Village plan for disaster mitigation (case study: reconstruction of Gampong Pande post-earthquake and tsunami disaster)

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Abstract. Gampong Pande on the north coast of Banda Aceh city which was destroyed after the 2004 earthquake and tsunami has been reconstructed with the assistance of the Asian Development Bank (ADB) with a comprehensive approach. One of the important steps taken for future disaster mitigation is to develop a village plan. The village plan was prepared with the aim of rebuilding the village and its inhabitants with a “build back better” approach. The community participation approach is carried out while respecting local culture but trying to introduce ecological aspects as part of disaster mitigation as well as economic resources. Village plans are also prepared based on efforts to minimize changes the existing land ownership patterns to avoid social conflicts, so that massive and careful social and land ownership data collection is carried out. To increase safety efforts during the earthquake and tsunami disaster, proper access is made for all land and houses to the ideal evacuation route. In addition to rebuilding houses to standards that are in accordance with the building code, the village plan is also presenting the development of better environmental infrastructure and facilities as part of efforts to rebuild community livelihoods after the disaster. Environmental quality improvement is also carried out by utilizing local coastal plants for ecological disaster as well as for community economic improvement.

1 Introduction

The earthquake and tsunami of 26 December 2004 destroyed most of the city of Banda Aceh with the worst damage to the northern coastal area. Following the catastrophe, many aids came from all over the world, one of the biggest aids was from the Asian Development Bank (ADB). A preparation team (Project Preparation Consultants) was immediately

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formed by ADB to prepare everything needed to rebuild the devastated area [1]. Researcher have been part of the team responsible for preparing housing and settlement aspects with a community empowerment approach.

Considering that there has never been a precedent for rehabilitation and reconstruction for a disaster with an impact like that in Aceh, direct intervention was carried out in the field by prioritizing aspects of community involvement at every stage in the context of rehabilitation and reconstruction. Big challenges are facing considering the massive level of damage, so many victims and the paralysis of the local government, and of course requiring a holistic and comprehensive planning to restore the lives of the victims. Rehabilitation and reconstruction in rural areas that have been destroyed requires the right strategy so that if one day a similar disaster occurs again, many lives can be saved. Gampong Pande is one of the most severely damaged areas considering its location on the north coast of Banda Aceh [2]. One of the important aspects carried out at the beginning is planning for village development with a more responsive approach to the threat of natural disasters. This is where the importance of the plan as a disaster mitigation effort as well as the initial media for disaster education for residents. Rehabilitation and reconstruction are not just merely built houses, but basically it is rebuilding lives [3].

2 Methods

Since the actions of rehabilitation and reconstruction post-disaster in the field were conducted by well-organized institution, this research focused on the intervention on helping communities dealing with problem post-earthquake and tsunami disaster. Action research paradigm focused on solving practical problem in the built environment with community participation approach [4].

2.1 Strategies

The village planning was carried out including the serial important activities, started with detailed technical surveys including environmental survey, topographic surveys for selected spots, if required. Another critical issue must involve the local communities and local government unit in discussion of development strategy and technical aspects of the village plans, including other sectoral department plans like housing, livelihood, and others, seek consensus among local stakeholders. The village planning will be carried out must be in line with district-level (Kecamatan) and city spatial planning. The village plans do interlink and match with the housing component, and land acquisition and safeguards issues. To facilitate the village planning and the design of drainage systems and to enable housing land distribution work to proceed to the stage of land titling, a reliable, sufficient, and accurate base maps must be available.

2.2 Case Study

Gampong Pande was selected as case study, because it was the first pilot project of ADB’s project for rehabilitation and reconstruction post-disaster. In Gampong Pande, 70 percent of the population was lost and all houses except one were completely destroyed. Likewise, the tambak (fish and shrimp breeding ponds) was heavily damaged (Figure 1 and Figure 2). The housing reconstruction program will provide security and so will also help those who are presently living in scattered locations throughout the city to return to work as before. It was chosen as an area that is easy to reach and so faces minimal logistical problems. Secondly it is a small to medium size development, and so will provide less problems than
much larger communities. The community is small enough to be treated as a single group and not require to be broken into smaller sub-sections to facilitate meaningful dialogues within the community on the shape of the development and on the options for housing design. Further, the community was chosen because there was already a community leader chosen by the survivors.

Fig. 1. Aerial map of Gampong Pande post-earthquake and tsunami

Further, the community was chosen because there was already a community leader chosen by the survivors. He had demonstrated in the early days after the tsunami, an ability to
organize the community and to provide the leadership required in such a situation. In an emergency situation, meetings with community leaders are carried out intensively and effectively with all the limited availability of facilities. The village plan is based on the objectives of building back better (Figure 3). The plan was prepared with the full involvement of the community, and respects existing historical sites, including the cemetery of the Raja of Aceh and other traditional burial grounds. The plan also tries to introduce ecological aspects, in particular the planning of ecological water purification ponds and the construction of compost (waste) gardens. An area is also identified for a nipa garden, which can be used in traditional building, and also serves as an ideal environment for crab fisheries.

Fig. 3. Village Plan of Gampong Pande

The plan is based on minimal disruption of the existing land ownership patterns. However, to improve security, some additional village roads are proposed to provide access to all plot holders to the main village road that leads into the city and so to the city’s own escape route to safer ground.

The plan has been accepted by the community and this is confirmed with the signatures of the geucik (head of the village) and the tueha peut (village elders). The plan is based on minimal disruption of households, except in so far as it is necessary to provide access to a plot, and hence involves a limited amount of agreement from owners of the affected plots. Each affected landowner was approached to request their agreement to donate the land.

Two sorts of village plan were produced to guide the development of housing and settlement. For all areas, schematic land use maps, showing housing land and land suitable for housing development with main drainage lines and any proposed flood protection work were and proposed rights of way or roads required enabling the population to move quickly to safer areas in the case of another Tsunami. These were schematic drawings, drawn to a
degree of accuracy that will enable the team to know whether there is sufficient land for the known housing needs and to identify the proposed drainage scheme for the area but will not include any technical or detailed drawings. It has also identified proposed locations for communal facilities. After a public posting and public meetings, the head of the community will be expected to sign, and documented that they accept the plan. This will form the basis for the detailed site planning for the housing areas.

The second type of plan is the detailed site layout plan for the housing areas (Figure 4). This includes the boundaries of individual plots, the present ownership and the proposed ownership. Information on land given for infrastructure work was also identified and showed the percentage the ceded land to the total area of the plot. It marks existing housing, indicating which units qualify for rehabilitation assistance, which should be demolished. It also shows what land adjustments have been made and what land has had to be taken from existing land claimants for access roads, drainage, rights of way and for land rationalization and readjustment purposes. The present and future owners of the land must be identified and must sign that they agree to the changes made. The owners need to supply proof of ownership, one way or the other. Further the community must decide the plan to be used, and sign their acceptance of the proposed housing design and any on-site or off-site water and sanitation system developed and other communal facilities required that can be covered within the budget allocated.

![Image](image.png)

**Figure 4.** Housing layout plan

Gampong Pande is a community that before the Tsunami was reported to have 1,139 people, which made up 205 households. Following the disaster, only 346 persons in 170 households were found to have survived. Of the surviving households, 20 were renters. But of these, three are single orphaned children, and one has three surviving children, all 12 years old or younger. The characteristics of the surviving households are as given in Table 1 below.

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<th>Male Head of H/hld Renters</th>
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In Gampong Pande, it has been built 153 thirty-six square meter nett houses, raised to a minimum of 60 cm above the road level or 30 cm above the highest tide of the year. More than 900 meters of new road was built and road improvements will be carried out on a further 270 meters of existing road. The new roads will ensure that all plots have access to the main spine road and from this to the city’s road network that leads to the main escape route out of the city. All new roads will have associated drainage on both sides of the road.

Each community will be involved in determining the design of the house and the materials to be used. However, the designs will be constrained by a number of factors, including, cost, size (36 square metres), suitability and availability of materials, suitability for adding extensions and environmental considerations (Figure 5). These include the risk of flooding, soil conditions and the impact of the use of certain materials on the local environment, in particular wood.

![House TYPE 1](image)

**Fig. 5.** Generic Housing Design

Further, the design of the housing needs to be adequate to withstand a quake of at least can stand the zone 6 destruction force or about 9 on the Richter scale and must conform with the national and provincial building codes for houses in seismic areas. The use of alternative materials will be taken into consideration such as light steel structure or composite material. Based on discussions with the communities in Banda Aceh, an additional toilet and cooking bench were added to the 36 square metres house that it become a 36+ square metres unit. In different setting for example in high density areas such
as in Banda Aceh city centre different designs are being finalized with the communities to accommodate communities’ needs and limitation of lands (Figure 6).

The drainage connects to the two ecological water treatment ponds or gardens, or directly to main drainage systems. Water from the ecological ponds can be safely returned to tambak. The sites of the ecological ponds also provide the location of compost gardens, producing compost that can be sold or used by the residents for the greening of the area.

The village plan also includes the construction of an office for the desa administration. This is built on public land. The design used the same model as for the residential house. One community hall or meuligoe was built on communal land. This will be of sufficient size to hold meetings for all members of the village. In later stage a fund was made available by donor from Montpellier in France to add a building for women’s activities (Bale Inong) to the house model.

![Fig. 6. Alternative housing design based on plot condition](image)

The reconstruction of destroyed houses in Aceh have a positive impact on local economy, as well as providing the security required for the population to begin to re-establish their lives. It will also provide healthier conditions for families and thus be a positive investment for the future. This by itself will help improve the lives of the people of Aceh, including families that were affected and women who lost their breadwinners and companions. A good and sustained housing program will mean an appreciation of the value of the people’s material assets. It should be noted that for many, the land is the only remaining asset they have after the disaster.

4 Conclusions

The village plan proved to be very effective and important although not so easy to prepare. Not only quality of expertise needed, but willingness and patience to work with the community is extremely essential. It is very important to get the full trust of the community and their leaders through friendly approach to achieve result in a most satisfactory built
environment. Effective serial meeting with the community in informal situation and respect with their culture are very effective to build friendly relationship to smoothing the way of rehabilitation and reconstruction process.

House planning must be basic and generic, to be improved and upgraded depending on the needs of the people. The design is open ended in order to accommodate the basic essence and character of the resident. There is always an opportunity to infuse local values and capabilities.

Promote and ensure that female members of the village that is selected and prepared to be served with housing reconstruction and rehabilitation have equal opportunity and right to voice their needs, aspirations, priorities and other specific ideas. Ensure that the designs and plans for housing reconstruction and rehabilitation and community facilities have considered the gender sensitive needs.

The experience gained in Gampong Pande will provide valuable experience on how to tackle the planning and development process in other areas. All activities are documented, so that the experience and the result of the undertaking can be used as a framework for sustained development.

References