Available online at www.sciencedirect.com

ScienceDirect

Procedia Engineering 212 (2018) 403–410

Procedia Engineering

www.elsevier.com/locate/procedia

7th International Conference on Building Resilience; Using scientific knowledge to inform policy and practice in disaster risk reduction, ICBR2017, 27 – 29 November 2017, Bangkok, Thailand

Integrated measures for managing permanent housing reconstruction

Abdulquadri Ade Bilau[ab]*, Emlyn Witt[a], Chamindi Malalgoda[b], Irene Lill[a], Dilanthi Amaratunga[b]

[a]*Department of Civil Engineering and Architecture, Tallinn University of Technology, Ehitajate tee 5, 19086 Tallinn, Estonia*
[b]*Global Disaster Resilience Centre, University of Huddersfield, Queensgate, HD1 3DH Huddersfield, United Kingdom*

Abstract

Following major disasters, stakeholders appropriate substantial resources for permanent housing reconstruction to mitigate disaster risk and to facilitate sustainable community resilience to disasters. Many stakeholders have, however, identified permanent housing reconstruction as one of the least successful humanitarian interventions as many housing interventions fail to achieve their intended outcomes. As a result, there have been calls for evidence-based studies to provide guidance for policy-makers and practitioners towards effective management of permanent housing programmes. This paper seeks to identify the issues that influence the effective management of permanent housing interventions and the measures that could be applied to manage those issues. Data were collected through semi-structured interviews with experts in post-disaster reconstruction and analyzed with the aid of NVivo 11 software. The findings served to validate and extend the issues influencing effective implementation of permanent housing interventions which had been identified in earlier research. These issues have been thematically classified into human resource issues; workmanship and quality issues; monitoring and control issues; coordination and communication issues; logistics and supplies issues; financial management issues; and health and safety issues. The study further identifies and presents the integrated measures that can be applied by policy-makers and practitioners to manage these issues and thus promote effective permanent housing reconstruction programmes.

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

Keywords: built environment; disaster resilience; permanent housing; post-disaster reconstruction; reconstruction management

* Corresponding author. Tel.: +372-620-2459; fax: +372-620-2453.
E-mail address: abdulquadri.bilau@ttu.ee

1877-7058
Peer-review under responsibility of the scientific committee of the 7th International Conference on Building Resilience
10.1016/j.proeng.2018.01.052

1. Introduction

The impacts of disasters on the built environment range from physical to socio-economic and include fatalities, injuries and wide-spread destruction of property [1]. Extensive damage and destruction of housing, loss of livelihood sources and the slowdown, stagnation or reversal of economic growth are some of the consequences of disasters [2]. With housing being the greatest loss component to major disasters [1, 3], affected communities, particularly in developing countries, often become homeless, unsafe, unsecured and prone to severe humanitarian conditions.

Responding to major disasters, stakeholders channel resources for reconstruction programmes with substantial amounts allocated for permanent housing reconstruction (PHR) to mitigate disaster risk and to facilitate community resilience to disasters. Far from being about placing bricks and mortar to provide dwellings, PHR entails the quick provision of acceptably livable disaster resilient housing [4, 5]. As both a product and a process, it facilitates the long-term sustainability of the buildings, revival of the affected communities' socio-economic activities [6, 7], and also helps to improve beneficiaries' well-being [8].

However, PHR has been considered by many stakeholders as one of the least successful humanitarian sectoral interventions [9]. Several authors, including [7, 10], have identified the ineffective management of permanent housing reconstruction as a major cause for the failure of PHR interventions in achieving their intended outcomes. As a result, there have been calls for studies that provide appropriate measures to guide policy-makers and practitioners towards the effective management of PHR [10]. In previous, literature-based, studies [11, 12], the management issues that affect the effective management of PHR programmes were identified and thematically classified as human resource issues, quality and workmanship issues, monitoring and control issues, coordination and communication issues, financial management issues, logistics and supplies and health and safety issues. This study seeks to validate the issues identified in the literature and aims to elicit measures for managing these issues by undertaking an experts' opinion survey. The study findings validate the previously identified issues affecting the effective implementation of PHR and offer integrated measures for managing effective management of PHR in developing countries.

2. Methodology

Data were collected through seventeen (17) semi-structured interviews with multi-institutional experts in post-disaster reconstruction and recovery management with wide-ranging experience in developing countries (Sri Lanka, India, Indonesia, Malaysia, Nepal, Iran, Pakistan, Haiti, Bangladesh and Maldives), working with multi-lateral donor agencies, reconstruction management agencies, international non-government organisations (NGOs) as policy-makers, practitioners and researchers. The data were thematically analyzed with the aid of NVivo 11 software through which integrated measures for managing PHR were drawn.

3. Management issues affecting the effective implementation of permanent housing reconstruction

In previous studies [11, 12], a number of management issues affecting the effective implementation of PHR were identified. Findings from the study assert the presence of the issues which are thematically classified and outlined below:

3.1. Human resource issues

Findings from the study identify inadequate local manpower at strategic and implementation management levels to formulate adequate PHR policies and strategies as a crucial issue in PHR. High demand for experts and deployable skilled labour, the escalation of labour wages against the financial constraints of implementing organisations and corresponding high labour turn-over rates resulting in the protraction of housing implementation and leading to delays. The creation of tension points between local resource capacities and external resourcing to fill the human resource gaps coupled with migration difficulties faced by invited workers due to visa issues. Lack of job satisfaction and motivation are other human resource related issues affecting effective management of PHR. These issues serve to validate those identified previously from the literature [4, 7, 13].

3.2. Workmanship and quality management issues

As in the literature [4, 14], findings from the study identify the lack of skilled labour and inadequate vocational training and certification programmes to up-skill local artisans and to develop new sets of local skills as some of the causes of poor quality workmanship in PHR. The use of "spontaneous working" imported labour and lack of competency on the part of some implementing organisations results in poor supervision and produces unacceptable housing. Other causes of poor quality workmanship include non-adherence to construction guidelines, use of sub-standard materials and inappropriate technology and the lack of beneficiary participation in housing implementation.

3.3. Monitoring and control issues

Monitoring and control issues influencing effective PHR were found to include local institutions' inadequate technical and managerial capacity to facilitate monitoring and control functions in geographically dispersed reconstruction sites, causing delays in the housing implementation process, see also [14, 15]. Inadequate institutional or organizational arrangements of the management and implementing organisations, the lack of effective implementation plans and schedules and the lack of beneficiary participation in monitoring and evaluation.

3.4. Coordination and communication issues

Coordination and communications issues affecting effective implementation of PHR include inadequate resources, roles and responsibility sharing [16], causing resentment and a lack of cooperation among implementing partners. Unclear delineation of donors or implementing partners' responsibilities resulting in the duplication of efforts and causing resource wastage. Ineffective communication [17] and engagement of beneficiaries and the inadequate donor agencies' sensitivity to community needs resulting in compromised social cohesion and poor housing products.

3.5. Logistics and supplies issues

The survey found that the scarcity of essential construction materials in local construction markets and the need for material importation result in high transportation costs and correspondingly high reconstruction costs. The disruption in the supplies of materials for reconstruction due to inadequate transportation infrastructure causes delays in housing delivery. Other logistics and supplies issues impacting effective PHR include inadequate local supply chains and poor supply quality and these relate to the issues previously identified in the literature [18, 19].

3.6. Financial management issues

Financial management issues affecting PHR include the inadequate financial management and accounting systems of implementing partners, delayed remittance of donor-pledges and non-flexible budgetary systems of government which cause delays in the disbursement of funds for implementation [15, 20]. Inadequate local institutional capacity to manage reconstruction funds and the lack of transparency and accountability together with corruption cause a lack of donor confidence in management agencies' capacity for financial management.

3.7. Health and safety management issues

The survey findings revealed inadequate conformance to building codes and building regulations and health and safety guidelines, imposition of varying health and safety standards due to the presence of differing donor or partner agencies with different level of health and safety expectations and non-alignment of local industry to the expectations create delay and inadequate awareness on health and safety risk present in the reconstruction environment exposing workers and beneficiaries to reconstruction hazards. Other health and safety issues acting as barriers to effective PHR concerned the use of hazardous materials in construction and the lack of enforcement on the use of Personal Protective Equipment (PPE).

4. Measures for managing the issues affecting permanent housing reconstruction effectiveness.

From the analysis of data, the measures for managing issues affecting PHR are presented in Table1.

Table 1. Integrated measures for managing issues in post-disaster housing reconstruction

#	Measure for managing housing reconstruction
1	Assessment and planning
	Anticipated local competency and capacity assessment, arrangement of funding for long-term local capacity building and the development of local human resources and materials suppliers database.
	Conduct risk and vulnerability assessment, zoning and restriction of reconstruction in high-risk zones.
	Conduct housing and financial resource needs assessment; identification, assessment and classification of participating stakeholders; assessment and certification of implementing organisations' competency and capacity.
	Identification and assessment of resource needs, mapping of resource markets; identification and assessment of local materials and technology; assessment of suppliers and resources requiring long-lead times and transportation needs.
	Assessment of competency and capacity requirements for the implementation of PHR, budget development and team planning.
	Beneficiary community and local council engagement for vulnerability and needs assessment to identify inherent hazards, housing needs, locally available resources, technology and markets, possible transportation alternatives.
2	Legislative and regulatory framework
	Establishment of a central reconstruction agency and building codes and building regulations.
	Budget for reconstruction; establish special finance vehicle (on-budget-on-treasury funding arrangement) and financial standards.
	Provide regulation for long-term accountability of donors and implementing organisations with regard to (re)constructed housing.
	Provide legislation for exploitation and management of local resources and for the development of local, small-scale industries.
	Control local resource markets and wage escalation and provide local businesses opportunities to participate in logistics and supplies.
	Enable external interventions to partner with local industry for local capacity building; mandate beneficiaries' participation and engagement; ease the migration of invited professionals/experienced builders and volunteers.
	Tax and import duty exemptions and toll waivers.
3	Mobilisation and recruitment of workers
	Draw staff from other local institutions or organisations to manage manpower inadequacy at strategic and operational management levels; engage new graduates as interns for built environment disciplines to work with operational managers.
	Recruit social mobilisers to mobilise local builders, skilled artisans, beneficiaries and volunteers for housing reconstruction.
	Invite experts and experienced builders from experienced countries to manage housing implementation and for local capacity building.
4	Education and capacity development
	Engage external agencies to build capacity of local strategic and operational management personnel.
	Establish approved and nationally accredited training centres and provide national certification on skills acquired.
	Engage, integrate and deploy administrative structures and local and international NGOs for local capacity building.
	Sensitize local communities on formal skills acquisition needs and imported workers on DRR and local practices.
	Provide education, rigorous training and up-skilling for local builders, artisans, community members and beneficiaries using construction guidelines and building codes as manuals and on turning acquired skills into businesses and long-term investments.
	Capacity building and sensitisation workshops for participating parties on effective financial, coordination and communication management, logistics and supplies effectiveness, health and safety risk management, DRR, quality management and effective project monitoring for ensuring the construction of acceptable, safe and resilient housing .
	Screen and ensure only trained and certified workers are engaged in more technically demanding construction tasks.
5	Workforce motivation

	Provide continuous training and capacity building.
	Regular payment of adequate wages, livelihood support and incentives.
	Production and utilisation of local construction materials, techniques and technologies.
	Give social perception of workers' role and worthiness of participation.
	Give respect, awards and recognition for good quality workmanship and regular engagement.
	Provision of safe and secure work environments and accommodation in close proximity to site.
6	Institutional and organisational arrangement
	Establish new or utilize existing central management agency (central) to manage housing reconstruction.
	Establish multi-tiered institutional and organizational structure with units at regional and/or state and/or district and community levels.
a.	*Stakeholder coordination*
	Establish stakeholder coordination units and deploy coordination personnel.
	Establish multi-stakeholder platform, stakeholder coordination plans with functions of key parties and schedule of meetings.
	Utilise management database to provides information on the reconstruction programme, participating parties and functions,
	Engage local councils to link beneficiary communities with donors and implementing organisations.
	Set-up local coordination committees comprising respected community members and leaders of socio-cultural groups and others.
b.	*Stakeholder communication*
	Establish or identify communication unit to manage communications and identify personnel responsible for communications.
	Assess and establish stakeholders' communication mechanisms including methods and channels to ensure close communication.
	Develop stakeholders' communication and engagement plan for reconstruction project life-cycle.
	Establish communication and feedback channels such as owner forums and communication portals for bottom-up communication.
	Establish communication and reporting mechanisms with clear protocols and stakeholders' grievance management procedures.
c.	*Financial management*
	Establish financial units with experts deployed to provide adequate institutional capacity and professional working standards.
	Establish Multi-Donor Trust Fund for effective donor-fund management and set up institutional mechanisms to realise donor-pledges.
	Provide flexible donor-funding arrangements and establish special finance vehicle for effective "on-budget-on-treasury" funding.
	Provide budgets, financial plans, spending schedules and financial allocation guidelines along with reporting standards.
	Conduct midterm review to assess project and financial progress; commission independent experts for financial auditing.
	Engage beneficiary communities in implementation and provide cash transfer to beneficiaries (owner-driven).
d.	*Quality-Cost-Time monitoring and control*
	Provide construction guidelines and building codes through public display and provide techno-social guidance for housing production.
	Standard Operating Procedures (SOP) for inspection, monitoring, certification and payment stages and processes.
	Provide project plans with defined timelines and quality standards and provision of archetypal houses.
	Establish inspectorate and supervisory units at project levels and provide monitoring checklist and corrective measure guideline for quality control and provide Management Information System (MIS) for project physical and financial progress monitoring.
	Deploy supervisory teams comprising engineers and technical personnel to project levels for technical supervisory assistance.
	Deploy an expert monitoring team of professionals and trained technical personnel for stage-wise quality inspection and certification.
	Deploy independent third-party experts for ad-hoc monitoring to verify compliance to standards before payment on certificates.
	Engage local councils for monitoring and enforcement of building regulations and other standards.
	Engage beneficiaries to ensure effective resource utilisation and efficiency for speed, quality, accountability and alignment to needs.
	Activate community efforts for monitoring and evaluation using score-cards to ensure reconstruction efficiency and accountability.
e.	Logistics and supplies management

	Engage in-house professionals to manage organizational procurement.
	Use e-procurement processes to minimize procurement bureaucracy, reduce procurement periods and ensure transparency.
	Engage local supply chain and involve the use of local labour, materials and technology in relation to the local resources available.
	Apply lean technology to minimize resource use and waste.
	Utilise multiple suppliers for logistics and supplies to ensure effectiveness.
	Strategic logistics and supplies intervention
	Create construction hubs and establish local supply chains and small-scale industries through subsidies and financial support.
	Incorporate local manufacturers and businesses into supply chains.
	Establish market linkages with manufacturers to eliminate hoarding by main distributors.
	Utilise locally sourced materials and import only essential, scarce resources.
	Provide support or enabling infrastructure and equipment; import duty and tax wavers, incentives and bulk discounting.
f	*Health and safety*
	Deploy experts to monitor and report on health and safety risk and remove hazardous materials.
	Provide first aid facilities in the reconstruction environment and utilisation of PPE and safety signs.
	Utilize adequate, culturally acceptable, indigenous and/or new technologies, materials and construction practices.
	Development of community level safety measures and relocation communities to safe zones in necessary and extreme risk contexts.
	Standardisation of health and safety guidelines and ensure implementing organisations' compliance to health and safety.

5. Discussion

Table 1 contains the integrated measures for effective management of PHR programmes. The integrated measures for managing permanent housing reconstruction programmes are described in the subsequent paragraphs.

For effective implementation of PHR, stakeholders of vulnerable communities must undertake adequate pre-disaster assessment and planning including the assessment and long-term local competency and capacity building, development of assessable databases of human resources and suppliers and the arrangement of funding for local capacity building. These are required to minimize down time and long periods of post-disaster capacity building and, thus, they enable quick and effective implementation of PHR. Following disasters, however, it is essential for reconstruction stakeholders to conduct vulnerability and needs assessments to identify inherent risks, determine housing needs, corresponding resource requirements and to develop financial estimates. Management agency and implementing organisations are required to conduct assessments of competency requirements for permanent housing reconstruction, corresponding budget development and project team planning.

Effective management of PHR requires the establishment of legislative and regulatory frameworks that enable the establishment and enforcement of standards and facilitate reconstruction governance to achieve the desired outcomes of interventions. It concerns the provision of regulations and policies for the establishment of the reconstruction agency, establishment of building codes and building regulations and the provision of long-term accountability mechanisms for donors and implementing partners to ensure the delivery of disaster resilient housing.

The unavailability of local manpower at all levels to facilitate the management of PHR and the sustainability of the projects is a major challenge faced by most housing reconstruction projects. However, the local manpower base can be developed by applying an integrated approach of drawing staff from other local organisations, engaging graduates and interns from related disciplines, and by employing social mobilisers that facilitate drawing local competencies including volunteers and beneficiaries for active participation in housing reconstruction. It also requires inviting experts, experienced and skilled personnel from other regions or experienced countries to manage the implementation process and also facilitate local capacity building through training and mentorship. These measures, however, require the provision of education and training on the skills required for PHR.

To ensure effective implementation of disaster resilience permanent housing, reconstruction management agency and implementing partners must ensure the development of requisite local skills following the mobilisation of local

manpower. This can be achieved through the establishment of accredited training centres, with external agencies and local and international NGOs engaged, integrated and deployed along with local administrative structures for local capacity building. This can be followed up with the provision of adequate education and rigorous training for mobilised manpower to develop the technical skills required for the construction of safe and resilient housing. For effective management of PHR, capacity development programmes should be organised for strategic and operational level managers and implementing partners while beneficiaries and other stakeholders are sensitized to ensure the integration of risk reduction measures during implementation. Adequate local capacity building would create new skills sets and livelihood options and it facilitates the long-term sustainability of reconstruction projects.

Coupled with existing inadequacy of skilled workers, high labour turnover rates affect PHR implementation. To minimise high labour turnover, workers' enthusiasm should be increased to ensure efficiency and performance. This can be done through workers' capacity building, regular provision of livelihood support, utilisation of local construction materials and technologies, recognition of workers' roles, awards for good workmanship and the provision of safe and secure work environments and adequate accommodation among other measures.

Adequate institutional and organisational arrangements for overall governance of the interventions should be established to facilitate the management of resources, participating stakeholders and the housing reconstruction process in order to achieve stakeholders' expectations. As a result, a central management agency with a multi-tiered institutional and organizational structure is required to manage the following:

- *Stakeholder coordination:* This concerns the stakeholders' classification based on their interest, deployment of coordination personnel to designated units and establishment of a multi-stakeholder platform to facilitate stakeholder governance. It involves the provision of stakeholder coordination plans with functions of key parties and schedules of meetings. For effective stakeholder coordination, local councils should be engaged to connect beneficiaries with implementing partners and establish local committees to coordinate beneficiaries. It also concerns the provision of grievance management mechanism.
- *Stakeholder communication:* This concerns the provision of effective communication to stakeholders involved in PHR. It requires the establishment of a communications unit, identification of personnel responsible for communication, setting out inclusive communication plans, protocols and the identification of effective mechanisms for communication and feedback receipt.
- *Financial management:* This concerns the provision of adequate institutional capacity and professional working standards through the deployment of experts to attain donor funding conditions and to effectively manage reconstruction finance. It involves establishing institutional mechanisms to pull donor pledges, donor-fund management and to provide flexible donor-funding arrangements. It requires provision of budgets, financial plans, spending schedules, financial allocation guidelines and financial accounting and reporting standards for implementing partners to ensure transparency and accountability.
- *Monitoring and control:* Effective PHR requires the provision of construction guidelines, building codes and archetypal houses for which quality standards are based. It requires the provision of MIS and SOP for monitoring, inspection, certification and payment on certificates and requires project plan development, stage-wise monitoring and quality inspection prior to the issuance of payment certificates. Effective monitoring requires the engagement of local councils to ensure conformance with regulations, the engagement of beneficiaries to facilitate efficiency, accountability and alignment to beneficiary needs.
- *Logistics and supplies:* The effectiveness of PHR also depends on effective resource supplies hence the need for the engagement of procurement experts and local community members to assess and identify resource requirements, locally available resources and local markets and transportation alternatives. The utilisation of e-procurement processes enables effective implementation by minimizing procurement durations and ensuring transparency. It identifies the utilisation of multiple but capable local supply chains to facilitate the revival of the socio-economic activities of the affected community and concerns the use of local labour, materials and the application of lean technology to minimize resource utilisation and waste.
- *Health and safety:* Effective implementation of PHR requires mitigation of health and safety risks through enforcement of building codes and regulations and utilization of adequate indigenous technology, materials and construction practice. It also requires provision of standardized health and safety guidelines, deployment

of experts for health and safety risk monitoring, removal of hazardous materials from the reconstruction sites and installation of safety precautionary signage and the use of PPE.

6. Conclusion

Post-disaster housing reconstruction is faced with a number of issues affecting its effective implementation. Findings from the survey identified numerous issues and these have been thematically classified as human resource issues, workmanship and quality issues, monitoring and control issues, coordination and communication issues, logistics and supplies issues, financial management issues, and health and safety issues. In addition, integrated measures for managing the identified issues affecting housing reconstruction effectiveness were drawn. Notable measures identified include long-term, pre-disaster assessment and planning by vulnerable communities to anticipate competency requirements and corresponding local capacity building, and the provision of local human resources and materials suppliers databases as they facilitate a quick reconstruction start-up. Additionally, the provision of a legislative and regulatory framework and its enforcement helps to facilitate the effective management of PHR programmes. Active beneficiary participation in the housing reconstruction process provides them a sense of ownership, helps to align their needs with the project, enhances efficiency and accountability and enables the construction of disaster resilient housing. Beneficiary participation also promotes psycho-social and economic recovery and improves the level of acceptance of housing products.

Acknowledgements

This research was supported by the Advancing Skill Creation to ENhance Transformation (ASCENT) project co-funded by the Erasmus+ Programme of the European Union. The data collection for this research was supported by European Regional Development Fund through the Archimedes Foundation. The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein.

References

[1] Lindell, M.K., *Recovery and reconstruction after disaster*, in *Encyclopedia of natural hazards*2013, Springer. p. 812-824.
[2] Fructuoso, M.J.P., *Economic Damage and Impact of Disasters (natural or man-made): An Outline Assessment Framework*, 2007.
[3] CERA, *Economic Recovery Programme for Greater Christchurch: A foundation for economic recovery and growth in greater Christchurch. Christchurch: Canterbury Earthquake Recovery Authority (CERA)*, 2012.
[4] Da Silva, J., *Lessons from Aceh.* Key Considerations in Post-Disaster Reconstruction, 2010.
[5] Iwai, T. and S. Tabuchi, *Survey: Housing projects delayed for more than 10,000 evacuees.* The Asahi Shimbun, 2013.
[6] Davidson, C.H., *Truths and myths about community participation in post-disaster housing projects.* Habitat Int., 2007. **31**(1): p. 100-115.
[7] Lyons, M., *Building Back Better:The Large-Scale Impact of Small-Scale Approaches to Reconstruction.* World Devt., 2009. **37**(2): p.385-98.
[8] Anuradha, M. *Post-Disaster Housing Recovery*, in *Oxford Research Encyclopedia of Natural Hazard Science*Apr. 2017, 'Oxford Uni., Press'.
[9] ALNAP, *ALNAP Annual Review 2002, Humanitarian Action: Improving Performance through Improved Learning.*, 2002, ODI: London.
[10] Lloyd-Jones, T., *Mind the Gap! Post-disaster reconstruction and the transition from humanitarian relief*2006: RICS.
[11] Bilau, A.A. and E. Witt, *An analysis of issues for the management of post-disaster housing reconstruction.* International Journal of Strategic Property Management, 2016. **20**(3): p. 265-276.
[12] Bilau, A.A., E. Witt, and I. Lill, *A Framework for Managing Post-disaster Housing Reconstruction.* Proc., Econ. & Fin., 2015. **21**(0): p. 313.
[13] Barenstein, J., *Challenges and risks in post-tsunami housing reconstruction in Tamil Nadu.* Humanitarian Exchange, 2006. **33**.
[14] Ophiyandri, T., R. Amaratunga, and C. Pathirage, *Risk identification on community based post disaster housing reconstruction projets.* 2011.
[15] Kennedy, J., et al., *The meaning of 'build back better': Evidence From post-tsunami Aceh and Sri Lanka.* Journal of Contingencies and Crisis Management, 2008. **16**(1): p. 24-36.
[16] Baroudi, B. and R. R. Rapp, *Stakeholder management in disaster restoration projects.* International Journal of Disaster Resilience in the Built Environment, 2014. **5**(2): p. 182-193.
[17] Tagliacozzo, S. and M. Magni, *Communicating with communities during post-disaster reconstruction.* Nat. Hazards, 2016. **84**(3): p. 25-42.
[18] Kovács, G. and K.M. Spens, *Humanitarian logistics in disaster relief operations.* Int. Journal of Phys., Dist. & Mgt., 2007. **37**(2): p. 99-114.
[19] Chang, Y., et al., *Resourcing challenges for post-disaster housing reconstruction.* Building Research & Information, 2010. **38**(3): p. 247-264.
[20] Jayasuriya, S. and P. McCawley, *Reconstruction after a disaster: lessons from the post-tsunami experience in Indonesia, Sri Lanka*, 2008, ADBI working paper.