

Site visit and observing to Yogyakarta , Bantul town and surrounding Area

General Condition

- The Earthquake disaster which hitteed Yogyakarta province and Central Java on May 27th 2006 were caused a big loss. a tentative prediction said that almost 6.000 people become victims and more than 150.000 houses and buildings were destroyed and heavily damage. Based on our field observation and a direct visit on some earthquake coridor areas (fault-line), specificy along Kecamatan Pleret – Imogiri – Parang Tritis almost 70-80 percent of buildings (especially houses) are totally destroyed or heavily damage.
- In general, we assumed that the damage is a combination of internal and external factor in building/housing structure. The internal factor is more influenced by the quality construction itself (material and construction system). Meanwhile, the external factor is influenced by the land structure in fault line.
- The disaster which happen in Yogyakarta is a quite different with the disaster in Aceh and Nias, in here the productive paddy field area relatively slightly damages and still can be used for income generating activity.
- The infrastructure condition relatively still in a good condition. Access to this area relatively still good and can be accesed with various kind of transportation, the light damages on the infrastructure can be repaired in a short periode. Therefore, lots of public building and public ammenities mostly face a damage and influencing the service to community and will affect the service providing to the community.
- The other striking diference is the availability of better human resources. Also supported with good governmnace followed by a high trust from the community for the local government. (influence of Yogyakarta sultanate).

Cause of Damages

Mainly almost all the building which destroyed on the earthquake were very old and the structure quality is very bad without any retroactive and renovation conducted in last few years. It was assumed that the culture within the community not accustomed and get use to with earthquake disaster threat. Beside, the Influence of soil quality such as clayey sand with soft layer is concerned that they had a significant impact to the current damage. The table below will indicate several main factors which influencing the damages in overall housing in Yogyakarta based on type of structure.

Table 1, Building type and cause of damage

Building type	Damaged cause
Masonry Building Brick house without reinforced concrete structure, usually	<ul style="list-style-type: none"> - Mixture of the cement is not according standard criteria as brick bond - The bad structure system (found in some buildings without foundation and sloof)

using one brick as shear wall.	<ul style="list-style-type: none"> - The ages of building is very old - The quality of building material is very bad - No joint/anchorage among roof structure and building wall
Concrete Building Using reinforced concrete structure such as column, beam, lintle beam and etc.	<ul style="list-style-type: none"> - The land condition is unstable - Anchorage of building does not meet with an appropriate standard - Not using good standard such as floor beam, lintle beam and also practical column

Source : Analyze of visual observation

Material Issues

The main which caused the destruction of the housing in this area are vary, but in general it is influenced by composition of cement mixture as adhesive element is not in a right method. The cement mixture as an adhesive material for bricks mixed with ratio of 1:10 with limes (1 cement: 10 limes). The numbers of limes has very high influencesl on cement capability as adhesiveness, therefore when the earthquake disaster strucked the brick in building is easily loose the grip and easily collapse.

The same mixture also conducted within reinfoecd concrete, the composition of lime and cement on concrete mixture had causes concrete becomes brittle/fragile, as a result the reinforced concrete does not able to receive and distributes lateral burden that causes to concrete fracture. This condition is worsened with unadequate of reinforcement on the concrete which is not according to the construction quality standard.

The usage one brick wall (Dutch Colonial Method) in some buildings which do not follow the adhesiveness standard from a good cement mixture will cause weight of brick becoming a fatal construction risk, with the strong potency of collapsing and threat the safety of the inhabitant. The several points below is the result of observation on tha factors related to building material which are influencing strength and durability of housing in yogyakarta.

- Bamboo truss (as a roof span) basically is quite good and flexible against shaking, but the usage in long term and rotten eaten by termite/borers causes this material becomes susceptible.
- The brick installment was conductet without enough showering and watering it first had decline the adhesiveness of the cement.
- The rubble stone which used for the foundation material mainly ias a lime stone which is not correct to be implement in soft layer soil. The lime stone have no capacity to handle the down force from the construction burden. (in some case we found out the bricks was used for foundation material as well as a floor beam)

Structural Failure

Buildings in this area commonly do not following the standard determined in SNI (Indonesian construction standart) for anti seismi building. There are several factors becoming the consideration:

- Brick material usage as sloof (floor beam) not able to transfer the force (construction burden) that supposed to be burdened. This condition is very dangerous, especially in the area with earthquake potency.
 - Foundation depthness also not according the standard criteria. mostly foundation only uses mountain stone as foundation with depth of 30 -40 cm (but there are several houses which are not using foundation).
 - Stucturall column rarely used, mainly the building s using a brick collumn, or using column with simply brick arrangement. The absence of column makes one of the cause of the failure in housing structure.
 - There are no existence of a practical column, therefore the bricks does not have a good binding and strenghtent.
 - No ring balk (Lintle Beam). This makes the building structure (both mansorary and concrete) can be easily destroyed since the building does not follow a stabile frame structure principle for receiving a tremor and shaking from eartquake. Building without ring balk (lintle Beam) can be easily ruined only with light earthquake scale.
- House with frame construction (beam and column) mostly still stands well, but some of them were destroyed due to the weaknesses of jointing/anchoring method among building structure part. Other factor is caused by most this concrete houses also does not used a lintel beam. Other factor is the distance between begel/ring in the reinforcement is too far and the stell bar rigidity becomes weak. Beside, the jointing/anchoring in building detail such as structure of roof and wall are not adequte. The bamboo material is valued quite good and flexible as building truss in enduring earthquake pressure, but commonly the bamboo material is not tied with a good anchorage, therefore many "sliding roof" effect incur quite dangerous.

Conclusion (Based on Mr. Teddy Boen Input)

- All the masonry buildings that collapsed suggest a shear failure indication of a brittle building
- Shear failure is typical for a brittle building and such failure is very quick.
- Masonry walls made of burnt bricks connected with weak mortar are no match for strong earthquake accelerations.
- Therefore, to provide some resilience, some tension resisting elements in the building, timber, r.c., steel must be provided and mortar mix of sand and cement must be used.
- All elements must be connected appropriately so that the building can act as one unity when shaken by earthquake.
- Half-brick thick masonry walls without reinforcement shall be retrofitted.
- From preliminary analysis, one brick thick masonry walls buildings can withstand the earthquake shaking for Yogya provided they are correctly built.
- For one brick thick masonry walls, it is suggested to use mortar consisting of sand and cement

Recommendation towards enhancing the quality of building structure

- Increase the public awareness through building a safer houses campaign which consist on how to build a good and safe house. This public campaign is felt very important due to the culture in this area not accustomed and get used to with knowledge related to anti-seismic building.
- The guideline for repairable or non-repairable construction should be immediately compiled by government. With this guideline, it is expected the community has a clarity in assessing the level of building damage and know well about the eligibility of a building to be repaired or not.
- The local government should immediately performs a persuasive activity regarding to the importance use of a good cement mixture. As well as the regulation on limestone usage within cement mixture.
- The activity of increasing the public awareness can be accomplished through various methods, either through dissemination of guidance leaflet, mock up, and display material or building a prototype house acoring to the anti-seismic standard.
- The local knowledge still becomes a main reference in reconstruction, maintains the building principec with one bricks system still a main option, but it should be added the understanding of the importance usage of cement with good mixture, column usage, practical column and a good proper lintle beam.
- Run the soil test before performing housing reconstruction. This is very important remembering the soil quality in disaster affected area is quite various. It is hope that from the result will have a knowledge on specific foundation design on any particular area.
- Community may re-use the "good" building material that is stil eligible to be reused, such as brick, timber, and roof-tiles. But they should be provided a with guideline to facilitate community in conducting the activity.

General Recommendation Towards to Early Recovery Activity

- Focus on providing tent in a quite big scale is not very effective, remembering that the number of the area which is not reached by the aid is very big, specially in Gunung Kidul area. The options are government and NGO provide small cash grants for community so that they may directly rebuild the transitional shelter before permanent house is completed.
- Beneficiaries enlisting should be performed in line with the identity card aministering to avoid the overlape in providing asisstance and ease the governement to control and indentified the number of beneficiaries.
- Providing the Block Grant is considered to be quite good, but the social verification mechanism need to refer to a proper community contracting system. The controlling mechanism and MONEV should really performed accurately, either through third party monitoring or through community monitoring to prevent the malfasance of fund allocation and also malfacanse in construction impelementation.

- For community which include as vulnerable criteria (extended family, renter without owning a land) can be provided an assistance through a microfinance, such as credit triguna (credit for land-house and livelihood) with this type of assistance is expected the vulnerable groups may have a chance to live better.
- Equity principle in distributing financial assistance for housing rehabilitation and reconstruction, equity principle can replace concept of asset replacement. For example in remote area in Parang Tritis mostly for permanent building constructed are destroyed, but a traditional house which constructed without using Gedek (bamboo wall) still stands. It is concerned without good mechanism and good assessment, this matter may occur social friction in the incumbent area.
- The importance of early start on strengthening sub district capacity since they will become information and coordination centre on reconstruction activity. In spite of that, it also very important to immediately established an information system in sub district based, in order to fluently information updating, either related to the needs, gaps and other information.