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Article

Analysis of Variance of the Effects of a Project's Location on Key Issues and Challenges in Post-Disaster Reconstruction Projects

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Abstract: After a disaster, the reconstruction phase is driven by immediate challenges. One of the main challenges in the post-disaster period is the way that reconstruction projects are implemented. Reconstruction cannot move forward until some complex issues are settled. The purposes of this research are to highlight the issues and challenges in post-disaster reconstruction (PDR) projects and to determine the significant differences between the issues and challenges in different locations where PDR projects are carried out. The researchers collected data within international non-governmental organisations (INGOs) on their experience of working with PDR projects. The findings of this research provide the foundation on which to build strategies for avoiding project failures; this may be useful for PDR project practitioners in the future.

Keywords: post-disaster reconstruction (PDR); issues and challenges; international non-governmental organisations (INGOs)

JEL Classification: Q54

1. Introduction

Every post-disaster situation is unique. Different to conventional construction, post-disaster reconstruction (PDR) is complex, dynamic, and chaotic in nature and represents many issues and challenges. Post-disaster reconstruction projects require planned and coordinated efforts on the part of all parties for a successful recovery of the affected population (Rotimi et al. 2006). Becoming aware of key issues in PDR projects will contribute to their success. Previous studies have shown that when projects are taking place, some central issues need to be addressed for the project to be successful (Attarzadeh and Ow 2008). The transition from the immediate relief phase to the reconstruction phase is the most significant challenge in any disaster situation. Each PDR projects bring specific challenges, and each one has to be dealt with on a case-by-case basis (CRS 2011). This study aims to enrich the literature with an empirical investigation on issues and challenges in post-disaster reconstruction projects that influence the success of project delivery. Thus, the objectives of this study are to identify the most common and fundamental issues and challenges that currently exist in PDR projects and to determine if there are significant differences between the issues and challenges in different project locations for the period of PDR projects. It is reasonable to assume that the issues and challenges in PDR projects will differ between project locations (Silva 2010).

2. Literature Review

In an attempt to understand the issues and challenges faced by INGOs, a literature review was carried out on five major disaster events that happened in Aceh, Sri Lanka, China, Iran, and Haiti from 2004 to 2010.

This research has elaborated the disaster reconstruction challenges as highlighted by the list of authors in Table 1 with a view to being aware of their nature from the perspective of the INGOs, which participate in managing international reconstruction projects. The studies discovered that the factors highlighted, if carefully managed, could contribute to the successful delivery of PDR projects. Therefore, it is vital for the PDR stakeholders to investigate the issues and challenges in PDR project activities, enabling them to provide solutions to overcome the complexity and uncertainties of PDR projects. Some of the issues and challenges highlighted are:

Table 1. Disaster Reconstruction Challenges in Publication.

No	Disaster	List of Authors
1	Tsunami, Aceh, 2004	(ADB 2005; Boen 2006; BRR 2006; Canny 2005; Kennedy et al. 2008; Nazara and Resosudarmo 2007; Silva 2010; Soelaksono 2009; Steinberg 2007)
2	Tsunami, Sri Lanka, 2004	(Ibrahim 2010; Karunasena and Rameezdeen 2010; Lyons 2009; Perera-Mubarak 2012; Shaw and Ahmed 2010)
3	Earthquake, Bam, 2005	(Ghafory-Ashtiany and Hosseini 2007; Kamani-Fard et al. 2012; Kopaei 2009)
4	Earthquake, Wenchuan, 2008	(Chang et al. 2011b; Sun and Xu 2011; Sun and Bi 2010; Yin and Zhou 2010)
5	Earthquake, Haiti, 2010	(Bornstein et al. 2013; GAO 2011; Moloney 2014; NAPA 2006)

2.1. Resourcing Challenges

In general, PDR resources are usually in short supply (Davidson et al. 2007). The challenges are in meeting the needs of the sudden increase in labour, and the fact that local natural resources are in scarce supply (e.g., building material) which leads to difficulties with following work schedules (Randall and Jowett 2010; Keraminiyage et al. 2008). Therefore, to ensure effective reconstruction, the parties involved need to understand the importance of the factors influencing resource availability and their potential impacts on resourcing outcomes (Chang et al. 2011b).

2.2. Challenges in Community Participation

It has been widely accepted that community involvement in each activity is a critical element for the successful delivery of PDR projects (Davidson et al. 2007; Wardak et al. 2011). The challenges in community participation are significant since they have a very particular role in all the stages of PDR, ultimately determining project success (Wardak et al. 2011). Affected communities have knowledge (Shaw and Goda 2004) that is critical for delivering successful reconstruction projects (Ophiyandri et al. 2013).

2.3. Poorly Funded Reconstruction

Organisations are often faced with large numbers of internally displaced persons (IDPs) after a disaster. Therefore, it is politically desirable for a government to provide reconstruction funding for permanent housing (Freeman 2007). According to Hidayat and Egbu (2010), the most usual problems found at the beginning of reconstruction are funding. A case study carried out by Adu-Boateng and Oppong (2011) in Ghana for post-disaster reconstruction activities reveals that inadequate funding is the primary challenge, and the same situation is faced by PDR projects in Bam, Iran (Gharaati and Davidson 2008) Sri Lanka (Shaw and Ahmed 2010) Aceh (Silva 2010) Tangshan, China and Hyogoken-Nanbu, Japan (Ye and Okada 2002).

2.4. Preliminary Assessment

Immediately after a disaster, a preliminary assessment is carried out to obtain an early assessment of the extent of the damage, the number of houses damaged, the categories of the houses, their location, and the condition of the disaster-affected people (Chang et al. 2011a; EPC et al. 2004). According to Kennedy et al. (2008), many agencies fail to conduct these preliminary assessments, which can increase exposure to other hazards (Doocy and Gorokhovich 2008). In Haiti for example, as reported by The UN System on an Integrated Emergency Response Program for Haiti, it was observed that assistance was hampered by the inability of Haitians to gather data and reporting requirements are burdensome and that hinder the capacity to administer aid (NAPA 2006).

2.5. Lack of Coordination

The task of reconstruction, as indicated by the United Nations (2008) and Zuo et al. (2009), demands a high level of coordination and a careful managerial approach. A review of NGO coordination after the Aceh post-earthquake/tsunami carried out by Canny (2005) found that many NGOs in the area displayed a lack of coordination and as a result created conflicting programmes amongst the NGOs (Soelaksono 2009). This poor coordination led to a repetition of actions, the ineffective use of finances (Nazara and Resosudarmo 2007), poor management capability (Hosseini and Izadkhah 2008), and the creation of competition among the organisations (Wardak et al. 2011).

2.6. Corruption

PDR projects can also fall prey to fraud and corruption, resulting in huge losses of project funding (Hidayat and Egbu 2010; Wardak et al. 2012); this affects the overall reconstruction activities (Ahmed 2011). Silva (2010) referred to a case in Aceh where the head of the community put family ID cards on the market; this meant that outsiders could obtain these cards, making these outsiders entitled to be given shelter support, at the expense of the rest of the community. Perera-Mubarak (2012) concluded in his recent study that corruption in Sri Lanka after the tsunami has overlapped with uneven power affairs, a lack of rights to use the resources, inequity in aid allocation, and a broken support system.

2.7. Build Back Better/Safer

The longer-term recovery and reconstruction process represents a significant opportunity to ensure that communities are “built back better” than they were before the disaster (Randall and Jowett 2010). This is an important issue for PDR as reconstruction efforts worldwide have provided lessons which can be adopted when implementing structural changes to avoid the issues of substandard structures in the rebuild, which could result in magnified damage (Mannakkara et al. 2014). As stated by Ophiyandri et al. (2013), the phrase ‘build back better’ refers to building structures that are superior to those that existed previously, and which are capable of surviving upcoming disasters. ‘Build back better’ has led to implementing structural design improvements to achieve efficiency and effectiveness in the rebuilding process (Mannakkara and Wilkinson 2013)—it ultimately should be referred as ‘build back better to withstand future disasters’.

2.8. Policies

The policies and strategies in place are critical to long-term reconstruction efforts (Chang et al. 2010), such as building policies, which include the land contamination regulations and procedures and debris clearance system (CRS 2011). The responsibility for creating and putting into practice the reconstruction policies lies solely with the authorities (EPC et al. 2004), although every NGO has its policies and procedures to manage its practices (Von Meding et al. 2009).

2.9. Quality of Works

The issues of material shortages (Sun and Xu 2011), poor material quality (Boen 2006; Parker and Little 2004), and poor workmanship (Lyons 2009) have resulted in poor-quality reconstruction project delivery. Poor quality of work was found to be the main cause of devastation and casualties in developing countries (Seneviratne et al. 2013). NGOs have played a central role in permanent PDR projects (Von Meding et al. 2009), where high demand and inadequate supply has led to a poor-quality reconstruction process (UNDP 2007) in which project efficiency and quality have been called into question.

2.10. Land Ownership Issues

The protection of property rights is a high priority after a disaster (Nazara and Resosudarmo 2007). The modification that a catastrophe makes to the contours of the complicated property identification of land ownership after the event (Ghafory-Ashtiani and Hosseini 2007; World Bank 2004) and lost land title information have caused delays in reconstruction processes (Ochiai and Shaw 2009). In Aceh for example, some of the beneficiaries wanted to have their houses built on their property, which had been cleaned out by the tsunami (Soelaksono 2009), yet the house documents had been destroyed during the disaster, creating a barrier in land property restoration (CRS 2011).

2.11. Shortage of Technical Staff

In order to manage complex, large and demanding types of reconstruction projects, organisations require competent and experienced staff (Seneviratne et al. 2013). Insufficient numbers of staff have been found to lead to unsuccessful project delivery (CRS 2011; Sun and Xu 2011; Seneviratne et al. 2013). Few humanitarian agencies have technical capacities within their organisations (Silva 2010), and the shortage of technical staff and competent experts is a prominent issue that has to be addressed in PDR projects (CRS 2011; Sun and Xu 2011).

From the reviews of previous research, eleven main issues and challenges in PDR projects were listed. Although the list of issues and challenges highlighted by the studies appears to point in the right direction, more issues and challenges in PDR projects should be dealt with in practice.

3. Research Methodology

This paper expands on the current literature available for this subject. A questionnaire survey of experienced PDR practitioners was conducted to gather the data required by the study. The questionnaire, which contained eleven main issues and challenges in PDR projects, was developed as a result of an extensive literature review and was consolidated by a series of pilot studies. The questionnaire was emailed to 1000 PDR practitioners over a period of two months starting from early November 2015 and ending in December 2015. A follow-up reminder for the online survey was forwarded to the respondents.

Apart from some questions intended to capture the background information of the respondents, the remaining questions in the questionnaire invited them to indicate the level of agreement of each factor in relation to the eleven main issues and challenges in PDR projects based on a five-point scaling, i.e., Strongly Agree = 5, Agree = 4, neutral = 3, Disagree = 2, and Strongly disagree = 1. To ensure consistency throughout the respondents, a brief definition of each factor was provided. Only 168 positive responses were returned in a usable format, and this provided a 17% return rate. Studies of organisations normally obtain lower return rates, with 15% return rates being considered acceptable for organisational surveys (Baldauf et al. 1999; Hager et al. 2003).

The results of the survey were analysed using inferential statistics mathematical approaches. The *t*-test was used for independent samples. In order to statistically test the distinction between the project location (IV) on the issues and challenges (DV) in PDR projects, this research adopted the one-way analysis of variance (ANOVA) to test the direct impact of the independent variables (IV) on

each dependent variable (DV) separately. The next section highlights the analysis results, and how these results address the objectives of this research.

4. Results

The results discussed here are in two sections. The first are the results from the questionnaire, and discusses the demographical profiles of the respondents to the survey. The second section provides the most common and fundamental issues and challenges in PDR projects and presents a detailed analysis of the significant differences between the issues and challenges in different project locations, and how these influence the success of PDR project delivery.

From Table 2, it is evident that more than half of the participants in the survey held key-management positions. The majority of respondents, 93.5%, had been involved in PDR projects and most of the respondents had been involved in major disaster events. A total of 39.3% have operations in Ormoc and Tacloban-Philippines, 16.7% focus in Aceh and Nias-Indonesia reconstruction, 15.5% in Nepal, 11.3% in Haiti reconstruction and 17.2% of the participants have been involved in other various reconstruction projects. Whereas 80% of the respondents reported having worked in the NGO sector, 11% of respondents worked for government or local authorities and only 9% of respondents did not work within either NGOs or the public sector, but had direct involvement or engagement with INGOs during the PDR period.

Table 2. Demographic Profiles of Respondents.

No	Designation of Respondents	Frequency	(%)
1	Project/Construction Manager	93	55.4%
2	Architect/Urban Planner	11	6.5%
3	Quantity Surveyor	1	0.6%
4	Civil/Structural Engineer	4	2.4%
5	Client/project owner	7	4.2%
6	M&E Engineer	4	2.4%
7	Consultant/Technical Advisor	17	10.1%
8	Project Coordinator/Officer	15	8.9%
9	Director	5	3.0%
10	Other	11	6.5%
No	Length of Experience	Frequency	(%)
1	I am not (no direct experience in PDR Projects)	11	6.5%
2	Less than 5 years	72	42.9%
3	6–10 years	41	24.4%
4	11–15 years	24	14.3%
5	16–20 years	9	5.4%
6	More than 20 years	11	6.5%
No	List of PDR Projects Location	Frequency	(%)
1	Aceh and Nias, Indonesia reconstruction, tsunami, and earthquake	28	16.7%
2	Bagh, Pakistan reconstruction, earthquake	12	7.1%
3	Haiti reconstruction, earthquake	19	11.3%
4	Ormoc and Tacloban, Philippines reconstruction, typhoon Haiyan	66	39.3%
5	Nepal reconstruction, earthquake	26	15.5%
6	Other	17	10.1%
No	Type of Organisation	Frequency	(%)
1	Government/Local Authorities	19	11.3%
2	Non-Governmental Organisations (NGOs)—Local	22	13.1%
3	International NGOs (INGOs)	110	65.5%
4	Private Firms/Designers	5	3.0%
5	Contractor Firms	3	1.8%
6	Consultants	2	1.2%
7	Intergovernmental Organisation	7	4.2%
	Total	168	100%

5. Identification of the Issues and Challenges

The respondents were requested to rate the degree of agreement on selected issues and challenges that influenced PDR projects on a 5-point Likert scale from 1 to 5, where 1 symbolises ‘Strongly disagree’ and 5 represents ‘Strongly agree’. Consequently, the data was analysed using Statistical Package for Social Sciences (SPSS) Version 16.0. The results of descriptive statistics and the one sample *t*-test conducted at a 95% significance level with a test value of 3.5 to highlight which issues and challenges poses the highest ranking that have significant influence on PDR projects. The results are shown in Table 3.

Table 3. One-Sample *T*-Test Result.

Issues and Challenges in Post-Disaster Reconstruction Projects	Mean	SD	<i>t</i> -Value	Sig. (2-Tailed)	Rank
Community Participation	3.786	1.045	3.5446	0.001	1
Assessment	3.744	1.174	2.6954	0.008	2
Funding	3.726	1.146	2.5578	0.011	3
Quality of work	3.690	1.142	2.1613	0.032	4
Corruption	3.625	1.207	1.3421	0.181	5
Coordination	3.601	1.122	1.1688	0.244	6
‘Build back Better’ principles	3.571	1.166	0.7938	0.428	7
Resources	3.542	1.060	0.5094	0.611	8
Land ownership	3.482	1.153	−0.2008	0.841	9
Policies	3.458	1.104	−0.4890	0.625	10
Shortage of technical staff	3.387	1.072	−1.3676	0.173	11

Note: Scale ranges from 1 = ‘Strongly Disagree’ to 5 = ‘Strongly Agree’. The null hypothesis is $H_0: \mu = \mu_0$ and the alternative hypothesis is $H_1: \mu > \mu_0$, where μ is the population mean, μ_0 is the critical rating at 3.5. The level of significance for the one-tailed test is 0.05.

One sample *t*-test of the mean was performed based on the sample’s ratings, to confirm whether the issues and challenges recognised within the questionnaire were influencing PDR projects. By using SPSS descriptive statistics analysis, a ranking of the factors as perceived by the respondents was obtained in order to identify critical issues and challenges that significantly affected PDR projects. The *t*-test results as shown in Table 3 indicated that the four major factors are community participation (sig. 0.001), assessment (sig. 0.008), funding (sig. 0.011), and quality of work (sig. 0.032), all of which have a significance level lower than 0.05. The mean results specify that the four factors concerning issues and challenges, are statistically significant and have strong influence on PDR projects whereas the other seven factors have a lower influence on PDR.

Further down the table, ranked 5th and 6th, are ‘corruption’ with a mean score of 3.625 and ‘coordination’ with an average rating of 3.601. Furthermore, ranked 7th to 10th are the issues of ‘Build back Better’ principles, with a mean value of 3.571, ‘resources’ (mean = 3.542), ‘land ownership’ (mean = 3.506), and ‘policies’ (mean = 3.458). The shortage of technical staff is perceived to be the lower influencer to PDR project based on the respondents as it was ranked 11th with a 3.387 mean score. However, the eleven issues and challenges were identified as having significant influence on the PDR projects according to the value of their means (higher than 3.00 mean score). The next section highlights the analysis result of issues and challenges by project location, addressing the second objective of this research.

Issues and Challenge by Project Location

The second objective of this research aims to highlight the significant differences in the issues and challenges faced by INGOs regarding project locations (CRS 2011; Silva 2010). The eleven most cited issues and challenges were analysed based on project locations in Aceh and Nias, Bagh, Haiti, Ormoc and Tacloban, Nepal and others. The differences between the issues and challenges in PDR projects by project location are presented in Table 4. The table shows the mean scores for different project locations

using descriptive analysis. In order to gain a better understanding of the survey results, the issues and challenges with the biggest average score and the smallest were both bolded in the mean score text.

Table 4. Issues and Challenges in Post-Disaster Reconstruction (PDR) Projects by Project Location.

Issues and Challenges in PDR Projects	Mean Score (N = 168)					
	Aceh & Nias	Bagh	Haiti	Ormoc & Tacloban	Nepal	Others
Policies	3.143	3.583	3.105	3.879	3.115	3.176
Assessment	3.750	3.667	3.526	3.955	3.654	3.353
Land ownership	3.786	3.667	3.368	3.500	3.231	3.294
Resources	3.643	3.583	3.211	3.773	3.038	3.588
Community Participation	3.750	3.500	3.789	3.985	3.577	3.588
Funding	4.036	3.667	3.526	3.955	3.231	3.353
Coordination	3.536	3.333	3.474	3.803	3.538	3.353
'Build back Better' principles	3.393	3.833	3.474	3.803	3.346	3.235
Quality of work	3.643	3.750	3.684	3.803	3.500	3.588
Corruption	4.036	3.750	3.632	3.788	2.923	3.294
Shortage of technical staff	3.393	3.583	3.158	3.667	3.000	3.000

From Table 4, it can be seen that the respondents in Nepal agreed that corruption is a minor issue and challenge dealt with by INGOs during PDR, with a mean score of 2.923 (significantly lower than other project locations). Meanwhile, the respondents in Aceh and Nias, Indonesia, agreed that the respective organisations had solved the issues and challenges of funding and corruption during the PDR (mean score = 4.036). Nevertheless, these results only describe the essential features of the data. It is essential to statistically test this data, thus observing if there is a significant distinction between the issues and challenges and the project location by using an inferential statistics mathematical approach, a one-way ANOVA. Therefore, a one-way ANOVA was performed to evaluate the influence of project location in Aceh and Nias, Bagh, Haiti, Ormoc and Tacloban, Nepal and others on the eleven most cited issues and challenges in PDR projects.

Table 5 shows a summary derived from the ANOVA results, and only the significant values, $p < 0.05$ (Field 2009; George and Mallery 2010), are presented in bolded form. Several issues and challenges were ranked significantly differently in several project locations. For example, in Table 5, the ANOVA test shows that participants from different locations have scored significantly differently on several issues and challenges in PDR projects: policies [$F(5,162) = 3.807, p = 0.003$]; corruption [$F(5,162) = 3.113, p = 0.010$]; funding [$F(5,162) = 2.493, p = 0.033$]; shortage of technical staff [$F(5,162) = 2.367, p = 0.042$] and resources [$F(5,162) = 2.318, p = 0.046$].

On the other hand, the issues and challenges on assessment [$F(5,162) = 0.974, p = 0.436$]; land ownership [$F(5,162) = 0.823, p = 0.535$]; community participation [$F(5,162) = 0.995, p = 0.423$]; coordination [$F(5,162) = 0.810, p = 0.544$]; 'build back better' principles [$F(5,162) = 1.287, p = 0.272$]; and quality of work [$F(5,162) = 0.310, p = 0.907$], did not significantly differ between the project location in Aceh and Nias, Bagh, Haiti, Ormoc and Tacloban, Nepal and others. The ANOVA test results in Table 6 however, show that there are significant differences between categories within a context variable. Thus, it does not provide specific information about which categories involve differences.

Therefore, further analysis was required to understand the differences between the different categories. This was done through the posthoc Tukey's Honestly Significant Difference (HSD) test, the most commonly used test for large samples (Field 2009; George and Mallery 2010). These include policies, resources, funding, corruption, and a shortage of technical staff, with significant values of $p < 0.05$.

Table 5. One-Way ANOVA for Significant Difference between Issues and Challenges in PDR based on Project Location.

No	Issues and Challenges in PDR Projects		Sum of Squares	df	F	Sig.
1	Policies	Between Groups	21.419	5	3.807	0.003 *
		Within Groups	182.289	162		
		Total	203.708	167		
2	Assessment	Between Groups	6.710	5	0.974	0.436
		Within Groups	223.284	162		
		Total	229.994	167		
3	Land ownership	Between Groups	5.500	5	0.823	0.535
		Within Groups	216.447	162		
		Total	221.946	167		
4	Resources	Between Groups	12.535	5	2.318	0.046 *
		Within Groups	175.173	162		
		Total	187.708	167		
5	Community Participation	Between Groups	5.429	5	0.995	0.423
		Within Groups	176.857	162		
		Total	182.286	167		
6	Funding	Between Groups	15.676	5	2.493	0.033 *
		Within Groups	203.729	162		
		Total	219.405	167		
7	Coordination	Between Groups	5.129	5	0.810	0.544
		Within Groups	205.151	162		
		Total	210.280	167		
8	'Build back Better' principles	Between Groups	8.678	5	1.287	0.272
		Within Groups	218.465	162		
		Total	227.143	167		
9	Quality of work	Between Groups	2.064	5	0.310	0.907
		Within Groups	215.841	162		
		Total	217.905	167		
10	Corruption	Between Groups	21.334	5	3.113	0.010 *
		Within Groups	222.041	162		
		Total	243.375	167		
11	Shortage of technical staff	Between Groups	13.063	5	2.367	0.042 *
		Within Groups	178.788	162		
		Total	191.851	167		

Note: * The mean difference is significant at the 0.05 level.

Table 6. Tukey Honestly Significant Difference (HSD) Result on Issues and Challenges by Location.

Issues and Challenges in PDR Projects	Project Location	Project Location	Sig.
Policies	Aceh and Nias, Indonesia	Ormoc and Tacloban, Philippines	0.029 *
		Nepal	0.027 *
Resources	Ormoc and Tacloban, Philippines	Nepal	0.031 *
Funding	-	-	-
Corruption	Aceh and Nias, Indonesia	Nepal	0.008 *
		Ormoc and Tacloban, Philippines	0.021 *
Shortage of technical staff	-	-	-

Note: * The mean difference is significant at the 0.05 level.

Table 6 presents the results of the posthoc Tukey HSD test on differences between issues and challenges and project locations using a one-way ANOVA, and only the significant values, $p < 0.05$, are presented. The Tukey HSD test shows that ‘policies’ differ greatly between locations: Aceh and Nias, Indonesia/Ormoc and Tacloban, Philipines ($p = 0.029$); and Aceh and Nias, Indonesia/Nepal ($p = 0.027$). Also, under ‘issues of resources’, there are significant differences between the locations in Ormoc and Tacloban, Philipines and Nepal ($p = 0.031$). Furthermore, the issues and challenges with regard to ‘corruption’ show significant differences between the locations; Aceh and Nias, Indonesia/Nepal (0.008) and Aceh and Nias, Indonesia/Ormoc and Tacloban ($p = 0.021$). However, the funding and the shortage of technical staff, although reported as significant in Table 5, yielded no significant differences in project locations after the Turkey HSD test was carried out.

6. Discussion

This section discusses the issues and challenges, and the differences between the factors and project locations in PDR projects. The eleven most cited issues and challenges were analysed based on project location in Aceh and Nias, Bagh, Haiti, Ormoc and Tacloban, Nepal and others. The results of the statistical analysis were demonstrated to identify the issues and challenges in PDR projects. The analysis shows that four factors, namely community participation, assessment, funding, and quality of work were perceived by the INGOs as important with regard to issues and challenges, while the other seven factors identified have a lower influence on PDR. The evidence suggests that the INGOs, as one of the key players in PDR projects, should engage and increase the communities’ participation, from the initiating stage to the closing stage, in order to achieve successful project outcomes. Communities are the first respondents after the disaster, and they have broad knowledge of cultures, designs, and other aspects pertaining to PDR projects. It can be noticed that at present, many of the INGOs had set up their assessment teams to gather all the information before giving any commitment to take part in the recovery phase.

The assessment carried out not only provides the data needed, but it also helps the INGOs to decide whether to proceed with the aid or to find strategically the partner agencies that can help with the funding of PDR projects. This research discovered that funding of PDR projects is one of the main issues that needs to be resolved by the INGOs to accomplish project management success. The lack of funding, as discussed in the previous literature reviews, had resulted in many project failures, and most of the INGOs had to implement exit policies to reduce the overburden of the project’s budget. Prior to this, the INGOs should value their capabilities and capacities to be able to deliver projects with high quality that can withstand the impacts of future disasters. High quality workmanship and top quality products are, therefore, recommended as important issues to be addressed by INGOs, based on the findings of this research.

These findings then led to further discussions on the difference between the factors and project locations, as suggested by Silva (2010), while at the same time answering the second objective of this research. The findings of the statistical analysis covered the effects of issues and challenges on PDR project locations in Aceh and Nias, Bagh, Haiti, Ormoc and Tacloban, Nepal and others. Project location had a significant effect on policies, resources, funding, corruption, and the shortage of technical staff in PDR projects. This finding pointed out that under ‘policies’ there are significant differences between the locations Aceh and Nias, Indonesia/Ormoc and Tacloban, Philipines. The differences between these two locations are that Aceh and Nias have gone through the reconstruction phase since 2004, while Ormoc and Tacloban experienced the typhoon Haiyan only in 2014. The policies implemented in Aceh, Indonesia have been well established, compared to those in Ormoc and Tacloban.

Under ‘issues of resources’, there are significant differences between the locations in Ormoc and Tacloban, Philipines and Nepal. These locations have difficulties in allocating resources because the distance between the PDR projects and the resources suppliers are very far. For example, to secure the materials for the reconstruction of Ormoc and Tacloban, the nearest warehouse is in Cebu Island,

which takes approximately 12–24 h by sea transport. It is similar within Nepal, where the place affected by the earthquake is located near the peak of the mountain.

The issues and challenges related to ‘corruption’ show major differences between the locations Aceh and Nias, Indonesia/Nepal, and Aceh and Nias, Indonesia/Ormoc and Tacloban. Corruption in a different location after the disaster may flow within the uneven power relations, a lack of rights to use the resources, inequity in aid allocation, and an inefficient support system.

7. Conclusions

Post-disaster reconstruction is a complex and highly demanding process that involves a number of different and well-coordinated courses of action. Therefore, it is vital that these complex activities are well planned. However, there had been many reports on PDR problems in practice, making it necessary to systematically analyse the current PDR research for future improvements. The results of the review from previous authors have then been categorised into eleven main categories. These cover issues of resources, community participation, funding, assessment, coordination, corruption, ‘build back better’ principles, policies, quality of work, land ownership, and a shortage of technical staff. From the statistical analysis, this research highlighted the most significant issues and challenges in the PDR projects, namely community participation, assessment, funding, and quality of work.

These findings then directed the research to further analysis of the differences between the factors and project locations. Based on the findings, it was found that project location had a significant effect on policies, resources, funding, corruption, and the shortage of technical staff, especially in the areas of Aceh and Nias, Indonesia, Ormoc and Tacloban, Philippines and Nepal. This paper has provided a fundamental review of PDR studies from the aspect of improving project performance by looking into the most common problems affecting the project delivery performance of INGOs. Consequently, these findings present a clear understanding of INGOs’ performance in PDR projects and could potentially enhance existing knowledge on the success of post-disaster reconstruction projects.

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References

- ADB. 2005. *An Initial Assessment of the Impact of the Earthquake and Tsunami of December 26, 2004 on South And Southeast Asia*. Manila: Asian Development Bank.
- Adu-Boateng, K., and B. M. Oppong. 2011. Post Disaster Reconstruction Activities: A Case Study in Ghana. In *Disaster Management and Human Health Risk II*. Edited by C. A. Brebbia, A. J. Kassab and E. A. Divo. New Forest: WIT Press.
- Ahmed, Iftekhar. 2011. An Overview of Post-Disaster Permanent Housing Reconstruction in Developing Countries. *International Journal of Disaster Resilience in the Built Environment* 2: 148–64. [[CrossRef](#)]
- Attarzadeh, Iman, and Siew Hock Ow. 2008. Project Management Practices: The Criteria for Success or Failure. *Communications of the IBIMA* 1: 234–41.
- Baldauf, A., H. Reisinger, and W. C. Moncrief. 1999. Examining Motivations to Refuse in Industrial Mail Surveys. *Journal of the Market Research Society* 41: 345–53.
- Boen, Teddy. 2006. Building A Safer Aceh, Reconstruction of Houses, One Year after the Dec. 26, 2004 Tsunami. In *40th Anniversary of Trisakti University, “Answering the Challenges in Today’s Civil Engineering”*. Jakarta: Trisakti University.
- Bornstein, Lisa, Gonzalo Lizarralde, Kevin A. Gould, and Colin Davidson. 2013. Framing Responses to Post-Earthquake Haiti: How Representations of Disasters, Reconstruction and Human Settlements Shape Resilience. *International Journal of Disaster Resilience in the Built Environment* 4: 43–57. [[CrossRef](#)]

- BRR. 2006. *Aceh and Nias: Two Years after the Tsunami*. Jakarta: Badan Rekonstruksi and Rehabilitasi, Indonesia BRR and Partners.
- Canny, Bill. 2005. *A Review of Ngo Coordination in Aceh Post Earthquake/Tsunami*. Geneva: International Council of Voluntary Agencies (ICVA).
- Chang, Yan, Suzanne Wilkinson, Regan Potangaroa, and Erica Seville. 2010. Resources and Capacity: Lessons Learned from Post-Disaster Reconstruction Resourcing in Indonesia, China and Australia. Paper presented at the Construction, Building and Real Estate Research Conference of the Royal Institution of Chartered Surveyors, Paris, France, September 2–3; Paris: RICS.
- Chang, Yan, Suzanne Wilkinson, David Brunson, Erica Seville, and Regan Potangaroa. 2011a. Identifying Factors Affecting Resource Availability for Post Disaster Reconstruction: A Case Study in China. *Construction Management and Economics* 29: 37–48. [CrossRef]
- Chang, Yan, Suzanne Wilkinson, David Brunson, Erica Seville, and Regan Potangaroa. 2011b. Donor-Driven Resource Procurement for Post-Disaster Reconstruction: Constraints and Actions. *Habitat International* 35: 199–205. [CrossRef]
- CRS. 2011. *How-to Guide: Managing Post-Disaster (Re)-Construction Projects*. Edited by Annika Grafweg. Baltimore: Catholic Relief Services.
- Davidson, Colin H., Cassidy Johnson, Gonzalo Lizarralde, Nese Dikmen, and Alicia Sliwinski. 2007. Truths and Myths about Community Participation in Post-Disaster Housing Projects. *Habitat International* 31: 100–115. [CrossRef]
- Doocy, Shannon, and Yuri Gorokhovich. 2008. An Integrated Approach to Natural Disaster Assessment. Paper presented at Solutions to Coastal Disasters 2008, Oahu, HI, USA, April 13–16; Reston: American Society of Civil Engineers.
- EPC, TCG, and LLC. 2004. *Participatory Planning Guide for Post-Disaster Reconstruction*. Ahmedabad: EPC-Environmental Planning Collaborative.
- Field, A. 2009. *Discovering Statistics Using SPSS*, 3rd ed. London: SAGE publications Ltd.
- Freeman, Paul K. 2007. Allocation of Post-Disaster Reconstruction Financing to Housing. *Building Research & Information* 32: 37–41.
- GAO. 2011. Haiti Reconstruction: Factors Contributing to Delays in USAID Infrastructure Construction. Available online: <http://www.gao.gov/assets/590/586701.pdf> (accessed on 21 November 2017).
- George, D., and M. Mallery. 2010. *SPSS for Windows Step by Step: A Simple Guide and Reference*. 17.0; Boston: Pearson.
- Ghafory-Ashtiany, Mohsen, and Mahmood Hosseini. 2007. Post-Bam Earthquake: Recovery and Reconstruction. *Natural Hazards* 44: 229–41.
- Gharaati, Mehran, and Colin Davidson. 2008. Who Knows Best? An Overview of Reconstruction after the Earthquake in Bam. Paper presented at the 4th International I-REC Conference: Building Resilience: Achieving Effective Post-Disaster Reconstruction, Rotterdam, The Netherlands, April 30–May 2.
- Hager, Marka, Sarah Wilson, Thomas H. Pollak, and Patrick Michael Rooney. 2003. Response Rates for Mail Surveys of Nonprofit Organizations: A Review and Empirical Test. *Response* 32: 252–67. [CrossRef]
- Hidayat, Benny, and Charles Egbu. 2010. A Literature Review of the Role of Project Management in Post-Disaster Reconstruction. Paper presented at 26th Annual ARCOM Conference, Leeds, UK, September 6–8.
- Hosseini, M., and Y. O. Izadkhah. 2008. Lessons Learnt from Shelter Actions and Reconstruction of Bam after the Destructive Earthquake of December 26, 2003. Paper presented at the 14 World Conference on Earthquake Engineering, Beijing, China, October 12–17.
- Ibrahim, Maggie. 2010. *Post-Disaster Housing Reconstruction in A Conflict Affected District, Batticaloa, Sri Lanka: Reflecting on the Climate Management Approach*. Strengthening Climate Resilience Discussion Paper 6; Brighton, UK: Institute of Development Studies.
- Kamani-Fard, Asal, Mohd Hamdan Ahmad, and Dilshan Remaz Ossen. 2012. The Sense of Place in the New Homes of Post-Bam Earthquake Reconstruction. *International Journal of Disaster Resilience in the Built Environment* 3: 220–36. [CrossRef]
- Karunasena, Gayani, and Raufdeen Rameezdeen. 2010. Post-Disaster Housing Reconstruction: Comparative Study of Donor vs Owner-Driven Approaches. *International Journal of Disaster Resilience in the Built Environment* 1: 173–91. [CrossRef]

- Kennedy, Jim, Joseph Ashmore, Elizabeth Babister, and Ilan Kelman. 2008. The Meaning of 'Build Back Better': Evidence From Post-Tsunami Aceh and Sri Lanka. *Journal of Contingencies and Crisis Management* 16: 24–36. [CrossRef]
- Kaushal Keraminiyage, Suranga Jayasena, Dilanthi Amaratunga, and Richard Haigh, eds. 2008. *Post Disaster Recovery Challenges in Sri Lanka*. Salford: CIB (International Council for Research and Innovation in Building and Construction).
- Kopaei, Mehran Gharaati. 2009. Knowledge Transfer in Post-Disaster Reconstruction: The Problem of Post-Post-Disaster Reconstruction. Ph.D. Thesis, McGill University, Montreal, QC, Canada.
- Lyons, Michal. 2009. Building Back Better: The Large-Scale Impact of Small-Scale Approaches to Reconstruction. *World Development* 37: 385–98. [CrossRef]
- Mannakkara, Sandeeka, and Suzanne Wilkinson. 2013. Build Back Better Principles for Post-Disaster Structural Improvements. *Structural Survey* 31: 314–27. [CrossRef]
- Mannakkara, Sandeeka, Suzanne Wilkinson, and Tinu Rose Francis. 2014. 'Build Back Better' Principles for Reconstruction. *Encyclopedia of Earthquake Engineering*. [CrossRef]
- Moloney, Anastasia. 2014. Haitians Still Homeless, 'Suffering in Despair' 4 Years after Quake-Amnesty. Available online: <http://news.trust.org/item/20140113063728-6lwyr/> (accessed on 21 November 2017).
- NAPA. 2006. *Why Foreign Aid to Haiti Failed*. Washington: International Affairs Series, National Academy of Public Administration.
- Nazara, Suahasil, and Budy P Resosudarmo. 2007. *Aceh-Nias Reconstruction and Rehabilitation: Progress and Challenges at the End of 2006*. Tokyo: Asian Development Bank Institute.
- Ochiai, Chiho, and Rajib Shaw. 2009. Reconstruction In Urban Areas In Aceh. In *Urban Risk Reduction: An Asian Perspective*. Bingley, UK: Emerald Group Publishing Limited, vol. 1, pp. 233–52.
- Ophiyandri, Taufika, Dilanthi Amaratunga, Chaminda Pathirage, and Kaushal Keraminiyage. 2013. Critical Success Factors for Community-Based Post-Disaster Housing Reconstruction Projects in the Pre-Construction Stage in Indonesia. *International Journal of Disaster Resilience in the Built Environment* 4: 236–49. [CrossRef]
- Parker, Ronald, and Kristin Little. 2004. *Project Performance Assessment Report El Salvador Earthquake Reconstruction Project*. Washington: Sector and Thematic Evaluations Group Operations Evaluation Department, World Bank.
- Perera-Mubarak, Kamakshi N. 2012. Reading 'stories' of Corruption: Practices and Perceptions of Everyday Corruption in Post-Tsunami Sri Lanka. *Political Geography* 31: 368–78. [CrossRef]
- Randall, Jonathan, and Emma Jowett. 2010. *Green Recovery and Reconstruction: Training Toolkit for Humanitarian Aid. The Green Recovery and Reconstruction Toolkit (GRRT)*. San Francisco: World Wildlife Fund, Inc. and American National Red Cross.
- Rotimi, James O. B., Jason Le, and Suzanne Wilkinson. 2006. The Regulatory Framework For Effective Post-Disaster Reconstruction In New Zealand. Paper presented at the Third International Conference on Post-Disaster Reconstruction: Meeting Stakeholder Interests, Florence, Italy, May 17–18.
- Shaw, Judith, and Iftekhar Ahmed. 2010. Design and Delivery of Post-Disaster Housing Resettlement Programs: Case Study from Sri Lanka and India. Available online: <http://mams.rmit.edu.au/2ulsye0lkgb5z.pdf> (accessed on 21 November 2017).
- Shaw, Rajib, and Katsuihiro Goda. 2004. From Disaster to Sustainable Civil Society: Kobe Experience. *Disasters* 28: 16–40. [CrossRef] [PubMed]
- Silva, Jo Da. 2010. *Lessons from Aceh: Key Considerations in Post-Disaster Reconstruction*. Disasters Emergency Committee, ARUP. Warwickshire: Practical Action Publishing.
- Soelaksono, Arwin. 2009. NGO and Donor Coordination to Speeds up Reconstruction and Avoid NGO Competition. Paper presented at the 4th Annual International Workshop & Expo on Sumatra Tsunami and Recovery in Banda Aceh, Kobe, Japan, November 23–25.
- Steinberg, Florian. 2007. Housing Reconstruction and Rehabilitation in Aceh and Nias, Indonesia-Rebuilding Lives. *Habitat International* 31: 150–66. [CrossRef]
- Sun, Caiyu, and Jiuping Xu. 2011. Estimation of Time for Wenchuan Earthquake Reconstruction in China. *Journal of Construction Engineering And Management* 137: 179–87. [CrossRef]
- Sun, Chunling, and Ran Bi. 2010. Study on Disaster Reconstruction Project Performance Evaluation Based on Fuzzy Analytic Network Process. Paper presented at 2010 International Symposium on Computer, Communication, Control and Automation (3CA), Taipei, Taiwan, May 5–7.

- Seneviratne, Krisanthi, David Baldry, and Chaminda Pathirage. 2013. Disaster Knowledge Factors in Managing Disasters Successfully. *International Journal of Strategic Property Management* 14: 376–90. [CrossRef]
- UNDP. 2007. Building Disaster Resilient Communities: Good Practices and Lessons Learned. Available online: http://www.unisdr.org/files/596_10307.pdf (accessed on 21 November 2017).
- United Nations. 2008. *Transitional Settlement and Reconstruction after Natural Disasters, Field Edition*. New York: United Nations.
- Von Meding, J. K., L. Oyedele, and D. J. Cleland. 2009. Developing NGO Competencies in Post-Disaster Reconstruction: A Theoretical Framework. *Disaster Advances* 2: 36–45.
- Wardak, Zabihullah Sadiqi, Vaughan Coffey, and Bambang Trigunaryah. 2011. Post-Disaster Housing Reconstruction: Challenges for Community Participation. Paper presented at the International Conference on Building Resilience: Interdisciplinary Approaches to Disaster Risk Reduction, and the Development of Sustainable Communities, Heritance Kandalama, Sri Lanka, July 18–22.
- Wardak, Zabihullah Sadiqi, Vaughan Coffey, and Bambang Trigunaryah. 2012. Rebuilding Housing after a Disaster: Factors for Failure. Paper presented at the 8th Annual International Conference of the International Institute for Infrastructure, Renewal and Reconstruction (IIIRR), Kandy, Sri Lanka, August 5–7.
- World Bank. 2004. *Project Performance Assessment Report: Armenia Earthquake Reconstruction Project*. Washington: Sector and Thematic Evaluation Group Operations Evaluation Department, World Bank.
- Ye, Yaoxian, and Norio Okada. 2002. Integrated Relief And Reconstruction Management Following A Natural Disaster. Paper presented at the Second Annual IIASA-DPRI Meeting, Integrated Disaster Risk Management: Megacity Vulnerability and Resilience, IIASA, Laxenburg, Austria, July 29–31.
- Yin, Yi-lin, and Jin-e Zhou. 2010. Research on the Application of CM-Agent Model in Public Projects of Post-Disaster Reconstruction. Paper presented at 2010 International Conference on Logistics Systems and Intelligent Management (ICLSIM), Harbin, China, January 9–10.
- Zuo, Kelvin, Regan Potangaroa, Suzanne Wilkinson, and James O.B. Rotimi. 2009. A Project Management Prospective in Achieving a Sustainable Supply Chain for Timber Procurement in Banda Aceh, Indonesia. *International Journal of Managing Projects in Business* 2: 386–400. [CrossRef]



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