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Disaster Recovery Indicators of Housing Reconstruction: The Story of Post Tsunami Aceh, Indonesia

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Abstract

The earthquake and tsunami that hit Aceh in December 2004 have come to represent the worst natural disaster in living memory. Post-disaster housing reconstruction was one of the concerns in re-building a better and safer Aceh. The rehabilitation and housing reconstruction works pose an immense challenge because of lack of expertise, resources, and coordination. This research was aimed to evaluate the housing rehabilitation and reconstruction process after one decade. Focus Group Discussion (FGD) was selected as the main data collection technique to achieve comprehensive discussion among all actors involved in the reconstruction process. It was concluded that there are four indicators that poses as strains and support of post-disaster housing rehabilitation and reconstruction process in Aceh. They are (1) housing delivery process, (2) community participation in housing design and supervision, (3) procurement for building materials and skilled labors, and (4) government involvement and policy. Coordination is also a significant factor that was neglected. Suggestions for better future practices are presented, such as ensuring the accuracy of beneficiaries' data to avoid overlapping; intensifying the role of government at every stage of the reconstruction processes; engaging the community to be actively involved in rehabilitation and reconstruction process.

Keywords: Tsunami, housing reconstruction, post disaster housing, disaster recovery Aceh, Indicators, Lesson learnt.

Introduction

The major urban area of the city of Banda Aceh is located near coastline on low lying topography. Facing directly towards Indian Ocean on the west, Andaman Sea on the north west, and Malacca Strait on the east increases the vulnerability to marine-related disasters, particularly those from Indian Ocean. Disasters happen when an area and its inhabitants are exposed to the risks of nature or non-nature activities. Disaster risks threathen the sustainability of life, community social order, and governance. This research was conducted in Lampulo village, Kecamatan Kuta Alam, Banda Aceh and in Kahju village, Kecamatan Baitussalam, Kabupaten Aceh Besar. According to a study, both areas are located in the red zone area, so called tsunami prone area, which is one of the 2004 tsunami hardest hit areas (Azmeri et al., 2014).

The earthquake and tsunami that hit Aceh in December 2004 have come to represent the worst natural disaster in living memory. 654 villages in Aceh were affected, and 63,977 disadvantaged households were displaced (Pramono, 2008). The giant waves left 139,195 houses either totally destroyed or badly damaged, which comprise of 78% from the total damages. It was reported that in the disaster recovery process, 140,304 units of permanent houses were rebuilt (BRR, 2008). However, complaints have arisen from the affected communities who admitted that they have not had houses rebuilt for them. This is one of the critical issues that indicate problems in post-disaster rehabilitation and reconstruction process,

particularly in housing and settlements sectors. Housing reconstruction is a priority intervention in post-disaster recovery programme in order to settle back the affected community. Post-disaster housing reconstruction is one of the most complicated challenges in post-disaster recovery effort, particularly in developing countries (Ahmed, 2011).

In Aceh, it is challenging to control issues related to land tenure administration, spatial planning regulation, beneficiaries' data collection, infrastructure and housing construction procurement, and community re-settlement process. Land tenure administration is a complicated problem that requires special attention. It was worsened by the fact that the National Land Administration office in Aceh was hit by the waves, which destroyed the office building and caused 30% of its officers missing or dead. The tsunami also erased most of the land boundary points. In the process of land tenure re-registration, only 10% of house and land owners who admitted to possess house and land before the tsunami officially have the certificate of ownership as regulated by Indonesian law. The rest only possesses the houses and land as private assets that are regulated by traditional custom and law (BRR, 2008).

According to Indonesian National Board for Disaster Management regulation Number 11 Year 2008 about guidance for post-disaster rehabilitation and reconstruction, post-disaster housing is provided for beneficiaries who are disaster victims whose houses are structurally damaged up to medium level. Medium level damages are defined by physical building damages assessment based on BNPB Technical Guidance (BNPB, 2008). A consequent problem then appears on where to build the houses. Almost all of the tsunami survivors want to come back to their previous houses/places, which are considered as dangerous zone. The Reconstruction and Rehabilitation Agency of Aceh and Nias (BRR) formulated Aceh-Nias Tsunami Emergency Reconstruction Programme (ANTERP) to solve such problem and other issues arise in the reconstruction process. The primary objective of the programme was to ensure the fulfilment of housing and settlement needs, including ensuring a systematic planning that provides housing and settlements with proper infrastructure (MDF and JRF, 2012).

An assessment of disaster recovery process had been carried out in Kobe, Japan, which suggests 7 determinant factors in recovery process, namely housing, social ties, community rebuilding, physical and psychological health, preparedness, economic and financial situation, and relation to government. This finding was concluded from a workshop attended by disaster affected communities, academia, and government representative (Sakamoto and Yamori, 2009).

An assessment of housing recovery process in Banda Aceh and Aceh Besar had also been conducted in 2012. The assessment of abandoned houses was done in Kajhu village, while the surveys on user satisfaction and community participation in post-disaster housing construction were conducted in Neuheun village and Blang Oi village respectively (TDMRC and IRP, 2012). However, these assessments only used questionnaire method to gain information from users/residences of post-disaster houses in Banda Aceh as respondents. The questionnaire used for the surveys had not been tested for its validity. Another research conducted in Alue Deah Tengoh village and Lambung village, Banda Aceh found different housing delivery methods in both locations. Housing reconstruction in Alue Deah Tengoh village was carried out by several local/international agencies and organisations. They applied various methods and approaches in housing and infrastructure reconstruction, which resulted in various types and designs of houses and buildings layout. The village also had been rebuilt in the same layout as it used to be, with winding and narrow streets. This development pattern makes it difficult to provide good access for primary or secondary network connections of water and drainage systems. It was also proven that during the tsunami, the pattern slowed evacuation effort. The development practice implemented by those agencies does not promote better and safer rehabilitation and reconstruction for the village. In comparison, in Lambung village, the

rebuilding and reconstruction process was planned with better concepts than before. Based on community discussion and consensus, the village was rebuilt with better village layout, with standardized road width, good housing arrangement, and adequate open spaces and green areas (Affan, et al., 2015).

To have a comprehensive picture of what has happened, the challenges, and the strength and weakness of post-disaster housing rehabilitation and reconstruction experience in Aceh, this research was conducted. The aims of this research are to identify and to evaluate indicators that can be used to assess Aceh post-tsunami disaster housing recovery and post-disaster housing rehabilitation and reconstruction process, and to reveal the indicators that specifically affected the post-tsunami disaster housing reconstruction in Aceh. This paper also attempts to compile the lesson learnt that may be useful to improve other post-disaster recovery processes elsewhere.

Study Area and Method

The case study area for this post-tsunami disaster housing reconstruction research is Kahju dan Lampulo villages. Kahju village is a coastal village that is administratively a part of Baitussalam subdistrict, Aceh Besar District, Aceh province with the following boundaries:

- Malacca Straits to the North
- Darussalam subdistrict to the South
- A mangrove swamp to the East
- Estuary of Krueng Cut River and Rukoh's wetland to the West.

Meanwhile, Lampulo village is located along Krueng Aceh riverbank to the sea. It is one of the villages in Kuta Alam subdistrict, Banda Aceh with the boundaries as follows:

- Lamdingin/Deah Raya village to the North
- Gampong Mulia to the South
- Lamdingin village to the East
- Krueng Aceh River and Peulanggahan village to the West.

Both villages are located only 1 km away from the coastline and have been categorized as red zone area, or tsunami prone area, which is one of the 2004 tsunami's hardest hit areas (Azmeri et al., 2014). The satellite image of the study areas can be seen in Figure 1.

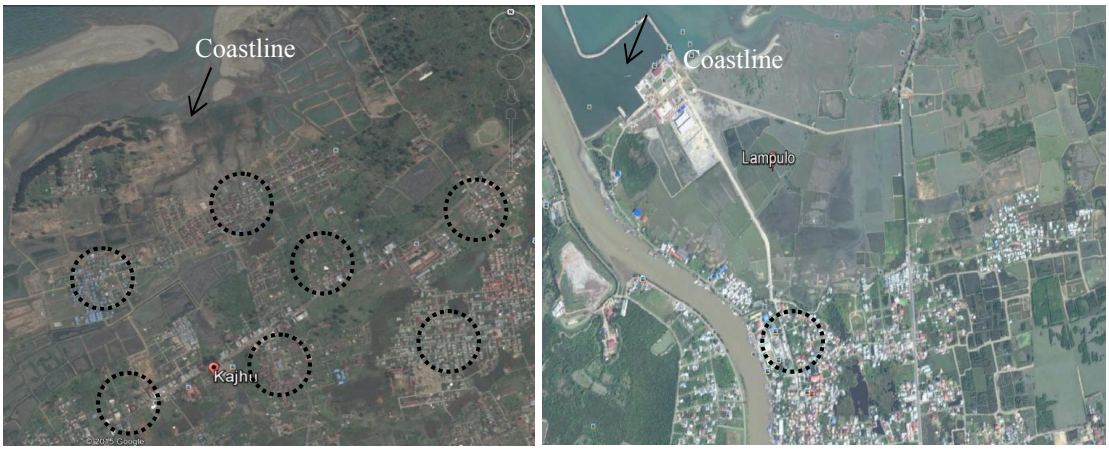

Figure 1. The Study Areas – (a) Kahju Village; (b) Lampulo Village

This research used Focus Group Discussion (FGD) as the main data collection technique to achieve comprehensive discussion among all actors involved in the housing reconstruction process. It aims to compile data on housing recovery process after the tsunami disaster in

Aceh in 2004. FGD was chosen because it is able to facilitate discussions with a small group of people who share common concerns, and because it provides an opportunity to cross-check information that has been collected using other techniques (Rietbergen J., 1998). Groups of respondent who were participating in the FGD are:

a. Government representatives (Department of Public Work and Reconstruction and Rehabilitation Agency of Aceh and Nias (BRR));
b. Non-Government Organization (NGO);
c. National and international humanitarian agencies;
d. Private sectors (design consultants, contractors, associations of professionals in building and construction industries);
e. Academia;
f. Community representatives as beneficiaries.

The initial data was collected from expert discussion forum to identify crucial and important indicators in post-tsunami housing reconstruction process (Figure 2). The forum was attended by the representatives of those groups of respondents.

Figure 2. Expert Discussion Forum

Based on the initial findings, further discussion forum was held to scrutiny more detailed information on aspects that may pose as strains and support of post-disaster housing rehabilitation and reconstruction process in Aceh. Representatives of the forementioned groups participated in the series of discussion forum (Figure 3). The forum also attempted to formulate the lesson learnt from working and managing rehabilitation and reconstruction process in Aceh post-tsunami disaster recovery. Qualitative descriptive analysis was used to analyze the primary data obtained from the FGD.

Figure 3 (a). The next stage of Expert Discussion Forum (FGD I)

Figure 3 (b). The next stage of Expert Discussion Forum (FGD II)

Figure 3 (c). The next stage of Expert Discussion Forum (FGD III)

Results and Discussions

The series of discussion forum concluded that there are four indicators that pose as strains and support of post-disaster housing rehabilitation and reconstruction process in Aceh. They are (1) housing delivery process, (2) community participation in housing design and supervision, (3) procurement for building materials and skilled labors, and (4) government involvement and policy. Further explanation of the four indicators is as follows:

3.1 Housing Delivery Process

Post-tsunami 2004 disaster rehabilitation and reconstruction in Aceh were effectively commenced in 2005 and officially ended in 2009. Massive housing reconstruction projects were also started. There are 2 methods of housing aid delivery to the beneficiaries, which are rebuilding or building house, and giving cash money to rebuild and renovate house. House delivery process was executed either by the government (BRR) or by third parties, in this case humanitarian agencies and NGOs. They are known as implementing agencies. The construction works were carried out by local or national builders and contractors, whereas the supervision and monitoring activities were performed by either the implementing agencies themselves or external independent parties. Finally, the completed houses were handed over to the beneficiaries by the implementing agencies.

Most of the houses in the study areas were built by international NGOs. They were newly built houses because very few of the houses survived. Some examples of post-disaster housing in Kahju dan Lampulo villages can be observed on **Figure 4 (a)** and **4 (b)**.

(a) Aceh Relief Type (b) BRR Type

(c) Care Type (d) Oxfam Type

Figure 4 (a). Housing in Lampulo Village

(a) Oxfam Type (b) BRR Type

Figure 4 (b). Housing in Kahju Village

There were various systems that had been undertaken by the implementing agencies in house delivery process. There was no standard that regulates this process. Therefore, it depended on each agency's regulation. In general, it was started by registering beneficiaries through the head of the villages. There were also agencies who came directly to the community and the affected location to collect the data. There were concerns about the accuracy of the data because there was no certain system that can be used to validate it. As the consequences, there

were overlapping housing beneficiaries, even within the same household. In the long run, problems like people who admitted to not have houses built for them emerged, even until the end of the housing reconstruction program in 2009.
There were also issues related to the quality of post-disaster housing, which is significantly different between the houses built by the government and the ones built by NGOs and other international humanitarian agencies. It was observed that the houses built by the government are in low and poor qualities. Meanwhile, international humanitarian agencies built good quality houses. It is believed that the agencies implemented good planning, execution, and supervision methods.

3.2 Community Participation

It was revealed that community participation concept was practiced in the housing reconstruction process. Eventhough this concept was not applied on the majority of housing projects in the areas, to some extent; several agencies had tried to implement this community-based reconstruction and development concept. It was reported that there are 2 types of community participations in housing construction process: fully participating and partly participating. Full participation means that the community is involved from the beginning of the designing process to the end of the construction process. Partial participation means that the community is involved only at the designing or only at the construction process.

A number of respondents believe that community participation and involvement are necessary to ensure house quality. It is believed that the users' sense of belongingness will encourage them to actively participate in controlling and supervising the construction process. It could also help generating culturally appropriate development that is in line with the community's social and cultural wisdom. As stated by Muzailin (2015), the knowledge of local wisdom will contribute positively in post-disaster housing recovery. There were even beneficiaries/users that are willing to spend their own money to have better quality houses. Ismail, Z. et al. (2014) also underlined that post-disaster housing reconstruction with community-based method has gathered a lot of success in the reconstruction of many affected areas, for instance in Bam, Iran, Gujarat, and Indonesia.

However, in this study's areas, it was discovered that considerable implementing agencies did not ask the community, as the users, to get involved in the planning, designing, and construction process. The participation rate was very low in both villages. This possibly caused unplanned village layout found in most of the housing compounds with winding and narrow streets. There were unoccupied houses, and even houses that had been abandoned by the owner. People admitted that they do not want to occupy their houses yet because the physical condition and the quality are poor and the most basic services, such as electricity, water, and drainage systems, are not there yet. Limited spaces and rooms inside the houses also dissatisfied the residents. Problems with accessibility also arise as some houses were built without adequate infrastructure and on improper location, for example on wetland areas that are easily flooded by the rain.

Apart from the advantages of community-based and community participation in housing reconstruction, there is an argument that community participation does not always give positive contribution. One of the reasons is the difficulty to achieve agreement among various aspirations and needs, which leads to planning and construction process delay. There is also a problem related to overwhelming aspiration from the community because sometimes they demand on what they want, not what they need. Therefore, some implementing agencies used approaches such as meetings and discussions that are limited to community representatives and officers from the village.

3.3 Procurement for Building Materials and Skilled Labors

Respondents in FGD reported that the availability of building materials for housing reconstruction in Banda Aceh was a critical drawback. The problems were particularly related to procurement and resourcing. At the beginning of the rehabilitation and reconstruction program in Aceh, the government struggled to overcome massive demand for building materials and resources. Price escalation on building materials was inevitable. There was also a problem when certain people from the community insisted to supply buildings materials that do not meet the standard and specification required. Coordination between the suppliers and the construction agencies involved in the reconstruction is considered as an important measure to overcome the problems. The government should regulate the coordination mechanism and should develop strategies for collaborative procurement strategy in post-disaster resourcing (Diaz, R., et al. 2014).

The availability of labors/construction workers in terms of number and skill affected the progress of housing reconstruction program as well. There was shortfall of skilled labors in Banda Aceh so most of the labors must be drawn from elsewhere outside Aceh.

3.4 Government Involvement and Policy

National and international agencies and NGOs involved in post-disaster housing rehabilitation and reconstruction in Aceh were coordinated by the Indonesian government through Reconstruction and Rehabilitation Agency of Aceh and Nias (BRR). Coordinations were held particularly at the initial, planning, and designing stages. Meanwhile, the monitoring and supervision activities were usually the responsibility of the implementing agencies. This is considered as one of the causes of problems related to poor quality houses and unsatisfied beneficiaries.

From the experience in Aceh, it should be emphasized that the role of government is crucial at every stage of post-disaster rehabilitation and reconstruction process. Government involvement in the reconstruction works is not only at the regulatory and administrative levels, but also thoroughly into field implementation. Government has a vital role and is the leading actor in post-disaster recovery. Frimpong (2011) revealed that 40% of the actors involved in post-disaster recovery do not understand the principles of disaster emergency management. They even do not have any formal basic training in managing and working in the field of disaster management and reconstruction. Yet, 75% of those actors are also concerned on the political intervention from the government in disaster emergency management and disaster recovery process. Thus, government involvement should be placed properly.

There were also some problems in post-disaster reconstruction process in Aceh related to government regulations, for instance, government regulation on dealing with resources shortfalls. There were regulations to substitute timber with steel or alumunium for structural roof frame. The substitution was applied without adequate preparation of labour's skills and without consideration of local climate conditions. Consequently, the construction works did not meet the required standards and the roof frame was easily damaged by seasonal storms and corrosion. The decision on changing material choices was often made during the construction process on the field. Perhaps it was made to avoid construction delay and to solve the problem of material unavailability. Hayles (2010), in her research, revealed that there are reconstruction works that unintentionally increase vulnerability because of materials choices and lack of knowledge and training of construction workers on new technologies. It is advised that governments and agencies should be careful in making such decisions and regulations. Those who participated in the FGD also reported that the government then had tried to overcome such problems by regulating quality assurance in planning, designing, and

construction stages. There were also trainings, workshops, and seminars to increase awareness, knowledge, and skills.

The summary of four indicators and its lesson learnt concluded from the series of discussion forum is presented below:

Table 1. Disaster recovery indicators of housing reconstruction and lesson learnt

No	Indicators	Lesson Learnt
1	**Housing delivery process:** a. There are 2 methods to deliver housing aid to the beneficiaries, which are rebuilding or building the house and giving cash money to rebuild and renovate the house. b. Houses delivery was executed either by the government (BRR) or by third party, in this case humanitarian agencies and NGOs. c. There were overlapping beneficiaries, even in the same household. d. Houses built by the government have lower quality compared to houses built by non-government organizations and other humanitarian agencies.	• The role of the head of the community and the village is important to attain accuracy in beneficiaries' data • Monitoring and supervision in housing constructions must be done by both the government and the owner
2	**Community Participation:** a. There were cases in which some beneficiaries participated in house reconstruction and others did not get the opportunity to participate. b. Community participation in housing construction process can be fully participating or partly participating. Fully participating means that the community is involved from the beginning of the designing process to the end of the construction process. Partly participating means that the community is involved only at the designing process or at construction process. c. A number of respondents believe that community participation and involvement are necessary to ensure the quality of houses. However, other respondents argued that community participation does not always give positive contribution. One of the reasons is the difficulty to achieve agreement among various aspirations and needs, which leads to the delay in designing and construction process.	• Training and capacity building for the community prior to engagement in housing construction work will significantly activate higher contribution to the work. • There should be mechanism for the community to deliver their aspirations and needs besides complaining to the builder or contractors.
3	**Procurement for Buildings Materials And Skilled Labors:** a. Buildings materials procurement was an immense challenge due to resources shortfall. Another unique issue is that there were certain people from the community who insisted to supply for buildings materials that do not meet	• The government should regulate and ensure the availability of buildings materials and skilled labor.

No	Indicators	Lesson Learnt
	the standard and specification required. b. There was lack of available labor in terms of number and skill. Therefore, most of the labor must be drawn from elsewhere outside Aceh.	
4	**Government Involvement and Policy:** a. Government involvement in housing rehabilitation and reconstruction is significant when it is only formality and ceremonial events. b. The involvement was limited to discussion and consultation at the planning and designing stage. c. The government was less involved at the construction stage, particularly in monitoring and supervision. For instance, lack of supervision to the housing construction in Lampulo and Kahju villages had lead to poor quality houses. d. At the early phase of tsunami disaster aftermath, institutional capacity was less existed. The government could not control and manage the resources shortage. There was no sufficient regulation to control the standard and technical specification of housing planning and constructions.	• The government should take part and responsibility in all phases of post-tsunami housing recovery and post-disaster housing rehabilitation and reconstruction process. • The government needs to provide regulations on the improvement of educated and skilled labor through regular training and workshop.

Conclusion

There are four indicators that pose as strains and support of post-disaster housing rehabilitation and reconstruction process in Aceh. They are (1) housing delivery process, (2) community participation, (3) procurement for building materials and skilled labors, and (4) government involvement and policy. The accuracy of beneficiaries' data is important and crucial to avoid housing delivery overlapping. Government capacity is vital and needs to be empowered from the initial phase of housing rehabilitation and reconstruction process. Community participation in housing rehabilitation and reconstruction needs to be carefully assessed and managed, depending on the situational context. Moreover, training and capacity building for the community prior to engagement in housing construction work will significantly activate higher contribution to the work. Less informed community could trigger dispute with contractor and builder, which resulted in construction delay. It is believed that if well-informed and trained beneficiaries are involved in their own housing construction, it will increase the quality of the houses because of self-monitoring and the house owner's sense of belongingness. Meanwhile, the government should regulate and ensure the availability of buildings materials and skilled labor. Trainings and workshops are essential to prepare skilled labors. In addition, monitoring and coordination between builder, construction professionals, and the government are key factors in implementing good practices in post-disaster housing rehabilitation and reconstruction.

References

Affan, M. et al. (2015). Lessons Learned from Two Villages in the Tsunami Most Affected Area of Banda Aceh City; A Review of the Housing Reconstruction and the Current State of Village Development. Post-Tsunami Hazard Advances in Natural and Technological Hazards Research 44. pp 59-72.

Ahmed, I. (2011). An overview of post-disaster permanent housing reconstruction in developing countries. International Journal of Disaster Resilience in the Built Environment, 2(2). pp. 148–164.

Azmeri, Mutiawati, C., Al-Huda, N. (2014). Identification of Educational Aids Condition after Earthquake and Tsunami in Aceh 2004. AIWEST.

The Indonesian National Board for Disaster Management. (2008). Regulations Chief No. 11/2008: Guidelines for post-disaster rehabilitation and reconstruction.

BRR. (2008). Book Series BRR 07 Housing, Roof Installing for The Pillar of Hopes, United Nations Development Programme (UNDP).

Diaz, R., Kumar, S., Behr, J. (2015). Housing recovery in the aftermath of a catastrophe: Material resources Perspective, Computers & Industrial Engineering 81. pp 130–139.

Frimpong, A. (2011). Sheltering and Housing Recovery after Disasters: Dissecting the problems of policy implementation and possible solutions. International Journal of Humanities and Social Science 1 (20). pp 1-12.

Hayles, C.S. (2010). An examination of decision making in post disaster housing reconstruction. International Journal of Disaster Resilience in the Built Environment, 1(1), pp 103–122.

Ismail, Z. et al. (2014). Project Management Success for Post-Disaster Reconstruction Projects: International NGOs Perspectives, Procedia Economics and Finance 18. Pp 120 – 127.

Multi Donor Fund for Aceh and Nias (MDF) and Java Reconstruction Fund (JRF). (2012). Efficient post-disaster infrastructure reconstruction: Experiences from Aceh and Nias.

Ophiyandri, T. et al. (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(2). pp 236–249.

Pramono, R. (2008). Functions of social capital in post-disaster recovery program (Case study: Earthquake and Tsunami Disaster Recovery at Lampulo village, Kuta Alam District, Banda Aceh, Nanggroe Aceh Darussalam. Thesis Dissertation. University of Indonesia.

Rietbergen, J. And Naraya, M. D. (1998). The International Bank For Reconstruction and Development/The Work Bank 1818 H Street, NW Washingkton D.C 20433, USA.

Sakamoto, M. and Yamori, K. (2009). A study of life recovery, A Study of Life Recovery and Social Capital regarding Disaster Victims – A Case Study of Indian Ocean Tsunami and Central Java Earthquake Recovery. Journal of Natural Disaster Science 31(2). pp13-20.

TDMRC and IRP. (2012). Recovery Status Report, Indian Ocean Tsunami 2004: Recovery in Banda Aceh.