#4	>30	Reconstruction expert	UN agency	Pakistan, Sri Lanka
I#5	>20	Professor Disaster resilience	HEI	Indonesia, Sri Lanka
I#6	>20	Consultant-Expert	Housing (line) agency	Iran
I#7	>25	Expert, Development planning	UN agency	Japan, Malaysia, Nepal
I#8	>15	Researcher, Disaster mgt.	HEI	Australia, Sri Lanka
I#9	>25	Expert/Practitioner	Donor org., INGO, UN Agency	Indonesia, Nepal, Philippines
I#10	>10	Practitioner/researcher	Donor org., INGO	Indonesia
I#11	>15	Specialist, Housing reconstruction	UN agency	Bangladesh, India, Indonesia, Nepal
I#12	>10	Specialist, Coordination and Communication	INGO	Indonesia
I#13	>15	Head, Technical team	INGO	Sri Lanka
I#14	>15	Researcher, Disaster resilience	HEI	Sri Lanka, UK
I#15	>10	Researcher, Disaster resilience	HEI	Sri Lanka, UK
I#16	>20	Professor Project Mgt and Disaster Resilience	HEI	Sri Lanka, UK
I#17	>10	Expert/Researcher, Disaster Resilience	HEI	Indonesia, Malaysia, UK

Information obtained from the interviews was transcribed, coded and categorised under pre-identified and emerging themes using NVivo 11. The results obtained were synthesised with those from the preceding evidence-focused review and the case-study to validate the pre-identified issues and to identify the measures for managing PHR programmes in developing countries. Subsequent integration and organisation of the measures with respect to time resulted in the development of a framework for the management of PHR programmes.

3. Outcome Expectations for Post-Disaster Housing Interventions

Whereas studies [11,41] have identified that large-scale PHR programmes have various objectives due to the interests of the multitude of stakeholders involved (e.g., risk reduction, reestablishment of permanent community, quick reconstruction of acceptable housing and socio-economic recovery of communities, and sustainability of reconstruction projects), the Sendai Framework for Disaster Risk Reduction 2015–2030 (SFDRR) identifies the need to utilise the PHR window as an opportunity to enhance preparedness for effective response and to "Build Back Better" (BBB) [35]. As a priority area for action, BBB advocates the effective implementation of reconstruction processes to enable systematic integration of risk reduction measures and to facilitate the recovery of affected communities in order to strengthen the communities' resilience to disasters [7,27,28,47]. Thus, the overall outcome goals for any PHR programme, as agreed by global stakeholders, are to reduce disaster risk and to facilitate social and economic recovery of communities through effective implementation of the reconstruction process. See [27,48].

3.1. Disaster Risk Reduction

Disaster risk reduction (DRR) concerns the methodical identification, analysis and prevention of new risk, reduction of existing disaster risk and management of residual risk to strengthen disaster resilience [49]. DRR comprises measures to minimize socio-economic vulnerabilities and environmental hazards, and to improve the capacity and resilience of communities [33,49]. Risk reduction involves establishing and integrating structural and non-structural measures into the reconstruction process [13,50]. Structural measures include improved design and building codes, strengthening of vulnerable structures and implementation of effective construction practices [50,51]. Non-structural risk reduction measures include vulnerability analyses and effective land management through hazard-based land use planning, legislative, regulatory and policy provision to minimise disaster risk and impacts, training and capacity building, sensitisation and public enlightenment campaigns [49,50]. The integration of risk reduction measures into reconstruction lessens vulnerabilities and enhances the resilience of structures and communities in order to mitigate exposure to hazards, reduce disaster risk and bring about safer communities [27,50,52–54].

3.2. Community Recovery

With the loss of loved ones and family networks, damage to properties and livelihood sources, and impacts on local economies [1], communities become susceptible to traumatic stress and harsh economic conditions leading to increased mortality and psychosocial issues [55,56]. Mannakkara and Wilkinson have considered community recovery in terms of social and economic recovery [27].

3.2.1. Social Recovery

The social recovery of communities is enabled through community consultation, participation and involvement in the PHR design and construction processes, allowing positive beneficiary input and alignment with beneficiaries' needs [57–59]. This helps to reduce trauma and hopelessness, and fosters the re-establishment of social networks while strengthening coping capabilities [60,61]. Beneficiary community engagement enhances the sense of ownership, restores dignity and improves confidence in the safety and quality of the new buildings [14,62,63]. A lack of community participation in PHR programmes goes against the principles of the SFDRR and denies the affected community an opportunity for recovery [44].

3.2.2. Economic Recovery

Active participation of beneficiaries in the PHR process requires the provision of training and capacity building which provide beneficiaries with new skills and alternative livelihood sources. Employment opportunities for beneficiaries within the PHR programme also contribute to the programme's long-term sustainability as housing is more likely to be properly maintained [25,27]. The engagement of local businesses in logistics and supply functions during the reconstruction process contributes to the revival of local markets, facilitates the return of businesses, and improves social and economic conditions for the affected communities [27].

4. Issues Affecting the Management of Post-Disaster Housing Reconstruction

Numerous issues arise in the post-disaster context which make the management of PHR programmes particularly challenging [19,21,25,41,64–66]. The ineffective management of these issues leads to the failure of PHR interventions to achieve their intended outcomes. Table 2 summarises the issues identified in this research, firstly from the literature, and the expert interviews. The issues are organised into categories and, within each category, they are ranked according to the number of experts referring to them in the experts' opinion survey. Note that issues having the same number of experts referring to them are grouped and synthesised in the same cells.

Table 2. Issues affecting the management of post-disaster housing reconstruction.

Issue Category	Issues Affecting Post-Disaster Housing Reconstruction Effectiveness	No. of Sources
Coordination and communication	Inadequate or unfair distribution of resources, roles and responsibilities.	4
	Ineffective communication between stakeholders (including lack of communication tools, communication gaps, lack of stakeholder cooperation).	3
	Inadequate local institutional capacity associated with poor coordination of stakeholders and lack of trust among implementing parties.	2
	Unclear delineation of implementing responsibilities leading to gaps, overlaps and duplication of efforts, confusion and wastage of scarce resources. Donor agencies' insensitivity to community needs resulting from lack or inadequate beneficiary participation and engagement leading to resentment.	1
Financial management	Donor-pledges delayed or not materialising at all (including due to corruption and lack of transparency and accountability) and associated with cash flow constraints.	3
	Non-flexibility of budgetary systems and stipulated spending deadlines. Inadequate local institutional capacity to manage and disburse donor funds, including a lack of or inability to use financial management, accounting and reporting systems and standards.	2
Human resources	Lack or shortage of readily deployable experts, local builders and skilled workers.	15
	Escalation of labour wages in the reconstruction environment coupled with donor or implementing agencies' financial constraints to pay good wages or salaries affects the ability to engage and/or retain the requisite skilled workers.	6
	Inadequate local human resources at the strategic level affects effective reconstruction policy formulation.	4
	The need for quick and extensive skilled workforce mobilisation and recruitment and the high labour turnover resulting from seasonal influences, competition among agencies, low job satisfaction and motivation.	3
	Tensions between local resource capacities and external human resourcing (political and trade union issues).	2
	Cultural issues related to acceptability of new (graduate) engineers by the community, the need for skilled manpower importation and difficulties faced by invited workers due to visa issues.	1
Health and safety	Insufficient awareness of health and safety risks present in the reconstruction environment, lack of harmonised health and safety standards and the non-adherence and inadequate enforcement of building codes (health and safety regulations) and construction guidelines.	2
	Reuse of substandard and hazardous (salvage) materials, use of materials and massive transportation of materials producing unsafe conditions, cultural and attitude problems and lack of commitment to health and safety.	1

Table 2. *Cont.*

Issue Category	Issues Affecting Post-Disaster Housing Reconstruction Effectiveness	No. of Sources
Logistics and supplies	Material price increases and inflation affects resource supplies and overall reconstruction cost leading to reduced housing provided.	5
	Delays in procurement processes and resource supplies associated with the scale of resource needs, high transportation costs and difficult access to the reconstruction environment resulting from the lack of or damage to roads, infrastructure and services.	4
	Material supply shortages associated with the high demand of materials due to concurrent reconstruction projects and disaster impacts on local markets.	3
	Need for importation and difficulty in clearing imported materials, disrupted and inadequate local supply chains and poor supply quality (wrong and damaged material delivery).	1
Workmanship and quality	Inadequate training and mentorship, supervision and inspection and insufficient regulatory mechanisms to enforce building codes, construction guidelines and quality management procedures during implementation.	8
	Use of inadequately skilled manpower, poor quality materials and technology for construction.	6
	Inadequate pre-qualification of participating organisations, corruption and lack of competency on the part of implementing organisations.	4
	Inadequate worker skills assessment, lack of beneficiary participation and workforce motivation.	4
	Use of spontaneous imported labour due to pressure for quick rebuild and short-term targets.	2
Monitoring and control	Inadequate local institutional capacity to facilitate the monitoring function for a wide geographical coverage and inadequate beneficiary participation in the monitoring process.	5
	Inadequate implementation plans resulting from lack of capacity and pressure for quick rebuild, inadequate or insufficient experts or technical personnel for project monitoring, evaluation and control and inconsistent standards (design and specification) associated with delays in project monitoring and evaluation.	3
	Political influence and lack of autonomy of supervisory/monitoring parties, corruption on the part of stakeholders involved and ineffective communication between donors, implementing agency, home owners and monitoring parties leading to poor housing products and affecting their acceptability.	2

5. Integrated Measures for Managing Issues in Post-Disaster Housing Reconstruction

From the analysis of literature and survey data, we identified measures, some context specific, some generally applicable, that could be deployed in managing the issues affecting PHR programmes. These measures have been integrated and organised into categories and with respect to time so that they can be presented in a practically usable format, i.e., the framework for managing PHR shown in Figure 3. At the highest level, the measures have been categorised into phases of the project management life cycle as:

- Preparedness measures
- Initiation measures
- Assessment and planning measures
- Implementation, monitoring and evaluation measures.

In addition to these, there are also categories of measures which apply across more than one of the (preparedness, initiation, assessment and planning, implementation, monitoring and evaluation) stages. We have termed these:

- Cross-cutting measures.

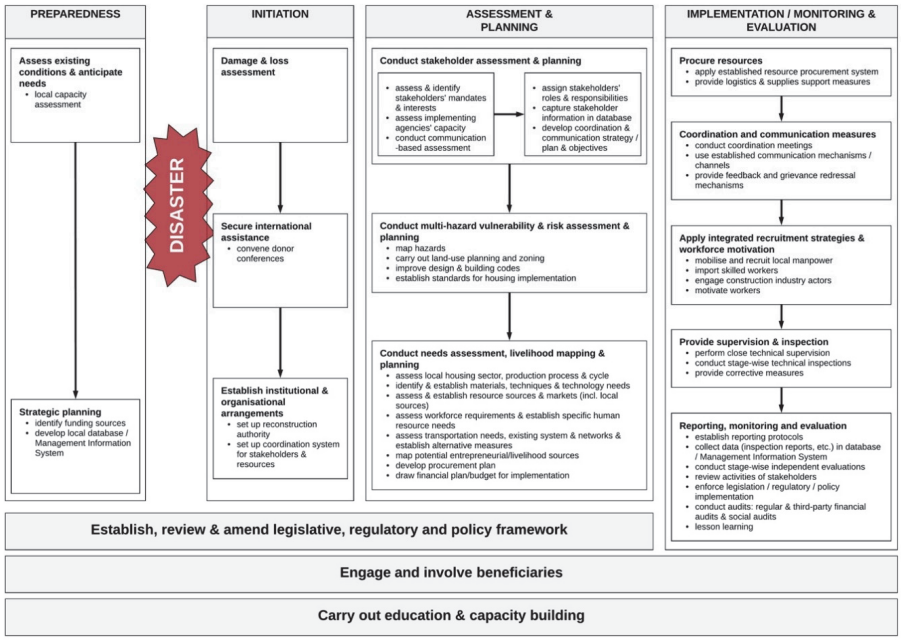

Figure 3. Framework for the management of post-disaster housing reconstruction.

5.1. Preparedness Measures

According to expert interviewee I#16: "there is no particular solution [to lack and/or inadequacy of (human) resources] rather than to be prepared". To minimise the risks and impacts of disasters, vulnerable communities firstly need to be prepared. Preparedness for PHR involves anticipating local capacity needs and planning and prepositioning resources prior to a disaster in order to facilitate effective reconstruction following disasters.

Table 3 shows the preparedness measures identified from the analysis, and these have been organised into two categories.

Table 3. Preparedness measures for PHR.

Assessing Existing Conditions and Anticipating Needs
• Assessment and establishment of skills and expert requirement, materials and financial resource needs and suppliers by designated agencies of government
Strategic planning
• Local capacity building—development of local skill and expertise through education and training • Establishment/development of local resource database by designated agencies and local councils • Identification and establishment of alternative funding sources by the national government

5.2. Cross-Cutting Measures

Three groups of cross-cutting measures were identified:

- Legislative, regulatory and policy framework
- Engagement and involvement of beneficiaries
- Education and capacity building.

Since all three of these groups apply to the preparedness stage as well as other, later stages, they are discussed before proceeding with the discussion of the initiation measures for PHR.

5.2.1. Legislative, Regulatory and Policy Framework

The need for legislation and regulation [53,66] and policy provision and review by the government were identified as important to provide direction for stakeholders, enable effective management of PHR programmes towards disaster risk reduction, and to facilitate socio-economic recovery of communities. The legislative, regulatory and policy measures identified from the data analysis appear in Table 4.

While some countries may have existing legislation, regulation and policies in place, the need for their review and amendment, as well as the enactment of new legislation and regulation and formulation of new policies, is clear in the preparedness, initiation and assessment and planning stages of PHR. The provision of appropriate legislation, regulation and policies is required to facilitate the effective management of PHR processes and enables PHR programme implementation.

Table 4. Cross-cutting measures for PHR.

Establish, Review and Amend Legislative, Regulatory and Policy Framework
• Legislative provision for the establishment of special reconstruction authority • Provision of financial regulations and accounting and reporting policy • Grant provision and stage-wise disbursement policies for beneficiaries/homeowners • Regulations and policy provision to allow external intervention (some) and beneficiary participation • Provision and/or review of legislation governing local resource exploitation • Provision and/or review of legislation and policies on tax and import duty exemptions and/or waivers • Legislation and policies to enable enforcement/adherence to building codes and land-use regulations • Regulation and policy provision or review to ensure provision and use of health and safety facilities and equipment • Provide legislation and policies to mandate local manpower engagement • Regulation and policy provision to control local resource markets including labour wage escalation • Legislation and policy provision to ensure accountability by donors and implementing agencies • Provide legislation to ensure enforcement of financial regulations and accounting standards
Engagement and involvement of beneficiaries
(measures appear under their respective stages in Tables 5–7)
Education and capacity building
• Engage external agencies and experts to provide education and capacity building for strategic management personnel to enable the development of driving policies and to facilitate effective decision-making • Provide training and capacity building programmes for management personnel to enable effective management of the PHR process • Education and sensitisation of stakeholders on reconstruction policy direction, legislation, rules, coordination guidelines and need to ensure adherence to building codes and other established standards including other local regulations and cultural practices • Educate beneficiary communities about risks and the requirement for their involvement and the integration of risk reduction measures during PHR process • Provision of nationally accredited skill acquisition centres across geographical boundaries to decentralise training and skill development while national level certification is provided for acquired competencies • Mobilisation, integration and deployment of government administrative structures, INGOs and partner agencies and social institutions for local capacity building • Provision of education and training for mobilised local manpower to create local capacity to facilitate the construction of safe and resilient housing, provide new economic and livelihood options and for the long-term sustainability of the housing programme

5.2.2. Engagement and Involvement of Beneficiaries

While the data analysis identified specific beneficiary engagement measures by the management and/or implementing agencies in the assessment and planning and the implementation, monitoring and evaluation stages, the engagement and involvement of beneficiaries (both as individuals and communities) is clearly essential to all stages of PHR.

The need for beneficiary (community) engagement by implementing agencies in assessment and planning processes, for instance, was highlighted by I#8 and I#17: "local knowledge is very key" to providing information about "construction techniques and technologies, supply chain and resource markets, knowledge of the communities' terrain and environmental conditions, provision of information about alternative transportation system and networks." In terms of monitoring largescale PHR programmes, I#11 noted that the: "beneficiary (community) is biggest monitoring tool". However, this also has been shown to have limitations—according to I#8: "their engagement for monitoring PHR may be limited to observation-making and critique of appearance, shabby workmanship and quality of a building and views-sharing on expectations". This calls for sensitization and awareness workshops to enable beneficiaries to identify good construction practice and to effectively monitor the reconstruction process, and it emphasises the link between beneficiary participation and education and capacity building.

Specific beneficiary engagement measures that were identified from the data analysis appear in Tables 5–7 under their respective stages; these have not been separately drawn out and therefore do not appear in Table 4.

5.2.3. Education and Capacity Building

Education and capacity building are required to provide requisite local competencies and capacities, risk reduction and resilience development knowledge to strengthen local institutions, aid the development of effective reconstruction policies and decision-making, enhance effective management of the PHR process. and to offer possibilities for turning acquired skills into long-term livelihood opportunities. This includes:

- Training provided to local artisans, new workers and beneficiaries and existing local manpower (with technical guidelines provided as a manual), for construction skills acquisition and upskilling in order to expand skills supplies for PHR.
- Education about legislative and regulatory provisions and/or changes.
- Education of imported manpower on local culture and practices to enable familiarization and adaptation to the local reconstruction environment, etc.

Table 3 shows the example measures identified from the data analysis. Expert interviewee I#16 noted, however, that local capacity building and training programmes for PHR are long-lead activities: "training new entrant workers does not resolve an ongoing human resource shortage but facilitates long-term project sustainability and recovery".

The long-lead, cross-cutting nature of education and capacity building is reflected in Figure 3. In the preparedness stage, communities are sensitised and educated on their vulnerability and the need to reduce disaster risks, develop knowledge and build capacity. Local capacity is developed for response, to minimise disaster impact, enable quick reconstruction start-up and facilitate the management of PHR programmes. For effective initiation of PHR, education and capacity building are required for strategic and programme-level management personnel to improve disaster risk and reconstruction knowledge to facilitate legislative, regulatory policy provision/review, to strengthen local institutions, enhance stakeholders and resource coordination, and to enable effective management of PHR. In assessment and planning, technical personnel/experts require training on the criteria and methodology for effective assessments and planning. In implementation, the focus is on training, upskilling and on-the-job mentorship for local artisans and supervisory, inspection and monitoring personnel, to enable safe and resilient housing production. In Gujarat, India, for example, training was provided for local masons and, in other cases, beneficiaries during reconstruction to improve the artisans' technical know-how and skills' supply. However, technical guidelines were not developed or provided. See also [67].

5.3. Initiation

Organisation and mobilisation for a specific PHR programme takes place immediately after a disaster occurs. We have termed this first post-disaster stage for PHR the initiation stage, which includes the following categories of management measures:

- Damage and loss assessment
- Secure international assistance
- Establish institutional and organisational arrangements.

These are introduced and discussed below, and the measures identified from the data under each category appear in Table 5.

Table 5. Initiation measures for PHR.

Damage and Loss Assessment
• Engage experts to conduct assessment of event impact and identification and classify damaged and/or destroyed houses and resource needs • Engage beneficiary communities in damage and loss and needs assessment • Forecast resource requirements for reconstruction to full recovery
Secure International Assistance
• Calls for international assistance (convene donor conference) to mobilize funds for reconstruction
Establish Institutional and Organisational Arrangements
• Set up reconstruction authority • Set up coordination system for stakeholders and resources—to coordinate efforts with UN coordination agency and to include donor fund coordination mechanism (multi-donor trust fund or donor basket) • Multi-level arrangements (as follows):
National Level
Central reconstruction authority Separate agency/unit to manage stakeholder communication Financial management unit with experts to provide financial management capacity Procurement unit to manage logistics and supplies
State/Municipal Level
Multi-tiered institutional/organisational structure at regional/state/district levels to facilitate coordination and monitoring of the programme
Local Level
Engage local councils for stakeholder coordination Create development authorities or committees at municipal or local and community levels
Project Level
Independent supervisory (project management) units at project and/or community levels Engage experts/trained and certified personnel/inspectors for regular inspection and monitoring
Beneficiary Community Level
Create resident monitoring teams and monitoring committees at local community level Local level (beneficiary) coordination and communication, monitoring and evaluation of the process using local structures such as community leaders, local community organisation or social groups, established local action committee Activate community level efforts through the engagement of community representatives and/or beneficiaries for progress monitoring and supervision
External Agencies
Collaboration with UN agency to facilitate coordination of other external agencies and for local institutions' capacity building Commission international consultant to monitor reconstruction finance

5.3.1. Damage and Loss Assessment

To identify disaster impacts, and as a preliminary measure for establishing resource requirements for PHR, our analysis highlighted the need for damage and loss assessment by experts, relevant stakeholders and representatives of the affected community. This enables the identification, classification, quantification and evaluation of the degree of damage and loss to housing, and the forecasting of costs and resource needs for reconstruction. Damage and loss assessment may be conducted using satellite imagery and GIS to map disaster impacts on housing, identify housing needs and to provide data on the number and types of houses affected and their damage severity levels, while household surveys are conducted to capture housing reconstruction and beneficiary needs (I#5 and I#15; [68]). In the words of I#3, "we used GIS mapping to know the number of houses destroyed, how many houses are partly destroyed, how many houses are visibly destroyed. These were the three categories of houses affected".

5.3.2. Secure International Assistance

The effective implementation of PHR programmes requires significant resources which vulnerable communities, especially in developing countries, typically lack. To mobilize resources for reconstruction following large-scale disasters, assistance is usually sought by the government from the international donor community through an international donor conference for reconstruction that is typically called at the insistence of the government of the affected country, with preliminary estimates and government's policy direction for PHR informed by the results of the damage and loss assessment exercise referred to above.

5.3.3. Establish Institutional and Organisational Arrangements

Our analysis highlighted the need for institutional and organisational arrangements since, as noted by I#5: "in a lot of developing countries, one of the problems is that, quite often, the local capacity to enforce and monitor is inadequate even in good times. So, in a context like this (post-disaster) where local institutions may have been distorted or destroyed" they may have "lost the capacity to operate". This may be achieved either through establishing new or strengthening existing institutions at the national level to provide "the reconstruction policy, the methodology or approaches and technical guidelines" for PHR (I#4). An effective institutional and organisational structure also requires decentralisation at regional or state/municipal levels, and the engagement of local councils and local level structures (beneficiaries' communities), so a multi-tiered governance structure is recommended that includes units created or designated to manage aspects such as financial management, logistics and supplies, stakeholder communication, etc. It also involves the engagement of local authorities and beneficiaries (community) to coordinate resources and stakeholders at local levels and to enable the buy-in and participation of beneficiaries while external agencies are engaged for local capacity building. Table 5 expands upon the multi-level institutional structures identified in our analysis:

Central reconstruction authority—The need to strengthen an existing reconstruction authority or establish a new one was identified. A reconstruction authority with a multi-level institutional structure is required to facilitate effective planning of PHR programmes, to coordinate and respond to stakeholders' needs, ensure effective resource utilisation, and to oversee the management and implementation of the PHR programme. The "central reconstruction agency ... brings all parties concerned together at the beginning of the programme and makes clear to every party, their roles and responsibilities" (I#16).

Coordination system for stakeholders and resources—For effective management of PHR programmes, a coordination system should be established to harmonize the activities of the central reconstruction authority, and local level authorities, UN coordination agency, donor-funds coordination mechanism (e.g., multi-donor trust fund or donor basket), etc.

UN coordination agency—A UN agency may be designated to coordinate the UN's PHR and community recovery efforts in close consultation with the government (through the reconstruction authority). "In the case of the 50,000 houses built in Sri Lanka, the UN-Habitat coordinated their own programme and other agencies" (I#4). For the reconstruction programme in Aceh, the United Nation's Office of the Recovery Coordinator (UNORC) was established to coordinate the United Nations agencies' effort and the INGOs involved in reconstruction in consultation with government [69]. When a designated UN agency coordinates the UN's and other reconstruction agencies' PHR efforts, it also facilitates local institutional capacity strengthening for community recovery and long-term project sustainability, while also serving as a channel into the UN system to facilitate UN support for the reconstruction programme.

Multi-donor trust fund or donor basket—Adequate institutional capacity to manage and provide accountability for donor funds is required. According to I#5, "Some donor agencies were not confident especially with the capacity of the management agencies to disburse funds. There are lots of issues around corruption and how the funds are being spent. So, there would have to be more effort in place to provide and build capacity to enable the disbursement and spending of the funds in an effective manner". In contexts where inadequate financial management capacity and fiduciary risks exist, it is recommended that a multi-donor trust fund (MDTF) is established to pool donor pledges, coordinate reconstruction funds and instill donor confidence in order to facilitate the release of donor pledges. In the reconstruction of Aceh and Nias, for instance, a MDTF was established to pool donor funds to finance and support the government reconstruction efforts. See [70,71]. Where adequate institutional capacity, an effective budgetary system and adequate fiduciary risk measures exist, however, a donor basket may be established to pool donor pledges.

5.4. Assessment and Planning Measures

Following initiation of a PHR programme, several assessment and planning functions were identified as necessary for enabling effective implementation. Firstly, considering the multitude of stakeholders available for large-scale PHR, it is required that stakeholders are adequately coordinated. Then, to minimize the exposure of buildings and communities to hazards and to enable the development of resilient structures, a multi-hazard vulnerability assessment of the reconstruction sites is called for. In addition, the affected communities' local housing sector and building production processes should be assessed by experts with the involvement of local community members to facilitate effective production of resilient housing, identify livelihood source areas that beneficiaries can engage in, potential constraints that may affect these, and measures to overcome the identified challenges. See also [72]. These measures are described in more detail below and summarised in Table 6.

5.4.1. Stakeholder Assessment and Planning

Stakeholder assessment and planning is required to "provide the coordinating agency an understanding of the different stakeholders, their functions and how to effectively engage them" (I#6) and to ensure implementing agencies possess the requisite competencies and capacity (I#6) [73,74]. Stakeholder assessment involves the accreditation and categorisation of stakeholders into groups based on their interests, mandates, function, interconnections, challenges, expectations and contributions. Our analysis highlighted the need for communication-based assessment to "identify their communication needs and challenges" (I#8), communication channels and first respondents, and to ascertain stakeholders' perceptions and expectations.

To ensure effective stakeholder coordination, roles and responsibilities should be fairly shared and enunciated to avoid gaps and overlaps, minimise redundancy, and to "impede resentment among implementing parties" (I#12).

A stakeholders' database or management information system where stakeholders' information, assigned roles and responsibilities are collected should be established to enable the effective coordination of participating parties. "We built a 'who-does-what-when' matrix database, where each

agency's information, assigned roles and responsibilities were collected. Application of the matrix provides information about the agency and the activities the agency is working on, geographical location and the duration of work" (I#12).

Table 6. Assessment and planning measures for PHR.

Stakeholder Assessment and Planning
• Accredit and assess stakeholders to be involved in PHR • Identify and categorise stakeholders • Allocate roles and responsibilities to stakeholders • Conduct communication-based assessment • Establish and maintain stakeholders' information in database or information management system • Develop communication strategy, plan and objectives
Multi-Hazard Vulnerability and Risk Assessment and Planning
• Assess reconstruction environment exposure to hazard and safety risk • Building diagnostic survey to assess the behaviour of existing and damaged buildings • Design improvement and establishment of building codes and construction guidelines • Establishment of new or improved (resilient) building design, codes and construction guidelines • Land use planning practice/zoning • Map hazards—identify risk and safe zones • Involve beneficiaries in hazard assessment and land use planning (mapping) • Relocate communities in extreme/high risk zones OR develop and utilise community level safety measures • Establishment of standards for housing implementation, including: ○ resilient local building codes and construction guidelines ○ model houses and the establishment of minimum workmanship and quality criteria ○ detailed construction documents and specifications and project implementation plans ○ standard operating procedures and monitoring checklists
Needs Assessment, Livelihood Mapping and Planning
• Conduct assessment on local housing sector and production process and cycle • Assess locally sourceable materials, techniques and technology needs • Assess and map resource sources and markets • Assess transportation system and networks (logistics and supplies support services) • Assessment and identification of workforce requirements and locally available skills and capacities • Plan for resource procurement • Provide detailed financial plan/budget for PHR • Ensure beneficiary (community) engagement

5.4.2. Multi-Hazard Vulnerability and Risk Assessment and Planning

Multi-hazard vulnerability and risk assessment enables the review of land-use planning regulation and practice and the development of adequate building (design) codes for the improvement of construction standards and to facilitate resilient reconstruction. According to I#15, "land use planning should be done to ensure housing are built in safe location". Effective land use planning mitigates communities' exposure to hazard, reduces disaster risk and enables effective development.

Where communities are extremely exposed to disaster risk, the relocation option should be explored. Local councils and affected communities must be involved in multi-hazard vulnerability and risk assessment and decision-making so that they fully buy into relocation, while access to livelihood sources, provision of social infrastructure and the safety of new settlement are all essential for acceptability. Where safe settlement proves difficult, community level safety measures may, however, be applied.

Following the identification and mapping of safe and risk zones, a building diagnostics survey, along with assessment of community disaster risk profile and historical events, is required to inform materials selection, the development of resilient designs, building codes and construction guidelines. Salvaged materials are often used in PHR (I#1 and I#7) [61,62], however, "some of the materials are

unsafe" (I#7), considering their exposure to hazard, lost strength and the potential health and safety risks. According to I#5, "the utilisation of salvaged materials must be under risk assessment basis" hence the need for assessment and approval before utilisation. For example, "in Sri Lanka, construction materials to be used in reconstruction were assessed by the National Building Research organisation to ensure they are up to approved standard" (I#15).

"The biggest measure to ensure the safety of buildings and communities from inherent hazards and health risk ... is the establishment of resilient building codes . . . that is based on risk equation" and "... tailored to a local context" (I#5). I#9 identified the need for the provision and "strict adherence to construction guidelines to ensure the construction of resilient and safe housing". To enable adherence to building codes and to ensure safe construction practice in reconstruction, "the guideline for rebuild should provide the community the freedom for design and material selection within the financial framework provided" or within the communities' financial capacity (I#4).

Our analysis identified the need for the establishment of standards such as:

Building codes and construction guidelines—Risk-based, local building codes with guidelines providing detailed building production procedures. For enforcement and adherence, building codes should be enacted into law with techno-social guidance provided for beneficiaries and low-skilled workers to explain the building production process.

Provision of model houses, establishment of minimum workmanship and quality criteria and quality management plan—To enable good workmanship and quality, model houses that are critically reviewed should be provided. See also [67]. The establishment of minimum workmanship and quality standards for building typologies "requires an agreement on the quality standards of housing ... among the donor agencies" (I#10) and in other cases, "having a proper building contract" to enable conformance and enforcement (I#9 and I#13). However, I#3, I#15 and I#17 highlighted the need for an enforceable quality management plan and control procedures.

Detailed construction documents and implementation plan—To enable good workmanship and quality construction standards, detailed construction drawings and approved specifications must be provided. The need to develop and monitor the project implementation plan in collaboration with beneficiaries/homeowners was identified as necessary for defining expectations, to provide a basis for assessing a programme's efficiency, and to help facilitate the maintenance of the housing quality level and activities schedules throughout the production process, thus enabling speed.

Provision of standard operating procedures and monitoring checklist—To ensure effective coordination and management of PHR projects, standardized operating procedures for supervision and inspection, approvals, and monitoring and evaluation are called for. These may be provided at national or state levels, and adapted at other project governance levels. Monitoring checklists should also be provided for each of the building typologies to serve as a basis for inspection and monitoring and ensure compliance with the established standards.

5.4.3. Needs Assessment, Livelihood Mapping and Planning

A thorough assessment of the local housing sector and production process/cycle is required to identify resilient housing reconstruction needs and map existing and potential entrepreneurial or livelihood source areas. "As part of assessment, livelihood mapping should be to understand what the community are engaged in ... to inform your planning" (I#5). The identified measures within needs assessment, livelihood mapping and planning are discussed and summarised in Table 6.

The local housing sector assessment enables the identification of construction materials, techniques and technology options, their disaster resilience characteristics, sufficiency and cultural acceptability, with consideration for health, safety and suitability for the environment. Identified areas of livelihood sources should be mapped while potential constraints are identified to inform planning. "In Pakistan, some of the houses destroyed were big traditional houses that use traditional technology like the stone in mud with planks of wood. We improved the technology for reconstruction ... and we retrained the local people on the knowledge required for rebuilding the houses to be earthquake resistant. We relied

mostly on local workers and a few international experts .... In fact, we rebuilt over 150,000 houses with this technology called Dhajji construction" (I#4). The use of local materials, techniques and technology enables quick reconstruction, provides livelihood source options for local communities, reduces logistics costs and enhances acceptability and long-term project sustainability.

To enable effective logistics and supplies for the implementation of PHR, early assessment is required to identify locally available materials, their supply sources or markets and capacity. These should be mapped against the distance to points of use to determine the logistics and supplies requirements and costs. Alternative material sources should be arranged in the case of supply shortages and price variations due to market or seasonal changes. "We identified areas with lots of thickly populated pine trees and lots of stones for Dhajji construction. Where there were no stones and wood, we introduced hollow masonry blocks for reconstruction" (I#3).

To manage inadequacies or lack of human resources for PHR requires an early assessment to identify specific skills needs, available local competencies and capacities and the constraints that affect skills provision and the implementation of the programme. "You need to have the right kind of combination of local expertise and ... technical knowledge for reconstruction. So, at a certain situation you need to assess the kind of combination that you require, the technical knowledge and the engineering skills and social skills required" (I#4). Workforce assessment enables effective construction team and budget development and identification of the resources required for workforce capacity building. "In Pakistan where we built over 150,000 houses using Dhajji dewari construction ... the skills required were not complicated, we identified we needed carpenters and Pakistan has a lot of people with construction skills. What we needed was to upskill the artisans, so we had to train a lot of carpenters and masons to give them the knowledge required for building earthquake resistant houses" (I#4).

An assessment of transportation needs and the condition of the transportation system and networks is required to identify transportation challenges, constraints and their impacts on resource logistics and supplies, and to identify alternatives and areas requiring strategic interventions. I#13 opined that the resulting issues from the transportation needs assessment "should be resolved before determining the types of materials, number of workers required and overall development cost for reconstruction". To ensure scheduled and cost-effective resource and project delivery, there is a need to identify, plan and mobilise for activities and resources requiring long-lead times.

On the basis of the assessment and identification of resource needs for PHR, detailed financial management and action plans with timescales for which funds are required can be developed. The detailed financial plans enable donors and implementing agencies to identify a project's funding requirements for a given period, mitigate delays in financial disbursement, as well as enable effective monitoring and assessment of PHR performance.

As noted in Section 5.2.2 above, the need for beneficiary (community) engagement in assessment and planning processes for PHR was identified.

5.5. Implementation, Monitoring and Evaluation Measures

Following assessment and planning, PHR programmes reach the implementation stage with concurrent monitoring and evaluation, as well as reporting requirements. Analysis of our data highlighted the role of resource procurement, logistics and supplies, stakeholder communication and coordination, workforce recruitment and motivation, supervision and inspection and reporting, particularly auditing, in achieving effective PHR outcomes for community recovery. These measures are described in more detail below and summarised in Table 7.

Table 7. Implementation, monitoring and evaluation measures for PHR.

Resource Procurement
• Utilisation of e-procurement system • Stratification of resource procurement: utilisation of sole and multiple source procurement approaches • Establish resource procurement prequalification criteria • Enabling legislation, regulation and policies provisions • Logistics and supplies: ○ Creation of construction hubs and storage facilities ○ Provision of support or enabling infrastructure and equipment ○ Support establishment of local supply chains and industries ○ Collaboration with and incorporation of local manufacturers and businesses ○ Establishment of market linkages ○ Importation of scarce resources
Stakeholder Coordination and Communication
• Establish stakeholder coordination mechanisms, such as setting up a multi-stakeholder platform • Conducting regular stakeholders' coordination meetings at municipal and local levels • Establishment of stakeholders' communication mechanisms and channels, such as utilisation of online portals/information management system, community/social forums, social media and mobile communication systems, face-to-face meetings and print media. • Establishment of communication and reporting protocols • Establish grievance redressal mechanisms
Recruitment Strategies
• Mobilisation and recruitment of local manpower: ○ Engagement of local construction actors with local, regional and international networks to draw skilled workers. ○ Engagement of social mobilisers, local experts, builders, skilled artisans, volunteers ○ Active engagement of beneficiaries for housing reconstruction ○ Engagement of new graduates and interns of construction disciplines from local academic/training institutions and agencies' staff • Invitation, recruitment and importation of experts, experienced builders and skilled artisans • Engagement of construction industry actors
Workforce Motivation
• Provision of market wages, incentives, rewards and livelihood support • Provision of regular training and capacity building programmes and value for new knowledge acquisition for long-term career growth • Possibilities of long-term engagement and carrier progression • Raise social perception of workers' role in the community (humanitarian service) • Provision of safe and secure work environment including adequate accommodation and transportation • Use of local construction materials and techniques and participation in reconstruction of own house • Recognition of workers for good workmanship and engagement in decision-making
Supervision and Inspection
• Provide close technical supervision during housing production • Engage beneficiaries (community), especially women, in supervision during housing production • Stratify inspection, certification and payment processes into pre-established construction stages • Provide independent technical inspection to ensure compliance and enforcement of standards • Deploy experts and certified technical personnel for stage-wise technical inspection and certification
Reporting, Monitoring and Evaluation Function
• Use management information system or database for reporting and monitoring programme's progress • Engagement of local councils in PHR project monitoring • Beneficiary and community engagement in regular monitoring during the implementation • Stage-wise transfer of cash to beneficiaries • Auditing: ○ Conduct regular and independent financial auditing on reconstruction finances ○ Conduct technical auditing on new buildings ○ Conduct social audit • Engage independent consultant to monitor and evaluate participating organisations' activities • Lesson learning: conduct regular review and document organizations' performance and lessons learnt

5.5.1. Resource Procurement Measures

The application of an e-procurement system for resource procurement was utilised in Indonesia because it "minimises bureaucracy, procurement periods ... ensures transparency of the procurement process" (I#10) and enables effective resource supplies for quick delivery of PHR programmes. Resource procurement should be stratified into different categories to enable effective resource delivery and performance based on suppliers' capacity, while both single sourcing and multiple source procurement approaches are utilised accordingly. Whereas single sourcing reduces unnecessary logistics and bureaucracy, procurement periods and transaction costs, and enables simplified and efficient resource supplies [75,76], multiple sourcing enables "competitiveness for the best value", "contributes to local economy" and provides "multiplier effect for the development of local supply chain" (I#1). Multiple sourcing also mitigates the risk of supplier failure, facilitates the availability of suppliers and material supplies and encourages community participation and emergence of local entrepreneurs, all of which assist in the revival of the local economy. Considering the merits of both single and multiple sourcing, "economic and financial analysis" (I#1) may be conducted to ascertain the most suitable procurement approach. "The ideal approach would consider diversifying (resource procurement) to the extent possible to target the potential for local production, ... prioritise national resources ... boost the potential for local entrepreneurs to emerge", while giving consideration for "the tendencies of getting economies of scale" (I#1).

In engaging logistics and supplies organisations for PHR, supplier prequalification criteria, including organisational capacity, financial strength, capabilities for effective resource delivery and procurement experience in the post-disaster context should be assessed. Further prequalification criteria may include knowledge of local resource sources/markets that would favour local industries and businesses and facilitate local community recovery.

To facilitate logistics and supplies, essential support services and/or measures are required from the government (reconstruction authority), for instance, a temporary road network is required to facilitate resource delivery and market linkages, minimise resourcing challenges, reduce time and cost, and ensure good quality materials supplies and protection following delivery.

5.5.2. Stakeholder Coordination/Communication Mechanism/System

For effective stakeholder coordination, the reconstruction management agency should, at the inception of the programme, create a multi-stakeholder platform that regularly brings all participating stakeholders together for periodic meetings (I#7, I#8, I#9, I#10, I#11, I#13 and I#16). "In Nepal, Housing Recovery and Reconstruction Platform (HRRP) has been created where we have periodic meetings" (I#11). Conducting regular coordination meetings in a generally understandable language (I#9), enables periodic project review, helps with knowledge and experience sharing and ensures stakeholder collaborations and inclusiveness. "In West Sumatra, we talked about issues and shared problems, visited each other's projects to learn from each other and then we involved in training the facilitators for the community-based housing" (I#10). The multi-stakeholder platform aids stakeholder coordination and collaboration and improves PHR effectiveness "because of the knowledge and information shared and built trust among stakeholders" (I#10). Project reviews, experiences shared, lessons learnt from previous and ongoing projects, and minutes of coordination meetings should all be coordinated, documented and utilised for future projects and should be communicated to participating parties after the coordination meetings, with participating parties also giving their feedback on the meetings (I#8, I#12 and I#15).

5.5.3. Workforce Recruitment and Alternative Strategies

To manage the human resource shortages in large-scale PHR, various alternative recruitment measures were identified:

Mobilisation and recruitment of local manpower—Local recruitment is crucial. While a lack of workers at strategic and project management levels can be managed by drawing staff between agencies, local builders, skilled artisans and beneficiaries can be engaged to create the workforce required for the management and implementation of housing production while new graduates and interns of construction disciplines can be engaged to support operational management needs. The need for social mobilisers for local manpower organisation was also identified.

Advantages of local manpower recruitment include that it enables the utilisation of local resources, indigenous skills and techniques, and facilitates "development of local capacities for long-term sustainability of the programme" (I#5); it also creates employment and livelihood source options and enables the alignment of beneficiary needs. Beneficiary engagement in supervision, especially by women, reduces unethical construction practices and "helps to ensure their houses are adequately built to ensure quality" (I#3), as well as providing beneficiaries with a sense of ownership and reducing problems with satisfaction and acceptability. I#5 and I#16 and [11] observe that local manpower engagement is more effective for simple buildings constructed under minimal pressure; analysis shows that inconsistent workmanship and quality issues arise with local manpower recruitment so that there is a corresponding need for education, training and capacity building.

Skilled workers importation—Although the importation of workers is often "challenged by visa ... local trade association and licensing issues" (I#8), I#11 argued that the importation of skilled workers should be for training and capacity building purposes to develop local competencies. Our analysis and evidence from previous studies, including [23,77–79], suggests that importing workers for PHR denies local livelihood opportunities and encourages capital flight, reduces local knowledge transfer and impacts acceptability, maintainability and beneficiaries' sense of ownership. Thus, it affects the socio-economic recovery of beneficiary communities and long-term sustainability of the programme. I#16 emphasised that "the effective measure to resolving manpower shortages is to prepare locals before disasters".

Engagement of construction industry actors—The engagement of construction industry actors to apply their management expertise and networks in order to resolve the lack of or inadequate workforce for PHR was also identified. Although engaging construction industry actors provides the competence and capacity required for speed, quality and resilient PHR, their engagement also creates a "tension between the need for short-term delivery and ... long-term sustainability of recovery projects" (I#5) [79]. To facilitate the achievement of the wider outcome goals of PHR, "a certain degree of contractors should be allowed but forced to help develop local skills and competencies particularly on the utilisation of new materials and technology and for long-term sustainability of the project" (I#5).

5.5.4. Workforce Motivation

Motivation is required to inspire workers' enthusiasm for efficiency, performance and retention, and to enable beneficiary participation in PHR projects. According to I#5, "unless those people deployed for reconstruction have passion for the work, you cannot achieve effective implementation, so they need to be motivated". Motivational measures necessary to raise workers' enthusiasm and enable their retention and performance in PHR are listed in Table 7. However, motivating workers in PHR, particularly by increasing wages to enable workforce retention, may "end up with wage escalation ... due to demand for skilled workers and that may necessitate the need to control the market or fixing wages to ensure donors and implementing agencies do not end up in competition with one another to have the best staff" (I#5). Hence the need for donor and implementing agencies to collaborate and agree appropriate wage levels (I#5 and I#9).

5.5.5. Supervision and Inspection

To ensure effective integration of risk reduction measures and the achievement of workmanship and housing quality standards, our analysis highlighted the need for effective supervision and inspection. Adequate supervision can be achieved through the deployment of technical personnel

to provide regular and close technical supervision. However, a lack of capacity often results in ineffective supervision, poor workmanship and housing quality in large-scale PHR. According to I#10, the provision of adequate "supervisory capacity during production requires some flexibility". That can be achieved by "tailoring local needs and capacity into the reconstruction process", through home-owner/beneficiary participation, "due to their availability" and "interest in the success of their own house" (I#3). Beneficiary engagement (especially of women) in the supervision and the management of the housing production process enables quick delivery of good quality housing that helps to reduce overall housing reconstruction costs and aids alignment of the beneficiary needs during implementation. Education and training are, however, required to develop the skills needed for effective supervision and management of the process. In supervision, mentoring should be provided for new entrants by skilled and experienced technical personnel to develop local capacity for supervision, implementation and long-term sustainability of PHR programmes through maintenance.

The need to stratify inspection, monitoring and payment processes into pre-established construction stages was highlighted. In Pakistan, "we divided the level of construction into four basic levels to enable effective inspection, monitoring and payments" (I#3). Technical inspection at pre-established project stages by an independent agency or third-party experts ensures the integration of risk reduction measures and that the expected quality standards are achieved before approvals are given and payment certificates are issued. Stage-wise inspection facilitates construction of safe buildings, effective progress monitoring, and helps in tracking financial resource disbursements for transparency and accountability purposes. To ensure adherence to local building regulations and the alignment of reconstruction housing with approved plans, local councils should also be engaged in inspection.

5.5.6. Reporting, Monitoring and Evaluation

To effectively monitor, track and report progress, compliance and financial resource use, various measures were identified as required including:

Reporting and utilisation of management information system/database—The need for the development of a management information system/database has already been discussed above and its utilisation to collect and make accessible all reporting was highlighted in our analysis for transparency, accountability and efficiency in monitoring PHR programmes. "In Aceh, to monitor and control reconstruction projects, one of the requirements is the use of RAN (Recovery Aceh-Nias) database. All agencies and experts involved in the reconstruction programme register on the database, update their project information and report on funds committed or allocated, disbursed and progress made" (I#10). The reporting of project information in the database enables monitoring parties at different levels to track progress, funds utilisation, compliance with standards, etc., and enables the identification of problem areas and corresponding needs for an effective intervention.

Beneficiary and community engagement—The importance of beneficiary and community engagement in monitoring has already been discussed in Section 5.2.2 above. A further measure identified as enabling effective monitoring of PHR projects is through cash-transfers to beneficiaries' accounts: "In Sri Lanka ... payments were made on the basis of work done and ... for construction-related activities ... on a stage-wise basis" (I#1). Although I#1 opines that the transfer of reconstruction funds to beneficiaries' accounts is "extremely useful in owner driven" and/or community driven approaches, cash-transfers to beneficiaries' accounts on a stage-wise basis after work progress and quality assessments "gives locals opportunities to participate in the process" (I#14). They also enable effective project monitoring, minimise the chances for corruption, "establish transparency" (I#4) and accountability, since "everyone knows how much money is going in and at what stage" (I#4), and they also lower transaction costs.

Local council involvement—Local councils' involvement "ensures that what is in the approved plan and reconstruction guidelines is what is being built" (I#15), thus it facilitates adherence to local building regulations. Local councils should be engaged from the outset of PHR projects to

establish a participatory working mechanism, in the provision of financial accounting and reporting standards and the provision of an independent monitoring mechanism to enable transparency and accountability [80]. Local council involvement in monitoring and evaluation also enables the development of their institutional capacity to facilitate the establishment of local regulations and standards, participatory project monitoring and evaluation, and to ensure transparency, accountability and long-term sustainability of the PHR programme.

Auditing—Auditing provides assurance to stakeholders on construction quality, financial transparency and accountability of the PHR process. Auditing requirements in PHR include regular internal and third-party financial audits, third-party quality audits and social audits. Regular internal and third-party financial audits provide assurance on effective utilisation and management of reconstruction funds. I#1 noted, however, that: "conducting audits is not just enough but personnel should be warned that auditing will be conducted" with defaulting personnel or agencies sanctioned according to regulations to serve as a deterrent to mitigate further deviant practices. Third-party technical quality audits to certify that reconstructed buildings comply with minimum quality and design standards, local building codes and other conditions should be conducted by expert inspectors and corrective measures taken where problems are discovered. As a measure to evaluate PHR programmes, analysis identified the requirement for social audits. A social audit, which "should be conducted at community and/or project levels" (I#17) and at the insistence of the beneficiary communities and other key stakeholders, "allows communities to have more say regarding holding ... donors, reconstruction partners and implementing agencies to account" (I#5). Social audits are required to assess and improve the impact of PHR programmes, and to ensure effective financial resource utilisation through value provision, beneficiaries' satisfaction and the development of resilient communities. Social audits can be conducted through commissioned surveys or community scorecards conducted by third-party consultants or through community-based organisations, with results made available to bring about improvements to existing and future projects.

Lessons learnt—Lessons from the successes and failures of organisations' performances in the PHR programme must be captured. A third-party consultant should be engaged by the reconstruction management authority to review the activities of the reconstruction agencies to draw out and document lessons and enable continuous improvement in the management of current and future PHR programmes.

6. Framework for the Management of PHR

Figure 3 represents all the measures described above as an integrated whole, with each key category of management measures arranged with respect to time and precedence, and with some important management measures included for illustration under each category. Space and clarity limitations prevent the full complement of identified measures from being included under each category within this article, but a larger-scale poster could certainly and usefully contain more information while adhering to the same general layout. The authors' intention is to propose an overall, evidence-based framework for PHR management practice which can serve as a guide to practitioners and policy-makers, in particular, but which is also useful for PHR researchers. The framework is focused at a level of detail which applies generally to all PHR situations. In this way, it is not context-specific but can and should be adapted and developed according to any specific geographic/community/post-disaster context. The framework should be considered to be limited to developing countries as the evidence on which it is based is almost entirely from PHR experiences in the developing world.

7. Conclusions

Permanent housing reconstruction (PHR) is an essential part of post-disaster reconstruction programmes. If well managed, it minimises communities' vulnerability to disaster risk and facilitates their recovery and resilience. PHR has historically, however, been one of the least

successful international development and/or humanitarian sectoral interventions due to the ineffective management of the reconstruction process. The study aim was to develop a framework for the effective management of post-disaster housing reconstruction. This was achieved through a qualitative research approach incorporating evidence obtained from academic and grey literature, practitioner databases, a case study to evaluate the outcome expectations of stakeholders, and an experts' opinion survey to draw "good practice" measures. On the basis of the evidence drawn from all these sources, the management issues affecting post-disaster housing reconstruction were identified, the outcome goal expectations for PHR were investigated, and management measures to deal with the issues and meet the outcome expectations were determined. Key among the measures identified include:

- The strategic importance of communities' preparedness. The assessment of existing conditions, vulnerabilities, needs and capacities, and the strategic planning of local capacity building and prepositioning of resources to enable the community to respond appropriately in terms of reconstruction.
- The need for sound initiation of the reconstruction programme based on a thorough damage and loss assessment, and taking into consideration the needs of affected communities towards mitigating potential future hazards. Securing international assistance is crucial to effective initiation of large-scale housing reconstruction programmes and the achievement of reconstruction outcomes since it enables the provision of financial aid and resources to the affected community (including the most vulnerable members). This enhances disaster risk reduction by enabling the reconstruction of safe and resilient housing and helps to resolve underlying social and economic issues. The study identified the need for the establishment of multi-level institutional and organisational arrangements at national and/or state levels to facilitate programme management and the coordination of stakeholders and resources. It is also crucial that local level administrative and organisational structures are strengthened and engaged to enable the buy-in of the beneficiary communities and allow them to take ownership of the programme, which, in turn, facilitates community recovery and long-term sustainability of the programme.
- The establishment of a legislative, regulatory and policy framework that provides direction for stakeholders, enables adherence to established standards and facilitates effective PHR programme management.
- The need for critical assessment of communities' vulnerability and identification of existing and underlying hazards and disaster risks. Assessment of stakeholders and resource needs is required to enable the development of standards and enables disaster risk reduction and effective implementation of the programme.
- The need for beneficiary community engagement in the reconstruction process is essential to give them ownership of the programme, ensure adherence to risk reduction measures, enable the development of local capacities to support social and economic revival of the community and for project sustainability.
- The provision of education and capacity building for stakeholders throughout the PHR management process, which facilitates all aspects of programme implementation and the long-term sustainability of PHR programmes.

In integrating and organising the identified measures with respect to time, the authors propose an overall framework for the management of post-disaster housing reconstruction which is aimed at providing general guidance to practitioners and policy-makers. This practice framework suggests the application of a participatory strategy in the management of large-scale permanent housing reconstruction programmes in order to achieve a programme's intended outcomes. The study focused largely on the reconstruction phase of the disaster management cycle with particular emphasis on permanent housing reconstruction. Given the singularity, complexity and catastrophic nature of post-disaster contexts, this framework for practice will need to be adapted to different, specific post-disaster reconstruction situations.

The proposed framework is also of potential interest to the PHR research community and future research is recommended to apply, evaluate, validate and refine the framework in practice.

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