Advantages and Limitations of Community-based Post-disaster Housing Reconstruction Projects

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Structured Abstract:

Purpose – The purpose of this paper is to discuss the advantages and limitations of the implementation of a community-based method in post-disaster housing reconstruction.

Design/methodology/approach – The research was based on multiple case studies in the implementation of a Community-based Post-disaster Housing Reconstruction project (CPHRP) in Indonesia. Data was gathered by conducting semi-structured interviews and a questionnaire survey.

Findings – **T**he research reveals 22 advantages of a CPHRP. Four advantages can be categorised as highly significant. They are: create sense of ownership, fit to local culture/customs/wisdom, build beneficiaries' confidence, and minimize corruption. There are some advantages that cannot be delivered if the housing reconstruction is conducted using a contractor-based approach. It was also found that psychological advantages are more dominant than the physical advantages. Despite its numerous advantages, CPHRP has limitations. Firstly, it requires a long pre-construction process, and secondly, there is a limitation with regard to the capacity of implementer and there are limitations within the community itself.

Originality/value – This paper is very specific as it attempts to discover the advantages and limitations of a CPHRP.

Keywords: *community-based, post-disaster, housing reconstruction, advantages, limitations, Indonesia*

Article Classification: Research paper

1 Introduction

Located at the juncture of four tectonic plates, Indonesia is frequently hit by earthquakes. In recent years, the occurrence of large earthquakes has increased significantly. EM-DAT (2013) records that earthquake occurrence has increased from 14 times during 1980-1989 to 39 times during 2000-2009. In addition, particularly following the giant earthquake in Aceh at the end of 2004 to 2010, USGS (2010) notes that 38 large earthquakes have taken place compared with only 12 earthquakes between 1992 and 2004. Examples of devastating earthquakes during this period are the 6.3 Richter Scale Yogyakarta earthquake in 2006 and the 7.6 Richter Scale West Sumatra earthquake in 2009. These earthquakes have created considerable losses for Indonesian communities. The impact of disasters in Indonesia is very significant. In 30 years (1982-2011), disasters have killed 200,152 people, affected 21,270,898 people and caused economic losses of US$ 23.65 billion. The huge earthquake, measuring 9.0 on the Richter Scale in 2004, which triggered the tsunami, was the worst incident, where 165,708 people were killed and economic losses of approximately US$ 4.45 billion were incurred. A summary of the fatalities, economic losses and the number of houses heavily damaged are presented in Table 1.

Table 1. Number of fatalities, economic losses and housing damage because of earthquakes in Aceh and Nias, Yogyakarta and Central Java, and West Sumatra

No.	Disaster location	Fatalities	Economic losses (US$)	Housing destroyed/ heavily damaged
1.	Aceh and Nias, 2004 and 2005	127,720	4.9 billion	139,195
2.	Yogyakarta and Central Java, 2006	5,716	3.1 billion	250,000
3.	West Sumatra, 2009	1,117	2.3 billion	115,000

Source: BNPB et al., 2009; BRR, 2009; Bappenas et al., 2006; JRF, 2010

The huge number of fatalities in Aceh was due to the impact of tsunami, while in Yogyakarta and Central Java, and West Sumatra fatalities resulted from collapsed houses. It can be seen from Table 1 that the total number of destroyed/heavily damaged houses in these areas are more than 500,000 houses. As a result, massive housing reconstruction programmes have been conducted. In these three affected areas, the practice of the community-based method for housing reconstruction has been implemented.

This method has brought many advantages to communities and has achieved high satisfaction amongst survivors (Arslan and Unlu, 2006; Fallahi, 2007; Barenstein, 2008; Lawther, 2009). Lyons (2010) suggests that large scale housing reconstruction with the involvement of the beneficiaries can contribute to vulnerability reduction. Moreover, particularly when compared with the contractor-based method, this method has distinct advantages. Accordingly, it would interesting to analyse what are the advantages of CPHRP, and what advantages make this method superior compared to a contractor-based method. However, the implementation of CPHRP is not without problems (Davidson et al., 2007; Dercon and Kusmawijaya, 2007, Jha et al., 2010; MacRae and Hodgkin, 2011). So, it would also be interesting to reveal the limitations of CPHRP.

2 Community-based approach

The word ‘community’ has different meanings and definitions. All the definitions use some combination of space, people and social interactions. McMillan and Chavis (1986) define community as a feeling that members have of belonging, a feeling that members matter to one another and to the group, and a shared faith that members’ needs will be met through their commitment to be together. According to Wright-House (2009), McMillan & Chavis's definition is probably the most influential among the theories on, and is the starting point for most of the recent research on, the psychological sense of community.

In the context of disaster risk management, Abarquez and Murshed (2004) define community as ‘a group that may share one or more things in common such as living in the same environment, experiencing similar disaster risk exposure, or having been affected by a disaster’. A similar definition, but one more closely allied to the built environment is proposed by Ginige and Amaratunga (2011). They define community as ‘individuals and groups sharing a natural and built environment that is vulnerable to hazards. In other words, community is the general public; the users and occupants of the built environment and the beneficiaries of post-disaster reconstruction’. In the sector of post-disaster housing reconstruction, Ophiyandri (2013) defines community as a group of beneficiaries of housing reconstruction whose original houses have been affected by disaster. The grouping is normally based in a geographical area. This clear definition is important since the meaning of community can be interpreted in so many different ways.

In post-disaster housing reconstruction, several approaches are available to be implemented (Jha et al., 2010; da Silva, 2010). These approaches can be categorized into two groups, community-based methods or contractor-based methods. In the contractor-based approach, housing reconstruction is carried out by a contractor or contractors and the community has no, or limited, involvement in the reconstruction process. On the other hand, in a community-based approach, the community have a significant amount of control over the project. Referring to the model of community participation proposed by Davidson et al. (2007), Ophiyandri et al. (2010) suggest that the definition of 'community-based' in the context of a post-disaster housing reconstruction project constitutes an approach wherein the participation of the community is at the level of collaboration or empowerment. Figure 1 presents the minimum level of community participation that can be named as 'community-based'. Hence, in this type of participation, the affected community are not just consulted about their needs and expectations, but they can be owners, supervisors, or even contractors of their own housing reconstruction projects.

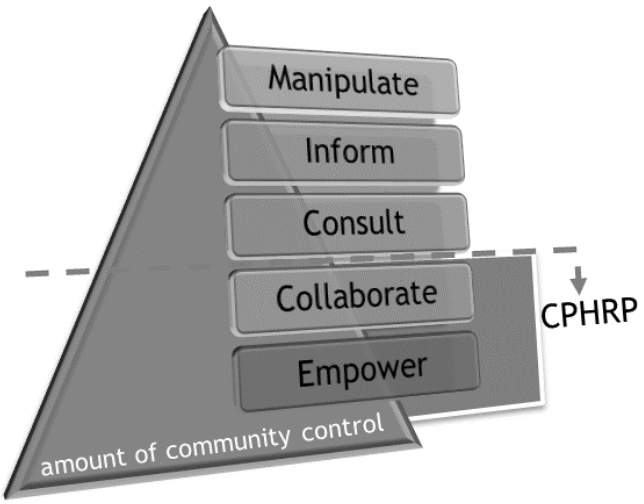

Figure 1. Minimum level of community participation in CPHRP
(adapted from Davidson et al., 2007)

Moreover, the terminology of a community-based method is slightly different to an owner-driven method. According to Lankatilleke (2010), an owner-driven method is an approach where beneficiaries can decide how to build a house with external support in the form of technical advice and funding. By this definition, it can be seen that in a community-based method, beneficiaries create a group in which they can discuss a plan for housing reconstruction. Any help or assistance are given through the group created by the community, not to an individual. In implementation, the community can choose their own house designs or decide who is going to construct their houses as in an 'owner-driven' method. Thus, it can be said that a community-based method can be in the form of an owner-driven method. Community-based housing reconstruction has proven to be a better way of reconstruction compared to a contractor-based approach. In addition to high construction quality, satisfaction and accountability scores, the delivery of housing reconstruction using a community-based approach is also faster than the contractor-based approach. When beneficiaries are deeply involved in the reconstruction work, many communities gain knowledge of the standard features that every house should have, such as proper foundations and strong roof beams. Many beneficiaries are industrious and save money by working on the construction of their own homes instead of hiring labourers.

3 Methodology

In order to achieve the objectives of the research as identified in this paper, multiple case studies were selected as the key research strategy. The cases that were investigated in detail in association with the implementation of CPHRP included Aceh and Nias, Yogyakarta and Central Java, and West Sumatra. In line with its research paradigm and in order to achieve the research objectives, this research adopted the mixed methods' approach, combining both qualitative and quantitative methods. Amaratunga *et al*. (2002) stress that the important factor in justifying the mixed methods' approach is that both qualitative and quantitative methods have strengths and weaknesses, and the mixed methods' approach focuses on combining their relevant strengths.

Following a model proposed by Miles and Huberman (1994) that links the qualitative and quantitative method, this research adopted a model with three phases: firstly, the researcher conducted exploratory qualitative data by interviewing respondents. The findings from the interviews together with the findings from literature review led to the development of a questionnaire as the quantitative instrumentation. Finally, the findings from the questionnaires were expanded and tested by conducting the next qualitative work, which was the semi-structured interviews.

In this research, the aim of the interviews was to identify as many advantages perceived by respondents as possible. In other words, the interview analysis was seen as a complementary method used to develop a questionnaire which functioned as a principal method. In this first phase of the data collection, 20 interviews were carried out. Prior to the interviews, the researcher introduced the research and its objectives, the structure of the interview, and the ethics of the interview. After that, the researcher asked the participant to sign the consent form and sought their permission to digitally record the interview.

The second stage of the data collection method in this study was a questionnaire survey which was composed using the results from the empirical investigation via the semi-structured and the literature review findings. The combination of information received from these two sources of data made the questionnaire more comprehensive. The primary objective of the questionnaire was to quantify the magnitude of the advantages. The questionnaire consisted of listing 22 advantages and was drafted in two languages, English and Bahasa Indonesia. This was necessary since the majority of respondents speak Bahasa Indonesia while only a few speak English. Respondents were invited to judge how significant the level of each advantage within a community-based approach was. The questionnaire used a five point Likert Scale: (1) 'not significant at all', (2) 'slightly significant', (3) 'significant', (4) 'very significant', and (5) 'extremely significant'.

The questionnaire was administered in December 2011 and the process of collection was completed in February 2012. The questionnaire was emailed to 92 potential respondents and 73 completed questionnaires were received by the researcher, representing a 79% feedback rate. The response rate was considered very satisfactory. Amongst these 73 completed questionnaires, 65 questionnaires were categorized as valid. The validity criterion was based on two factors, that the respondent had had experience of a community-based project and that one of the project locations with which the respondent was involved had to be in a case study location. These criteria were necessary because if the respondents had never experienced CPHRP in one of the case locations then their response to the questionnaire survey could be misleading.

The third step of data collection was the validation interviews which aimed to validate and refine the research findings if necessary. They were conducted using semi-structured interviews and the main question was whether the findings from the quantitative analysis successfully captured the real phenomena of the investigated topic. The interviews were conducted with four experts on community-based post-disaster housing reconstruction. The selection criteria for the interviewees were based on

the experience of the interviewee. The interviewees had to have at least two experiences of community-based approaches in the case study locations and to have come from different job functions.

The analysis for the qualitative data was conducted using content analysis while the data from the questionnaire survey was analysed using descriptive and inferential statistics. NVivo version 10 and SPSS version 17.0 were utilised to analyse the qualitative and quantitative data respectively.

4 Analysis and discussion

4.1 Advantages

The qualitative analysis and literature review revealed 22 advantages of CPHRP. Advantages mean the positive aspects or circumstances brought about by the implementation of CPHRP. These advantages were not only for the communities, but for all the stakeholders involved in CPHRP. For example, 'it is well accepted' and 'implementer can obtain a good impression' are the advantages that can be gained particularly by the implementer of CPHRP. Some advantages which were particularly stressed by the interviewees are highlighted below. According to the interviewees, the implementation of a community-based approach in a post-disaster situation can achieve the traditional objectives of any construction project, which is to meet the agreed costs, the desired quality and the delivery time. Interviewee A explained that within a CPHRP a project can be quickly completed. Based on his experience, the fastest a community can completely finish one new house is 30 days. Interestingly, this occurred when the form of community participation was empowerment, when the community acted as the labour for their own housing project. In cases where the community completed their own housing reconstruction projects, high quality housing can also be produced. Interviewee A added:

> *"As a result, this will make the quality better compared to if it is done by other people. Because they build their own houses."*

This indicates that because the community build their own houses, they will build them to the best of their abilities, follow the building code, and they will not cheat on the requirements set. If a house does not meet the required specification, they will suffer the consequences. Active community involvement in CPHRP should help a community to gain their confidence back and should also guarantee that their needs and expectations can be met. Another outcome is that the house will also fit with the culture, wisdom and customs of the community.

Respondents also perceived that a CPHRP can have high accountability and can minimise corruption practices. One reason why corruption is minimal is transparency. The CPHRP clearly requires transparency from the government, the implementer, and from within the community. Without transparency, the community-based method can fail.

The next advantage highlighted by respondents related to the sense of ownership. As noted by interviewee B:

> *"the advantage is that community has a sense of ownership; what they build belongs to them. It would be different if we used the contractor-based method, the contractor is the third party. These are their own houses, built by themselves. So they feel they belong to them".*

Analysis of the questionnaire survey data reveals that four advantages of CPHRP can be classified as very significant because their mean value is higher or equal to 4.00. As can be seen from Table 2,

creating a sense of ownership for the beneficiaries of the programme is the most advantageous benefit of CPHRP as perceived by respondents. This advantage has a mean value of 4.3538. The second most advantageous is the way that the houses are built using the CPHRP approach so that they fit with local culture, customs and the wisdom existing in the community. The third advantage is that CPHRP can build beneficiaries' confidence. The second and third advantages have the same mean value, but the latter has a higher standard deviation. Thus, 'building beneficiaries' confidence' is ranked at third place. The fourth most significant advantage of CPHRP is that it can minimise corrupt practices during the reconstruction process.

Table 2. Advantages of CPHRP

Rank	Advantages	Mean	Std. Dev.	Test Value = 0			
				t	Sig. (2-tailed)	95% Confidence Interval of the Difference	
						Lower	Upper
1	**Create sense of ownership**	4.3538	0.7166	48.9860	0.0000	4.1763	4.5314
2	**Fit to local culture/customs/wisdom**	4.0308	0.7900	41.1380	0.0000	3.8350	4.2265
3	**Build beneficiaries' confidence**	4.0308	0.8833	36.7890	0.0000	3.8119	4.2497
4	**Minimize corruption**	4.0154	0.9920	32.6330	0.0000	3.7696	4.2612
5	More funding goes to the community	3.8308	1.0394	29.7150	0.0000	3.5732	4.0883
6	Create jobs for beneficiaries so they can obtain income	3.8000	0.9220	33.2300	0.0000	3.5716	4.0284
7	Re-establish trust between the community	3.7846	0.9099	33.5350	0.0000	3.5592	4.0101
8	High accountability	3.7692	0.8798	34.5400	0.0000	3.5512	3.9872
9	Rebuild community networking	3.7692	0.7860	38.6620	0.0000	3.5745	3.9640
10	Meet beneficiaries' needs and expectations	3.7538	1.0312	29.3480	0.0000	3.4983	4.0094
11	It is well accepted	3.7385	0.8154	36.9630	0.0000	3.5364	3.9405
12	Ease beneficiaries' trauma	3.7231	0.8928	33.6200	0.0000	3.5018	3.9443
13	Create pride among beneficiaries	3.6923	0.8646	34.4290	0.0000	3.4781	3.9066
14	Strengthen community organisations/institutions	3.6154	1.0853	26.8570	0.0000	3.3465	3.8843
15	Better quality	3.6000	1.0869	26.7050	0.0000	3.3307	3.8693
16	Rebuild norms in the community	3.5385	1.2000	23.7740	0.0000	3.2411	3.8358
17	Involve vulnerable groups	3.5231	0.9700	29.2830	0.0000	3.2827	3.7634
18	High satisfaction	3.5231	0.9372	30.3070	0.0000	3.2908	3.7553
19	Faster reconstruction	3.0308	1.1855	20.6120	0.0000	2.7370	3.3245
20	Implementer can obtain good impressions	2.9692	1.1035	21.6930	0.0000	2.6958	3.2427
21	Cheaper reconstruction	2.9692	1.2115	19.7590	0.0000	2.6690	3.2694
22	Fewer problems	2.9077	1.1142	21.0410	0.0000	2.6316	3.1838

The advantages of CPHRP can be classified into two sections, psychological and physical. Psychological advantages are the advantages that make stakeholders, particularly beneficiaries, feel psychologically secure and psychologically satisfied, while the other advantages are the physical advantages. Physical advantages are more tangible than psychological advantages. Physical

advantages can be divided into two categories, construction and non-construction advantages. The categorisation of advantages and their ranking is shown in Figure 2.

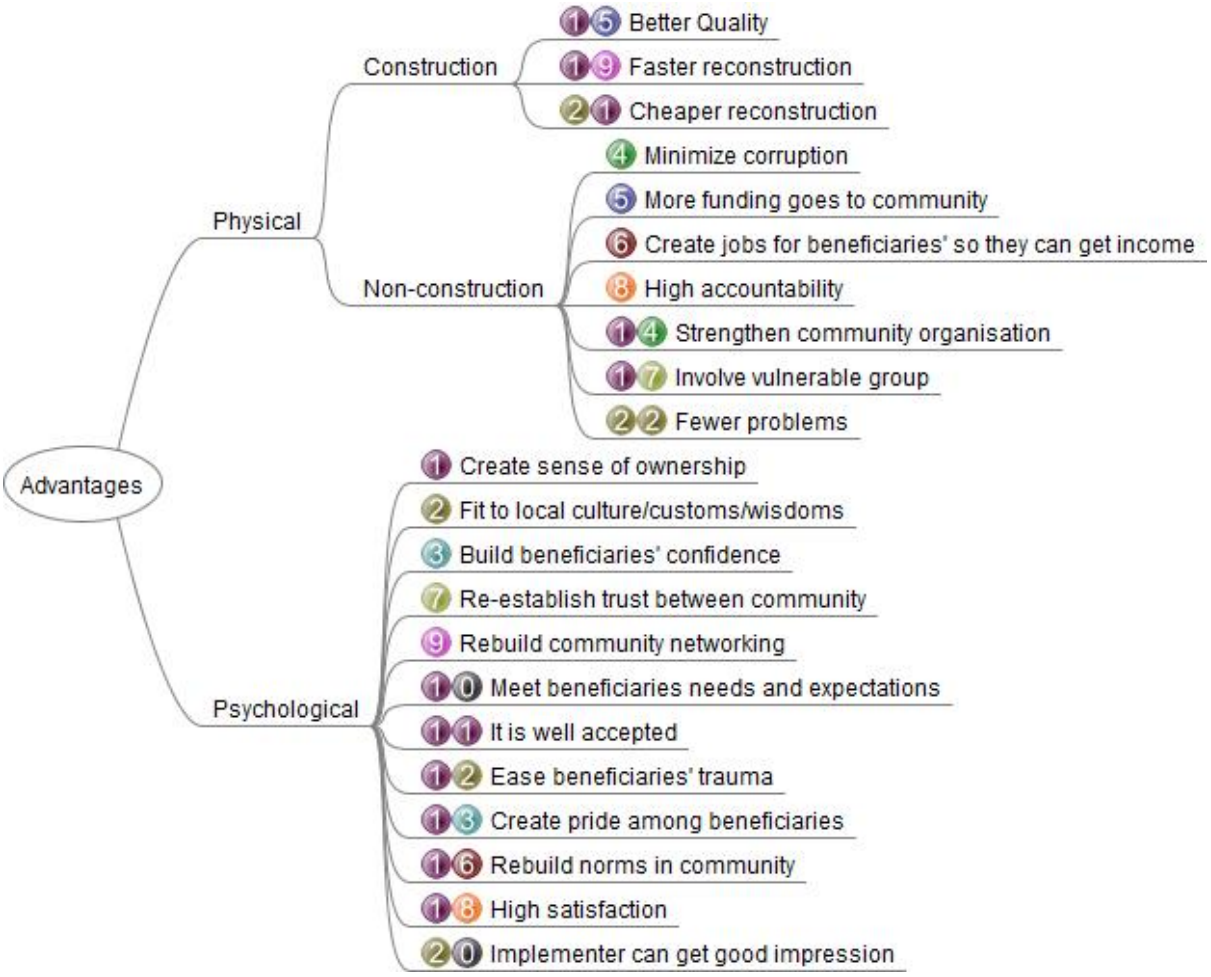

Figure 2. Advantages of CPHRP

It can be seen from Figure 2 that the psychological advantages are more dominant than the physical advantages. The top three ranked advantages are psychological. The empirical data analysis and semi-structured interviews also supported this finding. Furthermore, it can be stated after looking at the analysis that the construction advantages with the parameters of better quality, faster reconstruction, and cheaper reconstruction are not particularly significant compared to other factors. The ranking given to these common objectives of a construction project - time, cost, and quality - was in the bottom half of the order of significant advantages. It appears that the best ranking of the traditional objectives of a construction project in the list is better quality. It lies at ranking 15 with a mean value of 3.60. Faster reconstruction and cheaper reconstruction are ranked at 19 and 21 out of 22 advantages of CPHRP. This implies that the normal construction objectives are not the main purpose in the implementation of a community-based project.

This suggests that psychological advantage is distinct to the community-based method and perhaps could not be delivered by a method of housing procurement that did not involve active participation by beneficiaries, such as normally happens in the contractor-based method. This distinct advantage definitely contributes to the success of CPHRP. For example, as this method can create a sense of

ownership, beneficiaries will make sure that their houses are built to meet a required quality or even that they are higher than the general standard.

4.2 Limitations

Despite numerous advantages of CPHRP, this method also has limitations. Limitation means the condition that can hinder the success of CPHRP. Analysis of the data from the interviews suggests that the limitations of CPHRP can originate in the mechanism or in the system required by CPHRP itself, and the capacity of the stakeholders.

Two main drawbacks of this method were discovered. Firstly, it requires a long pre-construction process, which is the nature of CPHRP. Some activities cannot be carried out in a short time, e.g. forming community consultation. This kind of activity is very time-consuming. As noted by one of the interviewees:

> *"Because it (CPHRP) is a socio-engineering process, it requires a long process. To build a community needs a long time, as a result the outcome cannot be seen instantly. Without patience, the goal can't be achieved."*

Another interviewee gave an example of one particular time-consuming activity during CPHRP which is establishing community organisation. He said:

> *"The one that takes time was to establish community organisation, to organise them... Once this is done, they will become solid, and the next step will be easy… In our experience, in Aceh with all its huge constraints, it takes about 5 months to organise the community"*

Another example is the design process. This also takes time because it requires consultation with the community several times in order to synchronise it with their needs and expectations. Another interviewee said:

> *"Learning much from the Aceh case, in design, the implementer may have produced a good design, but the community will have some preferences, they want it to be like this and like that. This will take time and as a result pre-construction becomes extended."*

Thus, CPHRP requires sufficient time during the pre-construction process. Based on this interviewee's experience in Aceh, in considering the scale of destruction, the pre-construction process took about 5 months. The expected results cannot be achieved in a short time as pushing it can limit the community contribution, disrupt the process and, in the end, can lead to failure. This condition is completely different compared to a contractor-based approach. In the contractor-based method, if contractors already have a house design, they can undertake the construction immediately without having to consult the beneficiaries.

The capacity of stakeholders within a CPHRP, particularly the government and facilitators, to conduct a community-based programme was also found to be limited.

In Indonesia, CPHRP is widely known following the Aceh reconstruction programme which started in 2005 and ended in 2009. At the very beginning, according to one interviewee, there was doubt about the success of this programme if implemented. He said:

> *"At the beginning (in Aceh), the government did not really believe that the community-based method would work because the framework for implementation was not clear or because many stakeholders would be involved in the project management, but because the funding came from donors, the government finally approved this approach."*

CPHRP also requires many facilitators in order to facilitate the community to build their own homes. Inevitably, they are the main active participants in the success of CPHRP. As a result, high capacity facilitators are greatly necessary. One of the interviewees noted:

"The problem emerged, first that the number of facilitators was not sufficient, not the ones with the requisite competency. Then many of them are not in a situation in which they are an expert.".

Although nowadays CPHRP is encouraged by the Government of Indonesia, there is still a lack of understanding concerning the principles of the community-based approach. This is in line with the findings of Davidson et al. (2007) which state that only a little knowledge exists on how CPHRP should be carried out at project level.

However, the availability of facilitators is very limited and the situation is worsened by the fact that many of them still have no experience of CPHRP. Two other interviewees gave an example of the difficulties in recruiting facilitators. One noted:

> *"The problem emerged, first that the number of facilitators was not sufficient, not ones with the requisite competency. Then many of them are not in a position in which they are an expert. For example, because we need a lot of civil engineers, their availability becomes very limited. What's the consequence? We recruited people from outside civil engineering, from at least related professions, such as architects. When we couldn't find more architects, we recruited people from an engineering background. We trained them. Basically, we explained the basic principles and let them make use of their logic. The minimum had to be how to build earthquake resistant houses; what had to be controlled, we explained it all to them. So, we really lack facilitators that have appropriate capacity".*

Almost the same example was explained by the other interviewee:

> *"The number of technical facilitators is very insufficient. First, we look for civil engineering bachelors, but only less than 10% sign up. As a result, we accept people from an electrical background, also from the polytechnics. At the beginning, we also planned to recruit teachers from vocational high schools, to be employed in their local area. But it is not accepted…. There's also a plan to recruit our students (civil engineering), but the limitations are they can't be full time in the field."*

Another limitation originated from the community itself. Community knowledge about construction is very limited. One interviewee noted:

> *"The limitation is in resources, in local resources. They are not highly educated. Secondly, labour. It's hard to control the labour."*

He also highlighted the non-availability of labour:

> *"In the community, the limitation is the availability of labour. Labourers who have high levels of skill are very limited, the ones who understand the basics of earthquake resistant houses are very low in number. "*

5 Conclusions

CPHRP can bring several advantages and this research reveals 22 advantages of CPHRP, both physical and psychological. Four advantages can be classified as highly significant. The most

significant is ‘create sense of ownership’, followed by ‘build beneficiaries’ confidence’, ‘fit to local culture/customs/wisdom’, and ‘minimise corruption’. Furthermore, the research has found that psychological advantages are more highly rated compared to physical advantages, particularly when compared with construction advantages. Psychological advantages are a distinct advantage of CPHRP and can contribute to the success of CPHRP.

There are several limitations in the implementation of the community-based method in post-disaster housing reconstruction. The first relates to the system of utilising CPHRP. This method requires a long pre-construction process. In the implementation of real community participation, many activities during the pre-construction stage (such as forming a community organisation) require a long time for them to be completed. On the other hand, the nature of a post-disaster reconstruction project requires that housing projects be completed in the shortest time possible. Rushing the participatory process can hinder the real participation by beneficiaries. The second limitation relates to the capacity of the stakeholders. The understanding of stakeholders of the principle of the community-based approach, particularly at project level, is still very limited. The third limitation too has links to capacity, namely the availability of facilitators. The capacities of government, facilitators and the community itself need to be enhanced. This should be carried out long before a disaster takes place. Bureaucracy, limited funding, coordination problems, low capacity facilitators and their availability are the other most common risks raised by the interviewees. It can, therefore, be noted that the implementation of good practice in project risk management in the construction industry is expected to enhance the success of CPHRPs.

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