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Risk Identification on Community Based Post Disaster Housing Reconstruction Projects

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Abstract

In recent years, millions of houses have been damaged or destroyed by natural disasters, such as from earthquake and tsunamis. These disaster situations have led to the construction of a large number of housing units for disaster affected communities. Community based method in which beneficiaries participate with powers to control reconstruction projects has proven that high satisfaction can be achieved among survivors with high accountability and producing good quality houses. However, this method has its own problems also having been exposed to high risks. In construction industry, risk management process has been acknowledged to be an important factor to achieve project objectives. In contrast, examples demonstrating good practices of the application in post disaster reconstruction project are very limited. A typical risk management process is started with risk identification, and in this context this paper aims to identify risk associated with the community based post disaster housing reconstruction process. Special emphasis will be given to the “pre-construction stage” of the process. Comprehensive literature review and interviews were conducted to achieve the objectives. Interviews were conducted with experts, practitioners, government official and representatives of affected communities in Indonesia.

It was found that risks associated with community based post disaster housing reconstruction project at the pre-construction phase is higher than that of during the construction phase. It derives from the situation that in this method the pre construction stage plays a very important role of the whole reconstruction process and also because of many uncertainties exist at this stage. Some key risks that are found which are associated with this include: this method is not very well understood by many stakeholders, especially by local government and poor coordination between stakeholders and their roles in housing reconstruction. Since this method requires facilitation, the unavailability of them, both in terms of numbers and experience can affect the levels of success of the community based method. In this context, building a trust from community to facilitators is also imperative.

Keywords: community based, housing reconstruction, risk identification

1. Introduction

The increasing of natural disaster occurrences in the last decade has taken thousands of lives and affected millions of people. Most of the deadly natural disasters are come from geological disaster such as earthquake and tsunami. Millions of houses have been destroyed or damaged by them, Bam earthquake in Iran (2003), Gujarat India (2001), Indian Ocean tsunami which affected 12 countries (2004), Sichuan earthquake China (2008), Haiti earthquake (2010) and most recently Japan earthquake and tsunami (2011). These phenomena have led to the reconstruction of a large number of housing units for disaster affected communities all over the world. As a result, a good procurement method that can achieve high satisfaction among beneficiaries has to be developed.

Different procurement methods on providing houses for beneficiaries are available to be implemented, and one of them is a community based method. In the context of disaster, 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, similar disaster risk exposure, or having been affected by a disaster. Hence in this method, the affected community has a significant power to control the reconstruction project. Community can act as the owner, as the supervisor or even as the contractor of their own reconstruction project. This method has been proven to be one of the key success factors of the entire post disaster reconstruction project (Arslan and Unlu, 2006; Fallahi, 2007; Barenstein, 2008; Lawther, 2009;). However, this method has its own problem and thought to be being exposed to high risk.

Inevitably, post disaster housing reconstruction project can be categorised as a construction project. According to Hlaing et al. (2008) construction industry carries more risk and uncertainty compare to many other industries and because of it has changed significantly more risk and uncertainty are threaten than ever before (Flanagan, 2002). The post disaster situation which is very much different from the normal situation has rise the risk of post disaster housing reconstruction project. In dealing with risk, the construction industry has been acknowledged that risk management is an important factor in achieving project objectives (Kangari, 1995), minimizing losses and enhancing profitability (Akintoye and MacLeod, 1997). However, in post disaster housing reconstruction project, the implementation of risk management has not yet become a common practice (Silva, 2010).

As a starting point of the risk management process on community based post disaster housing reconstruction, this paper presents risks identified during the pre construction stage of community based post disaster housing reconstruction method.

2. Risk Management

Risk is the combination of the probability of an event and its consequence (PD ISO/IEC Guide 73:2002) and generally used only when there is at least the possibility of negative consequences. The success or failure of any project will be depending on how risk is treated and the construction industry has poorly managed it (Thompson and Perry, 1992). Although the risk is

often associated with negative impact, Hillson (2002) states that risk can also bring positive consequences on project objectives. As a result, Olsson (2007) suggests that risk management process should be capable of managing both risk and uncertainty. Risk can delay the project delivery, escalate cost and produce a low quality product (Thompson and Perry, 1992) because it affects productivity, performance, quality, and budget of a construction project (Kangari, 1995). Hence, the main purpose of the risk management process is to ensure the construction project to meet its objectives. However, the implementation of it is not easy (Thompson and Perry, 1992). According to Tang et al. (2007) there are three barriers in implementing the risk management process: lack of joint risk management mechanisms by parties, shortage of knowledge/techniques on risk management and different recognition of risk control strategies.

Risk management process is classified in a different way by scholars. Thompson and Perry (1992) divide it into risk analysis and risk management, while Boothroyd and Emmett (1996) classify it as risk assessment and risk management. In more detail, Baker, et al. (1999) states that risk management consists of five stages, risk identification, risk analysis, risk evaluation, risk response and risk monitoring, while PD ISO/IEC Guide 73:2002 classify it as risk assessment, risk treatment, risk acceptance, and risk communication. However, it is generally the process of identification, evaluation, treatment and communication of risk.

Thompson and Perry (1992) state that risk management is most valuable to be implemented in the early stage as there is much flexibility in design and planning and should be a continuing process until the project completion. Figure 1 shows risk and cost curve over project phase. It can be seen that if risk management process is carrying out at the beginning of the project than the impact of risk on project cost would be minimum and vice versa.

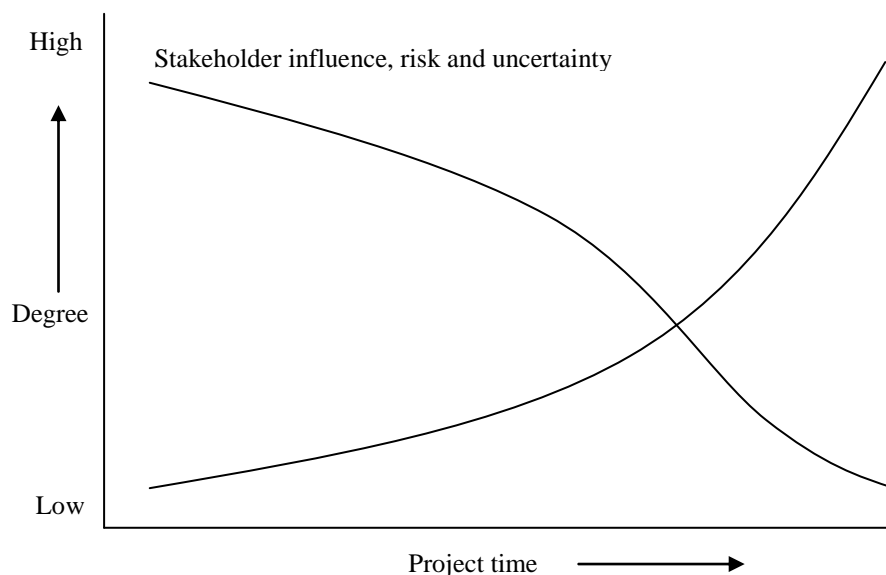


Figure 1. Risk and cost curve over project phase (PMI, 2008)

Risk identification is the first stage of a risk management process (Forbes et al, 2008) and it is the most important phase of the risk management process as no action can be taken on a risk if it

has not been identified (Boothroyd and Emmett, 1996; Chapman and Ward, 1997 and Forbes et al., 2008). The purpose of risk identification is to find, list and characterize risks which may affect the achievement of the agreed project or project phase objectives. This process may also reveal opportunities (BS IEC 62198:2001). There are a number of methods of risk identification (BS IEC 62198:2001): brainstorming, expert opinion, structured interviews, questionnaires, checklists, historical data, previous experience, testing and modeling, and evaluation of other projects. In addition, according to Thompson and Perry (1992) the common techniques implemented are checklists, interviews and brainstorming. The following section discusses about the housing reconstruction.

3. Housing reconstruction

In Indonesia, the number of large scale earthquakes has increased dramatically since the giant Aceh earthquake in 2004. It has been recorded that after the 2004 earthquake until 2010, there has been forty three big earthquakes compared to just only twelve earthquakes between 1992 and 2004 (USGS, 2010 and USGS, 2011). The severity of earthquake is not just in terms of fatalities, but it also took significant numbers of damage to houses and economic losses. Aceh earthquake in 2004 and Nias earthquake in 2005 has made 120.000 new houses were needed by people and economic losses were US\$ 4.1 billion. Yogyakarta (Central Java) 6.3 Richter scale earthquake in 27 May 2006 destroyed 157.000 houses and estimated economic losses were US\$ 3.1 billion (BAPPENAS et al., 2006). Two big earthquakes in 2009, Tasikmalaya earthquake (7.0 Richter scale), West Java, in 2 September 2009 damaged 65.700 houses and took 81 lives, and Padang earthquake (7.6 Richter scale), West Sumatera, in 30 September 2009 killed 1117 people and left 135.000 houses heavily damaged. The most recent earthquake (7.7 Richter scale) on 25 October 2010 in the remote area of Kepulauan Mentawai which triggered three metres tsunami took 509 lives and heavily damaged 879 houses. These facts have pushed the need for a good strategy in housing reconstruction to be developed. Hayles (2010) suggests that it must find a balance between affordability, technical feasibility and quality of life. Silva (2010) adds that the most appropriate method will be depending on the skills and capacity of the beneficiaries, the availability of local material, the complexity of the housing design and type of construction, the timescale for reconstruction and the availability of funding. However, its implementation is not easy as it requires inter-disciplinary strategies, tools and approaches (Haigh and Amaratunga, 2010).

The basic criteria of project success in construction industry are time, cost and quality (Chan and Chan, 2004). However, in the post disaster housing reconstruction this is not enough, as the community satisfaction is also an important factor. It was found that in some post disaster housing reconstruction projects beneficiaries were not satisfied with the houses provided for them although it has come with a good quality. This has led to the low occupancy rate. To overcome these problems, community based method may be the solution.

Davidson et al. (2007) propose a model of the level of community participation in a housing reconstruction project (Figure 2). It can be seen that the level of control of community reduces from the top ladder to the bottom ladder. Ophiyandri et al. (2010) suggest that to be named as

‘Community Based’ or ‘Community Driven’ post disaster housing reconstruction approach, the level of community participation should be in the level of collaboration or empowerment. In these two level communities have a control on the housing reconstruction project. In practical, beneficiaries can act as the owner, as the supervisor or even as the contractor of their own housing reconstruction project.

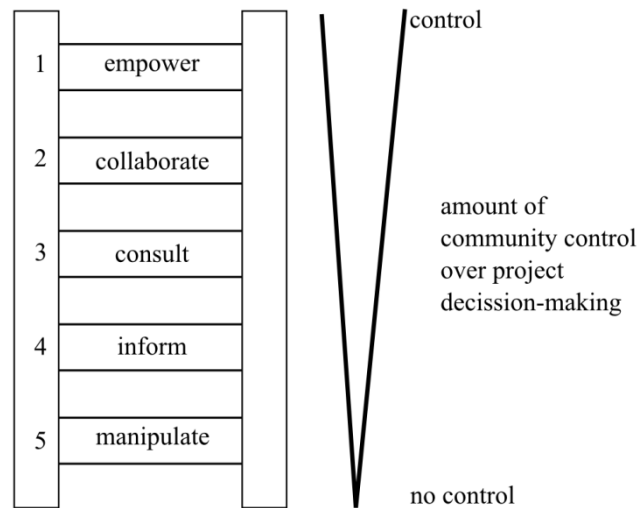


Figure 2. Ladder of community participation (Davidson et. al., 2007)

In Aceh reconstruction, the community based approach has proven its superiority compare to the contractor based approach, when it can produce high construction quality, high satisfaction and high accountability (Dercon and Kusumawijaya, 2007). Another benefit of it is it is faster (ACARP, 2007) and creates a sense of ownership and pride among beneficiaries (MDF, 2008).

4. Methodology

Considering that risk management for the whole reconstruction process is a very broad area with a very broad scope, this research focuses on the application of risk management principles during the pre-construction phase of the community based post disaster housing reconstruction projects. The other reason to focus upon the pre-construction phase of a community based post disaster re-construction project is that this phase is identified as one of the most important phases which contributes immensely towards the success of community based post disaster housing reconstruction project.

Comprehensive literature review and semi structured interviews were conducted to achieve the objective of the research. Total numbers of interviewees were thirty two which can be divided into five categories. Category and number of respondents are as follows: expert/academia three respondents, government official three respondents, facilitator nine respondents, practitioner eight respondents, and affected community nine respondents. Respondents have had an experience on post disaster housing reconstruction in Aceh (2004), Yogyakarta (2006) and Padang (2009). At this stage, the aim of these methods is to identify risk during the pre-

construction phase of community based post disaster housing reconstruction. It does not attempt to justify the probability of the risk to be happened nor its impact onto the project objectives.

The risk identification on the pre construction stage is categories based on the stages of the project, namely: initiation stages, building assessment, beneficiaries identification, facilitators recruitment, program socialisation and community organisation, community training and housing design.

5. Risk in Community Based Approach

5.1 Why in preconstruction stage?

Considering that construction projects are unique, the risk in involving a community in the disaster circumstances must be very specific and they would be very different compared to the risk on contractor base reconstruction activities. Although community based housing reconstruction has been proven to be a better way of carrying out reconstruction activities, it is obvious that without having any experience and knowledge on construction, community involvement has greater risks than the contractor based method. The employment of unskilled labour on construction projects can lead to poor quality, and cost over runs (Tabassi and Bakar, 2009), affect the level of productivity and may also lead to injuries (Nasir et al, 2003). Moreover, research by Thevendram and Mawdesley (2004) reveals that the level of importance of human risk factors in the construction project compared to the other factors (financial risk, environmental risk, political risk, construction related risk and physical risk) was significant (56%).

Many problems of community based post disaster housing reconstruction project also exist at preconstruction stage. Dercon and Kusumawijaya (2007) highlight that failures in community based approaches are caused by the delay in the start up process where there is little time for the participatory process. In addition, Uher and Toakley (1999) state that the conceptual phase of a new construction project is the most important and has the highest degree of uncertainty. Although it is viewed as the most important stage, in contrast, Lyons and Skitmore (2004) found that risk management usage in the execution and planning stages of the project life cycle is higher than in the conceptual or termination phases. In addition, research by Manelele and Muya (2008) on community based construction projects reveals that many of the critical risks identified during the pre-construction stage. Some risks identified are unconfirmed sources of funds, lack of technical advice, lack of consensus, lack of cooperation, non-conformity to standard specification, incompetency to recruit skilled labour, unavailability of skilled labour, incompetent labour, lengthy tender processes, and lack of work schedules (Manelele and Muya, 2008). Based on the interview it was found that 87% of the respondent (excluded the community) agreed that the pre-construction stage carried the more risk than the construction/execution stage.

In the pre construction stage, Dercon and Kusumawijaya (2007) reveal that there are three important lessons from Aceh that need to be learned in implementing community based

reconstruction: a need for a standard definition for the terms participation and community based as this can make confusion, implementer should provide enough time for the participatory process as giving short time can lead to failure, and as well as the shortage of facilitators. The lack of understanding on community participation also happened in housing reconstruction in Sirinkoy, Turkey, after the earthquake in 1999 (Ganapati and Ganapati, 2009). The limited knowledge on how community based approach can lead to the failure and mismanagement of reconstruction project.

5.2 Government capacity

After the experience on post disaster housing reconstruction in Aceh, where community based method achieved high satisfaction among beneficiaries, Government of Indonesia has accepted the community based as the priority method for post disaster housing reconstruction method. On the reconstruction of Yogyakarta in 2006 and Padang in 2009, from the early stage Government of Indonesia has taken the policy to implement the community based housing reconstruction. This implies that in the policy setting, this method has already been well accepted by central government. However, in the project level, especially on the local government this method has not been very well understood. Kusumasari (2010) highlights the lack of skills and expertise of local government. Low government capacity can lead to unclear reconstruction method, unclear role and responsibility of stakeholders and can create coordination and communication problems. Interviewee 1 stated: 'Poor coordination between stakeholders has slowed down the reconstruction process...'. Moreover, Kusumasari (2010) and interview found that this is the real situation in post disaster housing reconstruction. Another specific problem that emerged in Padang is a general election. Interviews reveal that general election process has slowed down the reconstruction process as the council leader sometime busy on a campaign.

5.3 Funding

Source of funding also has to be considered in designing the housing reconstruction. In Aceh, funding was not a big issue as budget to build a complete house for affected communities was available. However, in Padang reconstruction where finance came from governments' budget, funding has become a problem. A lot of administration procedure to deliver the fund to community has delayed the start of housing reconstruction. "...There are so many paper works that have to be done. It has made us confuse. We just want the fund to be in our account as soon as possible..", said interviewee 2. In spending government money, the time of reconstruction also has to be considered. As Padang reconstruction started at the end of a fiscal year, budget that cannot be spent during that year has to be send back to government.

5.4 Building assessment and beneficiaries identification

Building assessment and beneficiaries identification can run simultaneously and sometime these activities take place during the emergency period. Many organisations involve in the emergency period and they sometime bring their own method in building assessment. Local government should take this responsibility from the very beginning and should not let other organisations to

take charge on this process as this can lead to confusion among survivors. They have to provide a uniform standard building assessment. This process requires a lot of surveyors, as a result the unavailability of surveyors would be a problem. Another risk identified during this process is a lack of database on the property owner. However, the community based approach actually can minimise the risk of misidentification of eligible beneficiaries as this process will involve them intensively. Interviewee 3 said "...this process can ensure the fund goes to the right person. If individual tries to have more funding that he/she ineligible to have, there will be a social sanction from community...". Because of the severity justification of damage house (heavily damaged or slightly damaged) has direct implication on the amount of money the beneficiaries can have, many survivors often want their building to be categorised as heavily damaged. Beneficiaries sometime intimidate building surveyors to categorise their building into this group. Collusion among community or between community and surveyor also might happen in this process".

5.5 Facilitator shortages

As community based approach requires a lot of facilitators, Padang housing reconstruction struggled in providing technical facilitators. Not only in terms of facilitators number, their experience and knowledge were also limited. " availability is very limited in West Sumatra and most of them are still fresh graduate. Because of that, then we recruited architect, but still was not sufficient as we need thousands of facilitators": Interviewee 4. Jha et al. (2010) also state that risk can arise because of the failure in recruiting facilitators and trainers who understand and believe in the community based approach. This situation has led to a complaint from community stating that facilitators do not have a capability in guiding them to build a resilience and safer house. It was also found that there was a mispolicy from government because on the first reconstruction stage, facilitators were not trained on how to implement the housing reconstruction process and most importantly on how to work and to empower the On the second stage of the reconstruction the inappropriate strategy on first stage was realised by providing training to them. This implies that government has lack of knowledge on how important facilitators in community based method.

5.6 Trust

Gathering a trust from community to facilitator is one of the key factors on the success of community based approach as Interviewee 5 said "gathering trust from community is very important to be achieved at the earlier phase...". If this can be achieved, community would be willing to work together with facilitator. It means that community meeting phase plays an important part on the success of community based approach. As a result, knowledge of facilitators on how to manage the relationship with community and knowledge on the technical aspects of building reconstruction are imperative. It is obvious that sometimes there will be a resistance from community to facilitator or an incorporate community, but these are the problems that the facilitator has to deal with.

For affected area that has a very limited number of construction labour, community training is one solution to this problem. In this stage, again facilitator knowledge on how to build a safer house is very important. The availability of training material that can be easily understood by community would be easier the job of facilitator. In housing design, facilitator has to learn and understand the cultural consideration in community. This has to be inline with the building code for resilience earthquake house.

From above explanation, it can be seen that risk on community based post disaster housing reconstruction exist in every stage of pre construction stage. It mainly derives from the level of understanding of government, especially local government, on community based method and availability of facilitator knowledge and experience.

6. Conclusion

Risk in the pre-construction phase of community based post disaster housing reconstruction project is higher than the construction phase. It derives from the situation that the pre construction stage plays a very important role of the whole reconstruction process and also because of many uncertainties exists at this stage. Some key risks are: the community based approach is not very well understood by many stakeholders, especially by local government; the unavailability of facilitators, both in terms of numbers, experience and knowledge can affect the levels of success of the community based method. In this context, building a trust from community to facilitators is also imperative. The next step of this research process is to carry out a questionnaire survey to quantify the probability of identified risk and its impact on time, cost and quality.

References

- ACARP (2007) The Acehese Gampong Three Years On Assessing Local Capacity and Reconstruction Assistance in Post-tsunami Aceh, Report of the Aceh Community Assistance Research Project (ACARP).
- Akintoye, A.S. and MacLeod, M.J. (1997) Risk analysis and management in construction, *International Journal of Project Management*, Vol 15 No. 1, pp 31–38.
- Arslan, H and Unlu, A. (2006) The Evaluation of Community Participation in Housing Reconstruction Projects after Duzce Earthquake. Proceeding, International Conference and Student Competition on Post-disaster Reconstruction "Meeting stakeholder interests". Florence. Italy. May 17-19, 2006.
http://www.grif.umontreal.ca/pages/ARSLAN_%20Hakan.pdf# viewed 20/11/2009
- Bappenas, the Provincial and Local Governments of D.I. Yogyakarta, the Provincial and Local Governments of Central Java, and International Partners. (2006) Preliminary Damage and Loss Assessment Yogyakarta and Central Java Natural Disaster. The 15th Meeting of The Consultative Group on Indonesia Jakarta, June 14, 2006.

- Baker, S., Ponniah, D. and Smith, S. (1999) Survey of risk management in major UK companies. *Journal of Professional Issues in Engineering Education and Practice*. Vol. 125. No. 3. pp. 94-102.
- Barenstein, J. D. (2008) From Gujarat to Tamil Nadu: owner-driven vs. contractor-driven housing reconstruction in India. i-Rec 2008. available at: http://www.sheltercentre.org/sites/default/files/IREC_OwnerDrivenVsContractorDrivenHousingReconstruction.pdf viewed: 5 May 2009.
- Boothroyd, C. and Emmett, J. (1996) *Risk Management: A Practical Guide for Construction Professionals*, Witherby & Co. Ltd., London.
- BS IEC 62198:2001 *Project risk management-Application guidelines*, London.
- Chan, A.P.C. and Chan, A.P.L. (2004). Key performance indicators for measuring construction success. *Benchmarking: An International Journal*. Vol. 11 No. 2, pp. 203-221.
- Chapman, C. and Ward, S. (1997) Estimation and evaluation of uncertainty: a minimalist first pass approach. *International Journal of Project Management*, Vol 18. No. 6, pp. 369–383.
- Davidson, C.H., Johnson, C., Lizarralde, G., Dikmen, N., Sliwinski, A. (2007) Truths and Myths about Community Participation in Post-disaster Housing Projects. *Habitat International*. Vol 31. pp. 100–115
- Dercon, B. and Kusumawijaya, M. (2007) Two Years of Settlement Recovery in Aceh and Nias: What should the Planners have Earned? 43rd ISOCARP Congress, Antwerp, Belgium, 19-23 September 2007; Congress Papers
- Fallahi, A. (2007) Lessons learned from the housing reconstruction following the Bam earthquake in Iran. *The Australian Journal of Emergency Management*, Vol. 22 No. 1. pp. 26-35
- Forbes, D.R., Smith, S.D., and Horner, R.M.W. (2008) A comparison of techniques for identifying risks in sustainability assessment of housing. In: Dainty, A (Ed) *Procs 24th Annual ARCOM Conference*, 1-3 September 2008, Cardiff, UK, Association of Researchers in Construction Management, pp. 1135-1144.
- Ganapati, N. E. And Ganapati, S. (2009) Enabling participatory planning after disasters: a case study of the World Bank's housing reconstruction in Turkey. *Journal of the American Planning Association*. Vol 75. No 1. pp. 41-59
- Haigh, R. and Amaratunga, D. (2010) An Integrative Review of the Built Environment Discipline's Role in the Development of Society's Resilience to Disaster. *International Journal of Disaster Resilience in the Built Environment*. Vol 1. No 1. pp. 11-24.

- Hayles, C. S. (2010) An Examination of Decision Making in Post Disaster Housing Reconstruction. *International Journal of Disaster Resilience in the Built Environment*. Vol. 1. No. 1. pp. 103-122.
- Hlaing, N.N., Singh, D, Tiong, R.L.K. and Ehrlich, M. (2008) Perceptions of Singapore construction contractors on construction risk identification. *Journal of Financial Management of Property and Construction*, Vol. 13 no. 2 2008, pp. 85-95
- Hillson, D. (2002) Extending the risk process to manage opportunities. *International Journal of Project Management*, Vol. 20 pp. 235–240
- Jha, A. K., Barenstein, J. D., Phelps, P. M., Pittet, D. and Sena, S. *Safer Homes, Stronger Communities: A Handbook for Reconstructing after Natural Disasters*. The World Bank. Washington.
- Kangari, R. 1995. Risk management perceptions and trends of US construction. *Journal of Construction Engineering and Management*. Vol. 121. No. 4. pp. 422-429.
- Kusumasari, B., Alam, Q., and Siddiqui, K. Resource capability for local government in managing disaster. *Disaster Prevention and Management*, Vol. 19 No. 4, pp. 438-451
- Lawther, P.M. (2009) Community Involvement in Post Disaster Re-construction – Case Study of the British Red Cross Maldives Recovery Programme. *International Journal of Strategic Property Management*. 13. Pp153-169
- Lyons, T. and Skitmore, M. (2004). Project risk management in the Queensland engineering construction industry: a survey. *International Journal of Project Management*. No. 22. pp. 51–61.
- Manelele, I., and Muya, M. (2008). Risk identification on community-based construction projects in Zambia. *Journal of Engineering, Design and Technology*. Vol. 6. No. 2. pp. 145-161.
- MDF. (2008) Investing in Institutions: Sustaining Reconstruction and Economic Recovery, Four Years After the Tsunami.
- Nasir, D, McCabe, B. and Hartono, L. (2003) Evaluating risk in construction–schedule model (ERIC–S): construction schedule risk model, *Journal of Construction Engineering and Management*, Vol. 129. No. 5, pp. 517-527.
- Olsson, R. (2007). In search of opportunity management: Is the risk management process enough?. *International Journal of Project Management*. Vol 25 pp 745–752

- Ophiyandri, T., Amaratunga, D. and Pathirage, C. (2010) Community Based Post Disaster Housing Reconstruction: Indonesian Perspective. Proceeding of CIB World Congress. 10-13 May 2010. Salford, United Kingdom
- PD ISO/IEC Guide 73:2002. *Risk Management-Vocabulary-Guidelines for Use in Standards*, London.
- PMI (2008) A Guide to the Project Management Body of Knowledge (PMBOK® Guide), Fourth Edition.
- Project Management Institute. (2004) *A Guide to the Project Management Body of Knowledge*, 3rd ed., Project Management Institute
- Silva, J. D. (2010) *Lessons from Aceh: key considerations in post-disaster reconstruction*. Practical Action Publishing. Rugby. Available at: <http://www.dec.org.uk/download/721/lessons-from-aceh.pdf> viewed: 5 January 2010.
- Tabassi, A. A. and Bakar, A. H. A. (2009) Training, motivation, and performance: the case of human resource management in construction projects in Mashhad, Iran, *International Journal of Project Management*, Volume 27. No. 5, pp 471-480.
- Tang, W., Qiang, M, Duffield, C.F., Young, D.M., and Lu, Y. (2007) Risk Management in the Chinese Construction Industry. *Journal of Construction Engineering and Management*, Vol. 133 No. 12 pp. 944-956
- Thevendran, V and Mawdesley, M. J. (2004) Perception of human risk factors in construction projects: an exploratory study, *International Journal of Project Management*, Vol. 22. No. 2, pp. 131–137.
- Thompson, P. A. and Perry, J. G. (1992) *Engineering Construction Risks: a Guide to Project Analysis and Assessment*. Thomas Telford. London.
- USGS. (2010) *Historic World Earthquakes: Indonesia*, Available at: http://earthquake.usgs.gov/earthquakes/world/historical_country.php#indonesia viewed: 20/01/2010.
- USGS. (2011) Significant Earthquake and News Headlines Archive in 2010, Available at: <http://earthquake.usgs.gov/earthquakes/eqinthenews/2010/> viewed 20/01/2011
- Uher , T. E. and Toakley, A. R. (1999). Risk management in the conceptual phase of project. *International Journal of Project Management*. Vol. 17. No. 3. pp. 161-169.